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Effectiveness of Electronic Cigarettes in Smoking Cessation

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ABSTRACT

Background: Numerous investigations have been carried out to evaluate the effectiveness of electronic cigarettes in aiding individuals to quit smoking and to ascertain the security and feasibility of utilizing them as an alternative to traditional tobacco cigarettes. Research expenditures must be allocated significantly to the product's evaluation in order to perform an exhaustive examination of its usage prevalence, which includes its use as a smoking cessation tool as well as its adoption as a regular smoking behavior.

Methods: The current cross-sectional study was conducted at King Abdulaziz University's Faculty of Medicine in the first few months of 2022. There were 263 students that participated in the study in total. In the previous study, the researchers used an anonymous, standardized questionnaire, which they confirmed and put into practice. The concept was assessed and put to the test using statistical analysis using "IBM SPSS Statistics version 20.0."

Results: The study included a sample of 263 students, of whom 39.1% were classified as female and 60.9% as male. 49 of the 133 pupils in total were determined to have smoked in the past, while the remaining 86 were smokers currently. Regarding the sort of smoking habit used, it was discovered that 23 people (17.3%) used tobacco cigarettes, whereas 90 people (67.7%) used e-cigarettes or vapes. Furthermore, twenty people (15%) disclosed using other tobacco products. Of those who smoke, 36.1% use electronic cigarettes, or e-cigarettes, to cut back on tobacco use. There was a statistically significant link ($P<0.05$) found between the individuals' marital status and academic year and their regular use of e-cigarettes or vape.

Conclusion: The current study found that among a cohort of medical students who successfully quit smoking through its implementation, the use of electronic cigarettes (e-cigarettes) or vaping is a contributing factor in their success. Moreover, it is considered a transitional strategy for individuals who want to cut back on their total tobacco consumption.

KEYWORDS: E-cigarettes, vape, smoking cessation, medical students, smoking

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INTRODUCTION

The Nicotiana genus of plants, which includes tobacco, has been used extensively. There is a serious health risk associated with smoking. Numerous illnesses have a substantial effect on the respiratory and cardiovascular systems, which raises the rates of morbidity and mortality (Jayes et al., 2016; Morris et al., 2015). Furthermore, these illnesses also impact other body systems (Khani et al., 2018). The World Health Organization (2000) estimated that the global smoking population is somewhere around 1.1 billion. The annual health consequences of tobacco use are well known; smoking-related ailments are thought to be the cause of almost 7 million preventable deaths. The World Health Organization (WHO) estimated that in 2016, there were 9.1% of female teenagers and 21.2% of male teenagers in the Kingdom of Saudi Arabia who were smokers. In Saudi Arabia, the smoking prevalence among adults was 1.5% for women and 23.7% for men. Medical students who smoke had a prevalence of 12.4%, according to Alkhalaf et al. (2021), whereas 39.9% of medical students overall identified passive smoking as a common occurrence. Male medical

students had an 18.6% prevalence of active smoking, according to the study's findings, while female students had a lower incidence of 5.9%. Alkhalaf et al. (2021) revealed that 47% of male smokers reported using a hookah, while 77.8% of female smokers claimed the same. This information relates to the type of tobacco used.

The electronic cigarette, sometimes referred to as a vape or e-cigarette, is a tobacco product that doesn't burn. Typically, it contains flavors, vegetable glycerin, propylene glycol, and nicotine (Gotts et al., 2019). According to Gotts et al. (2019), the vaping industry has grown significantly and is becoming more and more enticing to people who smoke, have smoked in the past, and are young people who have never smoked. Since long-term safety evaluations and thorough preclinical toxicity assessments are frequently required for conventional medications and medical equipment, e-cigarettes were released into the market without completing these processes (Gotts et al., 2019). It is still unclear if e-cigarettes are safer than traditional tobacco products like cigarettes and hookahs, how effective they are as smoking cessation tools, and how they affect population health (Gotts et al., 2019).

The Polosa et al. (2014) study found that throughout the 2017–2018 timeframe, e-cigarette usage became more common. Between 2009 and 2018, this increase affected three markers of quitting smoking: stop attempts, recent cessation, and quit ratio. The results of a clinical trial by Polosa et al. (2014) and Adriaens et al. (2014) show that pen-shaped electronic cigarettes showed a noteworthy 36% quitting rate in just six months. A sample of 71 habitual smokers (44 men and 27 women) who switched from traditional to electronic cigarettes (e-cigarettes) in an attempt to stop smoking were studied by Polosa et al. (2015). Based on the data collected over a 12-month period, 40.8% of participants were classified as having successfully quit smoking, 25.4% as having reduced their smoking habits, and 33.8% as not having succeeded in stopping. The collection of research now in publication has a number of studies that have been done to evaluate how well E-cigarettes support quitting smoking. Nevertheless, no research has been found that explicitly looks at King Abdulaziz University medical students' use of E-cigarettes and their decision to stop smoking.

