‘’The Relation between E-cigarettes and Anxiety among Adults in Riyadh, Saudi Arabia’’

Abstract

The electronic cigarette (e-cigarette) is a device that utilizes a "e-liquid" that may contain nicotine and various flavorings including tobacco, menthol, fruit, and other possibilities. The smoker inhales an aerosol produced by the vaping device's internal heat generator. Electronic cigarette (e-cigarette) smoking or vaping is a global practice that has gained popularity despite its negative health implications. This study intended to show the relation between e-cigarettes and anxiety among adults in Riyadh, Saudi Arabia. An online cross-sectional study among 949 participants in Riyadh, Saudi Arabia. The study enrolled a total of 1005 individuals, of whom 949 (or 94.3%) completed the survey. The majority of respondents were between the ages of 18 and 24 (58.9%) and were male (55.8%). About 87.8 percent of participants held a bachelor's degree or more, while 10.53 percent held a high school diploma and 1.5% had not completed high school. The majority of respondents who used e-cigarettes are about (79%). We also discovered that rising age and male gender are connected with an increased likelihood of ever using electronic cigarettes. In addition, our data revealed a statistically significant relationship between e-cigarette usage and anxiety levels, and a greater proportion of e-cigarette users had moderate to severe anxiety levels.

Key word: E-cigarettes, Anxiety, Saudi Arabia, Adults, Smoking, Health.

Introduction

Tobacco smoking is one of the leading global risk factors for disease and mortality. If tobacco smoking continues to be a burden on world health, 8 million people will die each year by 2030. It is a widespread practice among people of all ages and genders. In addition, it was determined to be the first year of smoking for the majority of smokers worldwide. In a comparable study, the length of smoking was negatively related to the age of initiation (WHO, 2011).

The electronic cigarette (or E-cigarette) is a device that uses aerosolized nicotine to deliver electrical stimulation. This unit consists of a mouthpiece, atomizer, cartridge, and battery. The cartridge is a storage container for the fluid that contains nicotine, vegetable glycerin, propylene glycol, and flavorings (Series, 2013). The user inhales the vapor produced by the atomizer from the liquid contents. Among young adults, e-cigarettes have risen in popularity due to the widespread perception that they are a healthier alternative to traditional cigarettes, as well as a result of increased awareness of the dangers of conventional cigarettes, legislation and restrictions on smoking conventional cigarettes in public places enacted by health authorities, and continued focused marketing campaigns by the manufacturers.

For young people, the aerosol in e-cigarettes is enticing not just because it tastes good but also because it is easy to inhale, has no objectionable odor, and is seen as less harmful than traditional cigarettes while still delivering nicotine. Some young people try e-cigarettes in an effort to improve their social standing and popularity at school. Even while e-cigarettes have become increasingly popular among cigarette smokers as a means of quitting the habit, not everyone who uses them finds they are effective. Some people who have never smoked before, or who are just starting out with cigarettes, may find e-cigarettes to be a more appealing option for obtaining nicotine. The fundamental draw of cigarettes is nicotine, a psychostimulant and highly addictive chemical. Cigarette smoke, however, is notorious for its pungent aroma and foul taste. Never-smokers and newbies may be discouraged from

starting the habit because of these characteristics, even if they love the rewarding effects of nicotine. Aerosol from electronic cigarettes, on the other hand, is milder and sweeter. Aerosol from electronic cigarettes is often flavored, so it has a pleasant aroma and taste. As a result, folks who have avoided cigarettes because of their nicotine content may find e-cigarettes to be a more satisfying way to satisfy their nicotine needs.

Electronic cigarettes give nicotine without burning tobacco. This may have contributed to the idea that they are less dangerous than traditional tobacco products. Although e-cigarettes contain less carcinogens than conventional cigarettes, they can still induce acute adverse effects such as vomiting, burn injuries, irritation of the upper respiratory tract, bradycardia, hypotension, or atrial fibrillation (Ioakeimidis, Vlachopoulos & Tousoulis, 2016). In addition, even though users are not exposed to the numerous hazardous chemicals and particles of ordinary tobacco smoke, they nonetheless experience the effects of tobacco on the central nervous system. This characteristic makes electronic cigarettes appealing to many smokers. According to clinical investigations, e-cigarettes contain a large amount of nicotine, although their nicotine production results in lower plasma nicotine concentrations than that of traditional cigarettes. However, this discovery cannot be generalized because the concentration of nicotine delivered to the bloodstream is dependent on the frequency and intensity of usage in addition to the brand of e-cigarette. In addition to the numerous adverse effects that e-cigarettes may have on the human body, some study reveals a link between their use and psychological anguish (Park et al., 2017; Weinberger et al., 2020). According to other studies, e-cigarette users may be more likely to have suffered mental health issues at some point in their lives.