Furthermore, there has been a notable increase in the use of E-cigarettes among King Abdulaziz University medical students. This calls for a careful investigation of this phenomena to determine whether it may be used as a replacement for traditional cigarette smoking or as a means of quitting it altogether. This study's main goal was to evaluate how effective e-cigarettes are as a smoking cessation aid. The study also aimed to find out how common e-cigarette use was among King Abdulaziz University medical students in Jeddah, Saudi Arabia.

METHODS

Study design and Study setting

Between January and November of 2022, the current cross-sectional study was conducted at King Abdulaziz University's (KAU) medical faculty. The KAU Institutional Review Board (IRB) granted the study ethical approval; 359-21 was the allocated number. The study's participants were undergraduate medical students now enrolled in King Abdulaziz University's medical faculties in Jeddah, Saudi Arabia.

Inclusion and Exclusion criteria

Participants in the study included a wide range of students from Saudi and non-Saudi backgrounds, as well as male and female students from the second year through the internship year. The study does not include first-year students because this academic year is seen as a generic preparatory year for all university students. Furthermore, individuals who have never smoked and those with health issues that require them to give up smoking have been denied access to the program.

Sample size

The current study involved a cohort of 263 medical students. Out of them, 120 students said they had never smoked, and 10 more said they had stopped because of a health issue. them students were not included in the analysis. In our investigation, the stratified random sample approach was used. A group of students from every academic year was once thought of as a single unit. We then sent invites to all undergraduate medical students accepted into KAU-affiliated medical facilities. These students were asked to participate in the study by answering a set of questions with parts devoted to answering questions specific to female and male participants. It was concluded that a sample size of 265 participants was required for the investigation, with a 95% confidence interval, a population of 1000, and a 5% margin of error. The Qualtrics sample size calculator was used to perform the computation.

Data collection Technique and tools

In a previous study (Siegel et al., 2011), participants' data from their second year through their internship year was gathered by the researchers using an anonymous, standardized questionnaire. The sample comprised students from Saudi Arabia and other countries, as well as male and female students. The survey is distributed as an electronic form with six separate sections, created using Google Forms. All participants were asked to sign a consent form, and then they were asked to answer a series of questions that were divided into several sections.

The first phase of the study was devoted to collecting participant demographic data, which included things like gender, age, marital status, medical year, place of residence, and psychological problems. The second part involved assessing the participants' smoking status, which included a

number of factors like the predominant mode of smoking, smoking history and related characteristics, the extent of tobacco cessation or reduction after switching to e-cigarettes or vaping, the frequency of e-cigarette/vape usage, and the underlying ideologies and beliefs that motivate its use. The third section examined the usage patterns of e-cigarettes and nicotine among individuals who have abstained from smoking for a duration of six months.

Pilot test

A sample of twenty people were given the questionnaire, and they were asked to fill it out. This activity was taken in order to evaluate the survey's practicality and questionnaire's navigability. The study's final dataset does not include the data from the pilot project.

Data analysis

To evaluate and investigate the hypothesis, the current study used statistical analysis with "IBM SPSS statistics ver. 20.0". Basic frequency tables, cross tabulations, and percentages are used in the analysis. To investigate and clarify the relationship between two grouped variables, the chi-square test was utilized. Binomial logistic regression was used by the researchers to investigate the variables that predict the binary outcome variables. A threshold value of $P<0.05$ was utilized as the significance level.

RESULTS

Based on the information shown in Table 1, there were 263 participants in the study; 60.9% of the sample consisted of men and 39.1% of participants were women. According to the survey, 21.1% of participants were in their fifth academic year, while 32.3% of participants were enrolled in their third. Furthermore, 19.5% and 9.8% of the participants, respectively, were in their sixth and second year. According to the study, 88.7% of the participants were in the 20–25 age bracket. Of those polled, 22.6% were determined to be married, while the remaining 77.4% were single.