Problem Statement

Electronic cigarettes (also known as e-cigarettes, mods, vape pens, etc.) have been the subject of numerous statements and plans from public health organizations in recent years. These groups include the American Cancer Society (ACS), the Centers for Disease Control and Prevention (CDC), and the World Health Organization (WHO). According to new data from the National Institute on Drug Abuse, e-cigarette usage is widespread among formerly nonsmoking teenagers in grades 8 through 12 (ages 10 to 19). Moreover, 66% of these youths reported that the liquid they smoked was "just flavorings."

The American Cancer Society claims that although electronic cigarettes are "less harmful" than regular cigarettes, the long-term effects of using them are still unknown. However, the Centers for Disease Control and Prevention warn that the nicotine liquid in e-cigarettes is highly addictive and can hinder brain development in teenagers and young adults.

As e-cigarette usage increases, numerous issues remain unsolved regarding the trajectory of use, long-term health effects, and impact on adolescent developmental outcomes. E-cigarette use among adolescents is a major public health issue requiring immediate action due to the potential for long-term harm and its apparent allure.

The main question for the study is:

What is the relation between e-cigarettes and anxiety among adults in Riyadh, Saudi Arabia**?**

And the sub-questions are

1. What are the effects of using e-cigarettes on health?
2. What is the role of marketing strategies and social media on using e-cigarettes?
3. What recommendations should be implemented to reduce the use of electronic cigarettes?

Study Objectives

- To show the effects of using e-cigarettes on health.
- To clarify the role of marketing strategies and social media on using e-cigarettes.
- To shed light on the recommendations should be implemented to reduce the use of electronic cigarettes.

Significance of the study

One must remember that decades of studies were required to convince people that smoking cigarettes is dangerous. It took a great amount of time for the development of smoking cessation therapy to begin reducing the number of smokers. It will likely take years to disprove scientifically the widespread marketing of e-cigarettes as safe and

develop adequate evidence of their dangers. Even more time will be required to establish the techniques required to successfully initiate a decline in the usage of electronic cigarettes.

There is the potential, though, for a reduction in e-cigarette use. Approaches used to reduce cigarette consumption can serve as a template. To begin, researchers should construct robust study designs and collect evidence demonstrating the physiological effects of e-cigarette use over the long term. The data from these studies will become increasingly relevant as current users age and have used e-cigarettes for many years. Looking at e-cigarette users over the course of many years allows scientists to draw firmer conclusions on the effects of the products. The false notion that electronic cigarettes are a safe substitute for traditional cigarettes can be refuted with enough evidence from scientific studies.

Limitation of the study

The main purpose if the study is to show relation between e-cigarettes and anxiety among Adults. This study was applied in the Riyadh, Saudi Arabia in 2023, which means that the results of the study are specific to this country and not prevail over other countries.

Definition of terms

E-cigarettes: It looks like a cigarette or cigar and functions like a pen, however it does not contain tobacco. It's battery-operated and filled with nicotine, flavorings, and possibly dangerous compounds (Brown & Balk, 2020).

Anxiety: Anxiety refers to any sort of uneasy emotion, from slight unease to crippling fear or worry (Akiskal, 2019).

Literature Review

1. E-cigarettes

In 2003, electronic cigarettes (e-cigarettes) first appeared in China, following which they spread globally, primarily via the Internet. The battery-powered device heats and vaporizes a nicotine-containing fluid, which is subsequently breathed by the user. The first design was intended to replicate the appearance of a conventional tobacco cigarette. Later generations had different designs and features; the more advanced it was, the more adjustable it was, i.e., with the possibility to refill the same device with different solutions, thereby varying the flavor, and the ability to adjust the heating intensity (Dinakar & O'Connor, 2016).

Battery-operated e-cigarettes evaporate nicotine to simulate smoking traditional cigarettes without actually burning tobacco. Because of its sleek appearance, user-friendly functions, less painful smoking experiences, attractive flavors, and inconspicuous nature, modern e-cigarettes are a more socially acceptable alternative to traditional cigarettes among teens and young adults (Fadus, Smith & Squeglia, 2019). Popularity of e-cigarettes may have unintended consequences, such as renormalizing smoking among young adults and causing them to get addicted to nicotine. Nicotine, which is found in some e-cigarettes, has been linked to harmful impacts on mental health, especially when used unsupervised.

Young folks are more likely than older adults to try electronic cigarettes; among those aged 18 to 24, 5.1% are current users and 35.8.6% have tried them at least once. Carcinogen exposure through e-cigarette fluid has been verified, however the long-term health repercussions of e-cigarette use are still up for debate (Hess et al., 2017; Sleiman et al., 2016). Furthermore, it is already well-established that e-cigarette use is associated with an increased propensity to try traditional cigarettes for the first time (Primack et al., 2015). Adolescents and young adults who used e-cigarettes were 30.4% more likely to become smokers than those who did not. This finding was based on a meta-analysis of nine longitudinal studies (Soneji et al., 2017). E-cigarette use is also associated with an increased propensity to smoke conventional cigarettes.

However, persons with longer histories of e-cigarette use are less likely to be dual users, and two years of e-cigarette use has been related with greater rates of smoking cessation (Harrell et al., 2015; Zhuang et al., 2016).

1.1. Effects of E-cigarettes on Health

Many negative health outcomes are linked to adolescent tobacco smoking, but the risk of addiction stands out among them all. The National Center on Addiction and Substance Abuse reports that the risk of becoming addicted to nicotine increases with the age at which one begins using the drug. Shorter attention span and adult learning

difficulties have been linked to nicotine exposure during brain development, which can have lasting effects up to the mid-twenties.

The lungs were designed to accept and process oxygen. They are harmed by the introduction of any other drug. To accomplish the desired effect, e-cigarettes are designed to allow the vaping liquid to be heated and then ingested (Henry et al., 2019). Inhaling an excessive amount of vapor can result in simple health problems such as pneumonia. Numerous electronic cigarette users suffer from asthma, chronic obstructive pulmonary disease, and inflammation of the lungs. These are only a few of the many health hazards that vaping can bring, and they are typically precursors to lung cancer.

One of the most often diagnosed cancers worldwide is lung cancer. The American Cancer Society and many other organizations have made enormous efforts to educate consumers about the dangers of smoking because lung cancer has become such a widespread concern. Organizations dedicated to helping people kick the habit have sprouted up, and more people are looking for resources to help them kick the habit. Although electronic cigarettes (e-cigs) were once hailed as the solution, recent scientific studies have shown that they may actually be just as harmful to users' lungs as traditional cigarettes. Between 2012 and 2018, around seven investigations were published in scientific journals, focusing on the topic of severe lung injury and pneumonia. The use of electronic cigarettes has been linked to a variety of health problems, including scarring, inflammation, and popcorn lung, all of which can make breathing difficult (Maddock et al., 2019).

After quitting smoking or vaping, the lungs will need time to heal, and this might take several weeks or months. Furthermore, the detrimental effects of smoking on the lungs continue even after quitting, though they diminish gradually over time (Butt et al., 2019).

The harmful health effects of e-cigarette use are linked to the chemical components in e-liquids. One electronic cigarette puff has been shown to contain more than 115 different volatile compounds. It appears that the aerosolization process may increase the hazards connected with e-cigarette use, as many of the potentially dangerous chemicals found in the aerosol were not present in the e-liquid solution. Elevated levels of carbon monoxide, heart rate, and plasma nicotine are some of the immediate impacts of using an electronic cigarette. Respiratory distress, bronchitis, impaired vascular function, cell damage that can lead to oral illness, and links with cardiovascular disease and cancer are some of the other negative effects.