Table 1. Socio-demographic characteristics of participants (n=263)

Parameter		No.	%
Gender	Male	81	60.9
	Female	52	39.1
Medical year	Intern year	13	9.8
	2nd year	13	9.8
	3rd year	43	32.3
	4th year	10	7.5
	5th year	28	21.1
	6th year	26	19.5
Age	less than 20	9	6.8
	20- 25	118	88.7
	more than 25	6	4.5
Living Area	Central Jeddah	30	22.6
	East Jeddah	29	21.8
	North Jeddah	41	30.8
	South Jeddah	33	24.8
Marital status	Married	30	22.6
	Single	103	77.4

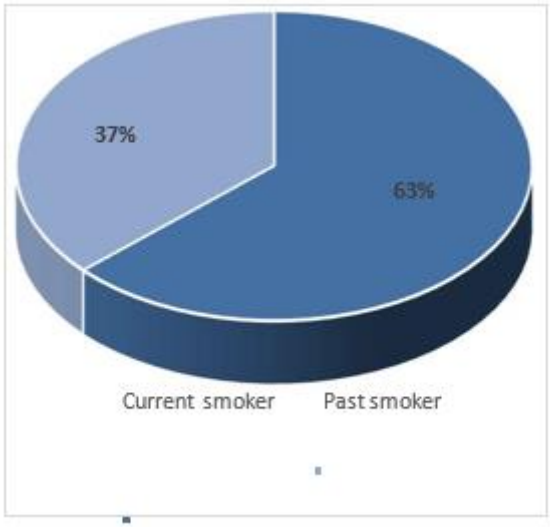

Figure 1. Smoking status among smoking participants

The distribution of smoking behaviors among the subjects is shown in Table 2. Ninety-seven people (67.7%) reported using e-cigarettes or vaping, whereas 23 people (17.3%) reported smoking traditional cigarettes. Furthermore, twenty people (15%) said they used shisha or other tobacco products. Of those who reported using e-cigarettes, 48 (36.1%) said they did so in order to quit smoking tobacco. Additionally, 55 people (41.4%) reported using e-cigarettes because they thought they had fewer side effects than tobacco cigarettes, such as headaches, dry mouth, and odor. Finally, thirty people (22.6%) did not give a convincing reason for using electronic cigarettes.

Table 2 Smoking status, type and history among smoking participants (n=133)

Parameter		No.	%
Smoking history (yearssmoked)	<1 year	18	13.5
	2-4 years	46	34.6
	5-6 years	19	14.3
	7-8 years	8	6.0
	>8 years	1	.8
	Don't know	41	30.8
Main type of smoking used	E-cigarettes/vape	90	67.7
	Other tobacco products (shisha, etc.)	20	15.0
	Tobacco cigarettes	23	17.3
Presence of psychological problems	Yes	6	4.5
	No	127	95.5
Using or used E- cigarettes/vape regularly	Yes	92	69.2
	No	41	30.8
Reason for using the E-cigarettes	As a way of tobacco cigarette cessation	48	36.1
	Less side effects than tobacco cigarettes (smell, headache, dry mouth, cough, etc.)	55	41.4
	No specific reason	30	22.6

It is evident from Table 3's statistics that 19.5% of participants believe there is absolutely no risk associated with e-cigarettes. Furthermore, while the majority of participants—58.6%—believe that E-cigarettes are less toxic than their tobacco counterparts, 20.3% believe that they are just as bad as tobacco cigarettes. Just 1.5% of participants think that e-cigarettes aren't as safe as traditional tobacco cigarettes. Of the participants, thirty-one percent strongly agreed and eight percent expressed partial disagreement that e-cigarettes are an effective way to quit smoking. A total of thirty-six percent stated partial agreement.