The use of electronic cigarettes has also been related to an increased risk of cardiovascular diseases in a recent study. While lung issues have gained more attention, it is well-known that nicotine increases blood pressure, which can lead to cardiovascular problems like heart attacks and strokes (Nayir, et al., 2016). Many Americans are at risk for heart disease because of their weight and type 2 diabetes; e-cigarettes exponentially increase that risk. Furthermore, the use of electronic cigarettes raises adrenal production and output, leading to permanent cardiac damage (Callahan-Lyon, 2014).

The impact of electronic cigarettes on the nervous system, and the brain in particular, could be devastating. Work and problem solving in the real world, for example, rely heavily on one's cognitive abilities. Research shows that e-cigarette use by teenagers and young adults slows brain growth and reduces mental capacity (Pesko, et al., 2018). Despite the fact that the brain changes caused by e-cigarette use may not become apparent for years, they may eventually lead to dementia or even personality difficulties. Significantly, not enough time has passed for studies to be conducted and for conclusions to be known regarding the long-term health implications of e-cigarette use (Chapman & Wu, 2014).

There are other bodily effects from using electronic cigarettes, such as a high body temperature, chills, a cough, trouble breathing, shortness of breath, chest tightness, abdominal pain, and loss of appetite. This raises the possibility of making an incorrect diagnosis. Getting an accurate diagnosis might be difficult because many teens will lie about using e-cigarettes. Scientists are trying to determine if using electronic cigarettes raises one's risk of contracting cytomegalovirus type 19 (COVID-19) (Maddock et al., 2019).

2. Role of Marketing Strategies and social media

Unfortunately, marketers are excellent at selling their wares and can make electronic cigarettes seem like a good time. In particular, these people are creative in the ways they flavor electronic cigarettes, especially those aimed at minors (Ford et al., 2016). As an added bonus, e-cigarettes come in a rainbow of fluorescent hues, some even light up and glow, while others feature humorous images. It's obvious that these campaigns are aimed at enticing a

younger demographic to buy these gadgets rather than grownups. E-cigarettes, in contrast to traditional cigarettes, have a hip and appealing design.

Using diverse marketing methods, e-cigarette businesses target young adults, notably college students. One of these strategies is the creation of flavored e-liquids. E-liquids used in e-cigarettes are available in a range of flavors, with mint, coffee, and fruit flavors being the most common (Grana & Ling 2014). There are about 7,764 distinct e-liquid flavors, according to one study (Zhu et al., 2014), excluding the custom flavors accessible to consumers in retail shops, sometimes known as "vape shops." Because teenagers and young people are more prone than adults to choose flavored cigarettes, the increasing appeal of flavored e-cigarettes poses a public health risk.

E-cigarette makers also target young adults and college students by utilizing social media platforms and the internet as their primary advertising channels. Social connections, such as friends or family members who use e-cigarettes, were named by 87.6% of college students as their primary source of information regarding e-cigarette usage. Social media platforms and internet searches ranked second and third, respectively (Dobbs et al., 2020). From 2010 to 2015, Google searches for e-cigarette terminology increased by 450%. (Ayers et al., 2016). In addition, 90 percent of young adults utilize social media in some capacity (Perrin, 2015), and 63 percent of Facebook and Twitter users rely on social media as their primary source of information and news outside of friends and family. It has also been discovered that college students interpret all internet information, including YouTube, Reddit, and Google search results, as legitimate without checking the source, and that personal experiences are regarded as sufficiently credible sources.

An analysis of e-cigarette videos on YouTube revealed that 85% of e-cigarette promotional videos were produced directly by e-cigarette manufacturers and that 94% of e-cigarette videos and advertisements on YouTube were "pro" e-cigarette use while only 11% of videos found were "anti" e-cigarette use, demonstrating the negative consequences of using e-cigarettes (Luo et al., 2014). 84.3% of "pro" videos contained a website link that led directly to the website of an e-cigarette vendor. With 74.6% of "pro" films employing this promotional tactic, e-cigarette producers' primary advertising strategy consisted on presenting e-cigarette use as a healthier alternative to smoking conventional cigarettes. Other promotional methods included emphasizing the ability to use e-cigarettes in social settings where smoking conventional cigarettes is frowned upon and highlighting the variety of flavor possibilities.

3. Anxiety

3.1. Types of Anxiety

The majority of individuals with anxiety exhibit signs of multiple anxiety conditions. In addition, individuals may also have psychological issues such as despair, stress, and anger. In other words, when individuals encounter a variety of scenarios and occurrences in their life that cause them to feel anxious, their mindsets get dominated by other forms of psychological issues. Individuals' prompt access to medical treatment and counselling and guidance services is an important consideration that must be taken into account. If anxiety symptoms are left untreated, they may take over the life of those affected. Generalized anxiety disorder (GAD), social anxiety, specific phobias, panic disorder, obsessive-compulsive disorder (OCD), and post-traumatic stress disorder (PTSD) are the forms of anxiety (PTSD). These are outlined below:

3.1.1. Generalized Anxiety Disorder (GAD)

Persistent and excessive worry in a variety of contexts characterizes those who suffer from generalized anxiety disorder (GAD). There are many things that people worry about on a regular basis: their health, the health of their loved ones, the health of their families, their relationships, their ability to get an education, to engage in extracurricular and creative pursuits, to find gainful employment, to fulfil their responsibilities as homeowners, and so on (Evans, 2016). Consideration of the urgency with which medical treatment and counselling and guidance services should be sought is a crucial consideration in cases with GAD. The best and brightest minds in the medical and healthcare fields should be contacted.

3.1.2. Social Anxiety

Teaching children as young as three or four that there is a world beyond their own communities and that they will need to participate in it is a common practice in today's society. People socialize with their mom and dad, siblings, and other relatives at home. Outside the home, however, communication with others is essential as well. This includes interacting with neighbors, friends, teachers, bosses, employers, coworkers, students, and so on. They should also take part in social activities such as going to parties, gatherings, and other social events. People in these

settings often suffer from social anxiety. People who suffer from social anxiety tend to avoid going to the kinds of places and events where their anxiety can flare up (Lazarov, Abend & Bar-Haim, 2016). However, people go to doctors, health care specialists, and licensed counsellors when the issue begins to negatively impact their bodily or mental health. They offer assistance in overcoming this challenge. Overcoming social anxiety is crucial for improving one's quality of life and enhancing one's living situations. As a result, a more holistic understanding emerges of the fact that there are methods and strategies that significantly aid in the process of conquering social anxiety.

3.1.3. Specific Phobias

An extreme aversion to something that poses little to no real threat is characteristic of specific phobia. Although individuals with phobias may understand the irrationality of their concerns, just contemplating exposure to the feared stimulus can cause a severe anxiety attack. The dread of certain circumstances, objects, animals, insects, spiders, heights, and so on are all examples of common specific phobias (Eaton, Bienvenu & Miloyan, 2018). In cases where people's physical and mental health are negatively impacted by the issue at hand, however, they seek the help of doctors, health care providers, and licensed counsellors. People are offered counselling and assistance services to help them deal with this issue. It is crucially important to overcome social phobias in order to improve one's living situations and general quality of life. As a result, a more holistic understanding emerges of the fact that there are methods and strategies that significantly aid in the process of overcoming social anxiety. People with social anxiety avoid social events because they fear they will be humiliated or humiliating.

3.1.4. Panic Disorder

When people have panic attacks frequently and without warning, they have panic disorder. People who suffer from panic disorder are constantly on edge because of their anxiety of having an episode. Family history of panic disorder or panic attacks, loss of a close family member to illness or death, sexual assault, traumatic brain injury, and similar events have all been linked to an increased risk of developing panic disorder or panic attacks (Asmundson, Taylor & AJ Smits, 2014). In most cases, it takes time for the individuals to work through these issues in their lives. For instance, dealing with the death of a loved one is something that must be done. But when people's bodily and emotional health are negatively impacted by this issue, they seek help from doctors, health care providers, and licensed counsellors. People are offered counselling and assistance services to help them deal with this issue. Sometimes these things cause people to get sick or injured, and then they have to go get medical help. Consequently, coping with panic disorder is necessary for maintaining one's living situations.