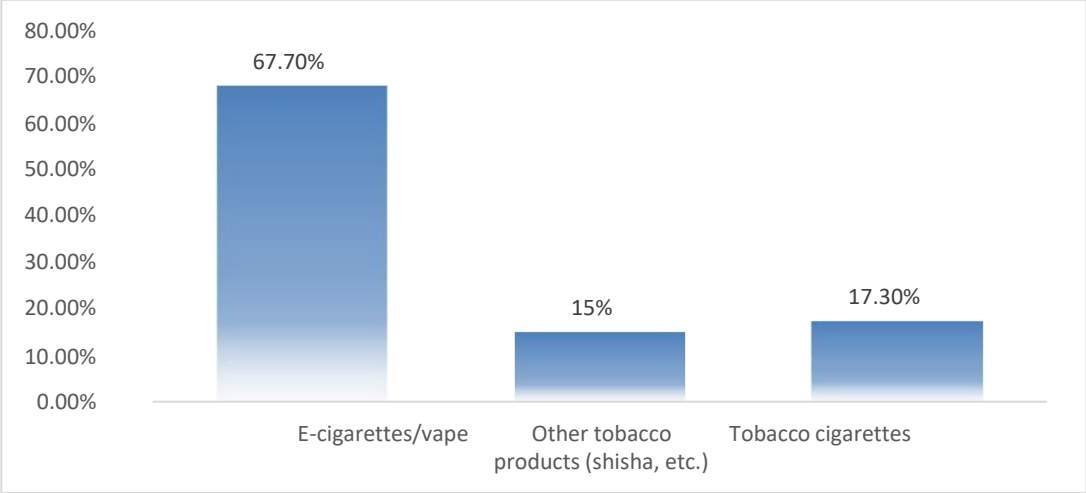

Figure 2. Main type of smoking used among study participants (n=263)

Table 3. Awareness about E-cigarettes among study participants (n=263)

Parameter		No.	%
E-cigarettes compared totobacco cigarettes are	Absolutely Harmless	26	19.5
	Equal harmful as tobacco cigarettes	27	20.3
	Less harmful than tobacco cigarettes	78	58.6
	More harmful than tobacco cigarettes	2	1.5
E-cigarettes are an effective way of smokingcessation	Neither agree nor disagree	28	21.1
	Partially agree	46	34.6
	Partially disagree	11	8.3
	Strongly agree	40	30.1
	Strongly disagree	8	6.0

The data presented in Table 4 indicates that a considerable percentage of individuals saw a decrease in their daily tobacco cigarette use (57.1%) and overall nicotine consumption (54.9%) after using e-cigarettes. When it came to the frequency of smoking, 32 participants (24.1%) said they smoked five to ten times a day on average. The remaining individuals said they smoked five or less times a day, eleven to fifteen times a day, or fifteen or more times a day. Regarding e-cigarette use, it is interesting to note that about one-third of the participants reported using them every day, while the remainder people reported using them occasionally. It's interesting to note that of those who had abstained from smoking for a long period of time, 51.1% only used E-cigarettes, 10.5% used alternatives without nicotine, and 7.5% used nicotine products without tobacco. Table 5 shows a statistically significant link ($P<0.05$) between the individuals' marital status and academic year and their regular use of e-cigarettes or vape.

Table 4. Determinants of use of E-cigarettes among smoking participants (n=133)

Parameter		No.	%
Reduced overall nicotine use after e- cigarette use	Yes	73	54.9
	No	19	14.3
	Don't know	41	30.8
Reduced number of tobacco cigarettes per day after e-cigarette use	Yes	76	57.1
	No	16	12.0
	Don't know	41	30.8
Number of previousquit attempts	0	18	13.5
	1–2	38	28.6
	3–5	21	15.8

	>5	15	11.3
	Don't know	41	30.8
Quit/abstained for a	< 1 week	14	10.5
period of time	1-4 weeks	26	19.5
	1-3 month	16	12.0
	>3 month	22	16.5
	Don't know	55	41.4
Reason for return tosmoking	Craving	28	21.1
	Others	6	4.5
	Stress	24	18.0
	Successfully quit and never returned	22	16.5
	Don't know	53	39.8
Number of times usedper day	0	9	6.8
	<5	16	12.0
	5–10	32	24.1
	11–15	13	9.8
	16–20	11	8.3
	>20	11	8.3
	Don't know	41	30.8
Weekly pattern of e-cigarette use	Everyday use	49	36.8
	No current e-cigarette use	10	7.5
	Only uses some days	33	24.8
	Don't know	41	30.8
Nicotine use of thosewho are not smokingfor 6- month period	Nicotine-free	14	10.5
	Using only E-cigarettes	68	51.1
	Using tobacco-free nicotine products	10	7.5
	Don't know	41	30.8

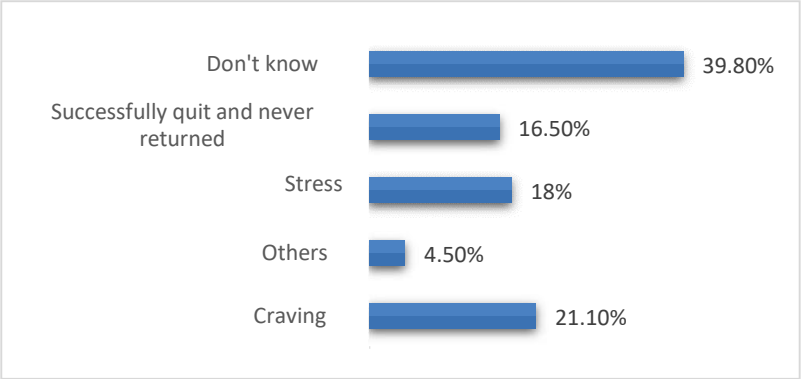

Figure 3. Reason for return to smoking among study participants (n=263)