3.2. Negative Repercussions of Anxiety

Anxiety has negative consequences on people's life across all demographics, including age, social class, education, ethnicity, occupation, community, category, and background. Persons with anxiety disorders often act in ways that are counter to the standards of their workplace when they are trying to carry out their daily obligations. They also provide hurdles for people to overcome while maintaining their current standard of living and working to improve their quality of life as a whole. Living in isolation, having trouble improving personality qualities, encountering obstacles while advancing one's professional prospects, and finding it difficult to improve one's quality of life are just some of the ways in which various forms of anxiety have negative consequences on people's daily lives (Martínez-Monteagudo et al., 2020). Loneliness is widely acknowledged to be a debilitating, persistent condition that has negative impacts on people's physical and mental health.

It is important for people to prioritize their own physical and mental health, develop their communication skills, cultivate a friendly demeanor, and practice the virtues of diligence, conscientiousness, morality, and ethics if they want to improve their personality qualities. The people need to have a wide variety of tools at their disposal. Furthermore, one needs to instill the attributes of meticulousness and industriousness in order to produce the required results. It is crucial that people make continuous efforts to improve their character traits throughout their life. Anxiety is thought to create roadblocks that prevent positive personality traits from developing. Therefore, it is clear from a broad perspective that people's lives are negatively impacted when they encounter obstacles on the path to improving their personality traits.

Previous Studies

According to Adzrago et al., (2023) Black/African-American adults are at a greater risk of having adverse health consequences due to tobacco use, but few studies have explored e-cigarette use behaviour in the adult-only Black/African-American community. The study investigated the relationship between e-cigarette use behaviors (never, former, and current usage), perceived harmfulness of e-cigarette use, and anxiety/depression symptoms in Black/African American individuals. This cross-sectional study was a secondary analysis of nationally representative Health Information National Trends Survey data from 2011–2020 (n = 6,268). Using the aforementioned risk variables, multinomial logit models were used to analyze variations in e-cigarette usage habits (reference group = never used e-cigarettes). The prevalence of prior and current e-cigarette use was 11.65 and 3.52 percent, respectively, among Blacks/African Americans. There was a substantial interaction between perceived e-cigarette toxicity and anxiety/depression. Moderate or severe anxiety/depression symptoms were connected with an increased likelihood of present e-cigarette usage, but not with past e-cigarette use. Those who judged e-cigarette usage to be equally as harmful as smoking cigarettes were less likely to be current e-cigarette users. Those who considered e-cigarette usage as more dangerous or were unsure were less likely to be previous or current users. Anxiety/depression and perceived harmfulness of e-cigarette use were strongly linked with e-cigarette use behaviors, as were their interactions. These findings provide the possibility to offer tobacco cessation and prevention programs to subgroups within this population and inform the creation of content for such interventions.

To the study of Jones, Asare & Lanning (2021) the usage of electronic cigarettes by young adults is a huge public health concern. 17.7–40% of college students had tried or presently use electronic cigarettes. Although few research has studied e-cigarette use among youth, there is an opportunity to investigate the psychosocial aspects that influence e-cigarette usage among college students. This study's primary objective is to evaluate the relationships between self-efficacy, knowledge, depressive and anxious symptoms, and e-cigarette use among college students. For data collection, a retrospective cross-sectional survey (20 questions) was used. The correlations between the independent variables and the dependent variable were evaluated using bivariate analysis and analysis of variance (ANOVA). 872 college students between the ages of 18 and 25 responded to the Qualtrics poll. There was a significant correlation between gender and the frequency of e-cigarette use (x^2=22.94, p <.001). Knowledge [F (3,808) =9.01, p < 0.001], self-efficacy [F (3,808) =4.85 p < 0.01], depression [F (3,808=8.31 p <.05], and e-cigarette use were associated with statistically significant correlations, as determined by an ANOVA. Post hoc analysis revealed that students who had never used e-cigarettes scored higher on knowledge and self-efficacy than those who used every day, some days, or rarely, indicating that never-users are more aware of the negative effects of e-cigarette use and are more self-confident than e-cigarette users. Knowledge about the adverse effects of e-cigarettes and self-confidence are modifiable factors related with reduced e-cigarette usage, according to the findings of this study. These modifiable factors could be the subject of interventions.