Table 5. Association between using E-cigarettes regularly with socio-demographic characters of participants

		Using E- cigarettes/ vape regularly		Total (N=133)	P value
		Yes	No		
Marital status	Married	26	4	30	0.018
		28.3%	9.8%	22.6%	
	Single	66	37	103	
		71.7%	90.2%	77.4%	

Gender	Male	54	27	81	
		58.7%	65.9%	60.9%	
	Female	38	14	52	0.435
		41.3%	34.1%	39.1%	
Academic year	Intern year	11	2	13	
		12.0%	4.9%	9.8%	
	2nd year	9	4	13	
		9.8%	9.8%	9.8%	
	3rd year	34	9	43	
		37.0%	22.0%	32.3%	0.004
	4th year	6	4	10	
		6.5%	9.8%	7.5%	
	5th year	11	17	28	
		12.0%	41.5%	21.1%	
	6th year	21	5	26	
		22.8%	12.2%	19.5%	
Age	Less than 20	8	1	9	
		8.7%	2.4%	6.8%	
	20- 25	80	38	118	0.414
		87.0%	92.7%	88.7%	
	More than 25	4	2	6	
		4.3%	4.9%	4.5%	
Living Area	Central Jeddah	21	9	30	
		22.8%	22.0%	22.6%	
	East Jeddah	25	4	29	
		27.2%	9.8%	21.8%	0.063
	North Jeddah	28	13	41	
		30.4%	31.7%	30.8%	
	South Jeddah	18	15	33	
		19.6%	36.6%	24.8%	

DISCUSSION

Electronic cigarettes, also referred to as E-cigarettes, are battery-operated nicotine delivery devices. These gadgets simulate the sensation of using nicotine while simulating the hand and inhalation motions that come with smoking. As such, they could also serve as a neurobiologically and psychologically effective smoking cessation strategy. Vardavas et al. (2015) claim that because e-cigarettes don't burn tobacco, they might not carry the same risks of morbidity and death as traditional cigarettes. This study offers fresh insights into the relationship between King Abdelaziz University medical students' use of e-cigarettes and their decision to stop smoking. According to the results of our investigation, 36.1% of smokers use electronic cigarettes to cut down on tobacco use. After using electronic cigarettes, or "e-cigarettes," a considerable percentage of participants—54.9%—showed a decrease in their total amount of nicotine use. Furthermore, 57.1% of respondents reported a decrease in the amount of cigarettes they smoked each day. Hartmann et al. (2016) did a systematic review in which they evaluated the effectiveness of E-cigarettes versus placebo and nicotine replacement therapy as a smoking cessation aid. The analysis revealed that there were not enough studies in existence, and those that were were frequently of low quality and had tiny sample sizes. Similar conclusions about the low quality of the studies and the limited effect of electronic cigarettes (E-cigarettes) on quitting smoking have been reached by a number of additional systematic reviews. According to one such analysis, those who use E-cigarettes are often less likely to give up smoking (Grabovac et al., 2021). Electronic cigarettes, or e-cigarettes, have been shown to be more effective than a placebo at helping people stop smoking, according to the results of four systematic studies (Eidib et al., 2017; Hartmann et al., 2016; Khoudigian et al., 2016; Rahman et al., 2015). According to research done in 2016 by Kalkhoran and Glantz, people who used e-cigarettes had a 28% lower chance of effectively quitting tobacco use than people who did not use them. Five randomized controlled trials (RCTs) were included in the investigation, and the results showed that the group using

e-cigarettes had a 2.6% higher abstinence rate than the control group.

A number of research (Hajek et al., 2019; Lee et al., 2019; Li et al., 2020; Soneji et al., 2017; Tseng et al., 2016) have proposed that e-cigarettes may help adult smokers quit smoking more successfully than placebo or nicotine replacement therapy (NRT). The existence of control groups in these investigations lends credence to this view.