Study of Masaki et al., (2022) depression and anxiety have been linked to cigarette smoking in adolescents. Higher levels of impulsivity have also been linked to higher smoking behaviour. However, comparatively less is known regarding the relationships between depression, anxiety, and impulsivity and e-cigarette use, and how these relationships compare to the relationships between depression, anxiety, and impulsivity and cigarette smoking. In addition, nothing is known regarding the influence of impulsivity on the associations between depression, anxiety, cigarette and e-cigarette use. This study evaluated the hypothesis that higher depression and anxiety symptoms are similarly linked with more e-cigarette usage and cigarette smoking, and that these connections are stronger among individuals with greater impulsivity. Participating in a cross-sectional study were 2,622 young adults (18-25 years old; 54% female) enrolled in 4-year and 2-year colleges in Hawaii. 68% of the sample reported not using either e-cigarettes or traditional cigarettes, 13% reported exclusively using e-cigarettes, 9% reported just smoking traditional cigarettes, and 11% reported using both. Higher levels of depression, anxiety, and impulsivity were shown to be strongly linked with current cigarette and e-cigarette use. For instance, increases of one unit in sadness, anxiety, and impulsivity were linked with 34%, 17%, and 38% greater probabilities of e-cigarette use relative to non-use, respectively. The relationship between anxiety and cigarette smoking was shown to be significantly moderated by impulsivity, with the correlation being stronger among individuals with greater impulsivity. There was no evidence that impulsivity moderated any other connection. Results suggest that tobacco use prevention education should target children and young people with higher levels of internalizing symptoms, paying special attention to those with higher impulsivity.

Methodology

1. Research Method

For the purpose and objectives of this study the researcher applies cross-sectional descriptive method and the nature of the study requires choosing this method.

2. Data Collection

Data collection is the process of gathering and assessing information on variables of interest in a defined and systematic manner, which enables one to answer specific research questions, test hypotheses, and analyze outcomes (Gliner, Morgan & Leech, 2016). The research aspect of data collection is prevalent in all academic disciplines, including the physical and social sciences, the humanities, business, etc. Although procedures vary per field, the emphasis remains on guaranteeing exact and honest selection. The objective of all data collecting is to collect high-quality information that can be converted into a thorough data analysis and used to generate convincing and trustworthy answers to posed questions.

2.1. Secondary Data

Secondary data enables the researcher to develop and better appreciate the topic of study, as well as to broaden the body of knowledge on the problem of study. In addition, it gives a solid foundation for continuing the research and assists in identifying relevant research methods. Secondary data can also facilitate the interpretation and comprehension of primary data (Hair, Page & Brunsveld, 2019). In this regard, the research is conducted by a comprehensive literature evaluation of essential research papers.

The collection of information is implemented from several secondary resources such as published books and articles.

2.2. Primary Data

According to Pandey & Pandey (2021), primary information refers to data obtained directly by the researcher on the topic under investigation. They argue that primary data should be collected when secondary data are insufficient to answer the research issues. Various methods, such as surveys, comments, and interviews, can be used to collect primary data (Al Kilani & Kobziev, 2016). In both quantitative and qualitative techniques, primary data collection methods must be known; nevertheless, the choice of method depends on the objective of the study, the availability of resources, and the skill of the researchers.

The questionnaire is chosen because it will allow for a greater number of potential respondents, eliminate any personal bias that may arise during the questionnaire, and equal opportunities to answer the questions under similar conditions.

3. Population and Sampling process

The population of interest for the study consists of the persons, groups, organizations, or other entities to whom or to whom the study results can be generalized or transferred (Asiamah, Mensah & Oteng-Abayie, 2017). Moreover, the study's target demographic is the principal focus of the investigation. In addition to presenting the reader with environmental and contextual cues, demographics define the scope of an investigation. These limitations establish natural constraints on the research, allowing the researcher to maintain the appropriate level of attention and preventing the conclusions from being generalized to all contexts. Through the setting of boundaries, the researcher is also able to clearly identify subpopulations, such as the target population, and sample, and to assure alignment between these groups within the framework of the research.

Sampling refers to the procedure through which a statistically representative subset of a target population is selected. Because there are usually too many people in the population of interest to include in any study at once, sampling is a crucial tool for researchers. Good samples are statistically representative of their larger populations and are large enough to permit investigation of their research questions (Lakens, 2022).

The sample population is 949 respondents selected randomly to form the study’s sample in Riyadh, Saudi Arabia.

Results

Table (1): Participant descriptive characteristics and sociodemographic distribution

Variable	n (%) 949
Age	
Less than 18 years	70 (7.37%)
18 – 24 years	559 (58.9%)
More than 24 years	320 (33.7%)
Gender	
Male	530 (55.8%)
Female	419 (44.15%)
Educational level	
Less than Secondary school	15 (1.5%)
Secondary school	100 (10.53%)
College and above	834 (87.8%)
Ever used E-cigarettes	
Yes	749 (79%)
No	200 (21%)

The study enrolled a total of 1005 individuals, of whom 949 (or 94.3%) completed the survey. The majority of respondents were between the ages of 18 and 24 (58.9%) and were male (55.8%). About 87.8 percent of participants held a bachelor's degree or more, while 10.53 percent held a high school diploma and 1.5% had not completed high school. The majority of respondents who used e-cigarettes are about (79%).

Table (2): Association between E-cigarette use and anxiety

Anxiety level	Total
	n = 949
Normal	59
Mild	330
Moderate to severe	560
Age	
Less than 18 years	70
18 -24 years	559
More than 24 years	320

E-cigarette use was largely reported by individuals aged 18 to 24. 59% of subjects self-reported moderate to severe anxiety levels.

This study examined the prevalence, factors related with usage, and association between e-cigarettes and anxiety levels among adolescents and young adults. 79% of our survey participants acknowledged ever using electronic cigarettes. We also discovered that rising age and male gender are connected with an increased likelihood of ever using electronic cigarettes. In addition, our data revealed a statistically significant relationship between e-cigarette usage and anxiety levels, and a greater proportion of e-cigarette users had moderate to severe anxiety levels.

Conclusion

E-cigarettes are only one example of a good-intentioned product that was misappropriated to create a billion-dollar industry. Possibly, as technology advances, e-cigarettes can be adjusted to serve as a safe smoking cessation aid. However, the present judgement is that this technology is not safe, and in the coming years, additional regulatory modifications will be made to regulate its use.

In conclusion, this study gives useful information regarding the prevalence of majority adults using electronic cigarettes among adults in Riyadh, Saudi Arabia. In addition, it considers enjoyment to be the primary motive for

vaping, followed by a desire to quit traditional smoking. In spite of the fact that e-cigarettes offer less of a threat to health, it is vital that health professionals have a thorough understanding of the risks and advantages of e-cigarettes.

Recommendations

1. Nationwide education initiatives must be undertaken in order to begin raising awareness of the negative effects of e-cigarette use. For instance, current science textbooks that address substance abuse among adolescents need to be updated with material on e-cigarette use. In addition, health professionals must visit schools and colleges to teach children and adults about the dangerous effects of e-cigarette use through class discussions, and parents must reinforce this knowledge with their own children. As large-scale e-cigarette intervention programs become accessible to the public, the outcomes of these programs can be published in peer-reviewed publications and the material displayed on user-friendly websites that provide up-to-date information on the dangers and side effects of e-cigarettes.

2. As scientific information about the hazards of e-cigarettes accumulates, the FDA must become more involved and at the very least ban counterfeit e-cigarette pods, as well as adopt further regulatory rules, particularly those that target e-cigarette users under the age of 18.

3. There must be stronger consequences for individuals who offer these smoking devices to minors, as well as for those minors who are caught illegally attempting to purchase these products.

4. The government should partner with a prominent figure to serve as the campaign's spokesperson and education leader. Thus, instructional initiatives powered by social media are efficient in reducing e-cigarette use.

5. Numerous public forums should be utilized to demonstrate to various audiences the severity of youth e-cigarette use. These messages will persuade many parents to pay more attention to their children's behaviour, so encouraging many users to quit on their own. It is always more effective to persuade someone to give up an addiction by demonstrating the product's toxicity and the advantages of quitting. Thus, these tools facilitate the provision of the necessary motivation to cease dangerous behaviors.

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