When evaluating the effectiveness of E-cigarettes as a smoking cessation aid, consumer items' accessibility may be important. The state of affairs is comparable to the discrepancies found in the use of legally prescribed nicotine replacement therapy (NRT) medications to help people quit smoking in non-clinical settings and the effectiveness of these medications as shown by clinical studies. The relationship between different over-the-counter nicotine products and the act of quitting smoking has been the subject of numerous studies. The results obtained from the extensive population-based California Tobacco Surveys show that when nicotine replacement therapy (NRT) was only available by prescription, it was effective in helping people quit smoking over the long run. But after NRT became widely accessible over-the-counter, the beneficial association between it and successful smoking cessation was no longer seen (Pierce and Gilpin, 2002). According to Patel et al. (2021), the findings of a nationally representative survey conducted in the United States indicate that adults rarely use e-cigarettes to help them quit smoking. However, there are conflicting results in the literature on the effectiveness of e-cigarettes as a smoking cessation aid. Therefore, evaluating the effectiveness of e-cigarettes as a smoking cessation aid is the main goal of this cross-sectional study carried out in Saudi Arabia.

One commonly noted reason for using electronic cigarettes (also known as e-cigarettes) is the desire to stop smoking traditional tobacco cigarettes. This tendency can be ascribed to the effectiveness claims made in e-cigarette advertising campaigns in China, the UK, and the US. It is noteworthy, however, that regulatory agencies have not officially validated these claims. According to Kalkhoran and Glantz (2016), e-cigarettes are marketed as a way to get over smoke-free laws. Nicotine addicts may use them for this purpose, even if their primary goal is not to stop using them.

It is important to think about how marketing tactics and consumer motivations might be impacted by regulations pertaining to electronic cigarettes. The usage of E-cigarettes as a replacement for traditional cigarettes may decline with the acceptance of voluntary smoke-free policies and the implementation of smoke-free laws. Furthermore, these actions might enhance the efficacy of E-cigarettes as smoking cessation tools. Due to their unrestricted availability on the market for unrestricted consumption, there is a discrepancy between the availability of E-cigarettes for use by the general public and their distribution for cessation within the context of tightly controlled clinical trials. Therefore, a thorough analysis of the marketing tactics and usage trends of e-cigarettes is necessary to assess their effectiveness as a tool for quitting smoking and its overall health consequences (Kalkhoran and Glantz, 2015).

Future research should focus on standardizing definitions related to e-cigarette usage, examining the relationship between varying degrees of use and different devices, and examining the results of quitting smoking. It would also be beneficial to carry out randomized clinical trials contrasting e-cigarettes with traditional treatments like nicotine replacement therapy (NRT). Additionally, it's critical to examine how the use of e-cigarettes affects variables like the desire to stop smoking and to categorize users of these products according to their reasons for using them.

LIMITATIONS AND RECOMMENDATIONS

There were numerous restrictions on the research that was done for this study. The study initially used self-reported measures of smoking duration and intake, which may introduce recall bias, especially among those who had quit. Moreover, the study was conducted among a group of medical students, which restricted the possibility of using a larger sample size. As is common in large-scale population research, an objective assessment of the current smoking status was not undertaken. The COVID-19 pandemic established restrictions that made it impractical to collect data on physical files. As a result, an online survey was utilized as a substitute technique for gathering data. Another limitation concerns the elimination of 120 volunteers out of the 263 total since they had never smoked. In terms of health, the majority of participants—133 out of 143, or 93%—were judged to be free of medical conditions. On the other hand, a smaller portion of participants—10 out of 143, or 7%—were found to have a medical condition that prevented them from smoking. Neither the phenomena of nicotine addiction nor the possible influence of alternative tobacco products on attempts to quit smoking were examined in this study. Information about the possible effects of different electronic cigarette devices on the success of quitting smoking was not included in the study. In the end, the relationship between e-cigarettes and rates of tobacco quitting may shift as usage habits and e-cigarette variety continue to evolve. While the idea of quitting smoking is frequently promoted and occasionally utilized as an excuse for smokers to use e-cigarettes, the general consensus based on studies to date is that e-cigarette use is becoming more commonplace within the current regulatory framework.

It is highly recommended that additional research be done on long-term quitting smoking after using e-cigarettes. Saudi Arabia as a whole should be represented in the study's huge sample size. Examining the possible health concerns connected

to e-cigarettes in contrast to traditional cigarettes is also crucial.

CONCLUSION

The current study found that among a cohort of medical students who successfully stopped smoking by using e-cigarettes or vapes, using these products significantly helps with smoking cessation. Moreover, it is significant that these gadgets function as a transitional aid for people who want to cut back on tobacco use, since a significant percentage of our participants were able to successfully stop smoking by switching to vaping or e-cigarettes.

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