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**Annals of Clinical and Analytical Medicine**

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**Prevalence and Demographics of Smoking Traditional and Electronic Cigarettes among Students at King Abdul Aziz University**

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Received 30/12/2022; revised 5/1/2023; accepted 14/1/2023

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**Abstract**

**Introduction:** The majority of tobacco by-products such as cigarette usage begins in adolescence and early young age. Tobacco contains nicotine which is an extremely addictive drug, and adults and teenagers may be particularly vulnerable to dependence. This study aimed to determine the prevalence of smoking both traditional and electronic cigarettes; in addition to its potential sociodemographic determinants among university students.

**Methods:** A study design is a plan for conducting research. It includes the specific methods and procedures that will be used to collect and analyze data. There are several types of study designs, including observational studies, experimental studies, and randomized controlled trials. In the present study, the cross-sectional observational study design was followed in order to gather data from a sample of King Abdul Aziz University students at a single point in time. A self-generated online survey was disseminated via emails and SMS followed by reminder messages, among the students to assess the dynamics of traditional versus e-cigarette smoking. The data was analyzed statistically by using SPSS software. The p-values less than 0.05 are regarded as signs of statistically significant associations or differences

**Results:** A total sample of 392 students responded to the questionnaire, of them 62.2% were males. the preliminary association between demographic characteristics and type of cigarette smoking among the students was assessed. The results showed that among smokers, 77% of males are involved in cigarette smoking as compared to 23% of females. Among 77% of males, 48% of them belong to 20-23 years of age in comparison to 11% and 42% of less than 20 and more than 23 years old respectively. While in the case of non-smokers, 55% are females and 45% are males. Most of these females belong to the 20-23 age group while most of non-smoker males are 23-40 years old. So, it can be said that 20 to 23 years old males smoke more than females of the same age. While the results about the type of cigarette smoking showed that most people around 40%, 90%, 61%, and 52% people think that e-cigarettes are less harmful than regular cigarettes, electronic ones, both regular and electronic, and shisha respectively.

**Conclusions:** Demographic association, especially in terms of age and gender, for the prevalence of smoking both traditional and e-cigarettes, demonstrating that male students are more addicted to both types of cigarettes.

**Keywords:** *Smoking, Risk factors, E-cigarettes, Students, Saudi*

## Introduction

Smoking is the leading cause of preventable deaths worldwide widely with an expected 8.3 million deaths in 2030 [1]. Smoking has a well-established relationship with many serious diseases such as lung cancer, cardiovascular diseases, and chronic obstructive pulmonary disease. Nearly a decade ago, electronic cigarettes were introduced which provide almost the exact feel of traditional cigarettes [2]. Since its introduction, the world has seen enormous number of people getting lured to e-cigarettes which have now become a critical concern. These cigarettes are designed based on a battery that heats the electronic liquid to vaporize, so that the smoker inhales it [3]. All e-cigarettes do not contain nicotine but any e-cigarette that comprises of nicotine is generally derived from tobacco which is a significant public concern.

According to the World Health Organization (WHO), the estimated global prevalence of smoking is 21% among the population aged above 15 years old [4]. In the Kingdom of Saudi Arabia (KSA), according to the national survey, the estimated overall prevalence of active smoking ranges from 2.4% to 52.3% [5]. Data about the prevalence and determinants of e-cigarettes are needed for planning public health interventions. Educational and behavioral programs are important to control the rapid dissemination of this problem, particularly among young adults [6]. Thus, there is a need for studies that assess the prevalence and identify the determinants of e-cigarette smoking among young adults in Saudi Arabia. The majority of tobacco by-products such as cigarette usage begins in adolescence and early young age. Tobacco contains nicotine which is an extremely addictive drug, and adults and teenagers may be particularly vulnerable to dependence [7]. In the year 2018, approximately 840,000 youngsters in middle school and 4.0 million teenagers in high school had used tobacco products over the previous 30 days. Smoking traditional cigarettes is a major cause of preventable morbidity and mortality worldwide. The health risks associated with smoking are numerous and well-established. Some of the most serious health problems associated with smoking include cardiovascular disease [8].

Traditional cigarette smoking can also cause a variety of respiratory problems, including chronic bronchitis, emphysema, and asthma [9]. Electronic cigarettes, also known as E-cigarettes, are devices that are used to deliver nicotine and other substances to the user in the form of a vapor [10]. These devices have become increasingly popular among students in recent years, particularly because they are often perceived as being safer or less harmful than traditional cigarettes [11]. Since 2014, E-cigarettes have emerged as the most popular tobacco by-product amongst young people. However, the long-term health effects of e-cigarette use are still not fully understood, and there is ongoing debate and research on this topic.

Some research evidence such as a study by Alzahrani et al. has suggested that e-cigarette use may be associated with an increased risk of certain health problems, such as respiratory infections and cardiovascular disease [12]. So, it is important for students to be aware of the potential risks of using e-cigarettes and to make informed decisions about their use. The producers of cigarettes project tobacco as a legal substance despite its potential harm to a large number of consumers. The World Health Organization (WHO) reported in 2019 that tobacco use—specifically, traditional cigarette smoking, chewing tobacco, pipes, cigars, waterpipes, non-tobacco products, but not e-cigarettes—kills approximately half of its consumers and above 8 million individuals annually, of whom 7 million die from tobacco use directly, while 1.2 million non-smokers die from passive smoking [13]. In youngsters, the use of E-cigarettes and waterpipe products are major attractions, especially for those who have never smoked due to the fact that they are less dangerous, are available in a wide variety of enticing tastes, and are not subject to laws once they are released onto the mainstream market. Therefore, there has been a significant rise in the consumption of waterpipe and e-cigarettes as compared to traditional cigarette smoking [14]. Additionally, it has been widely believed that the e-cigarettes are less harmful than tobacco smoking. However, e-cigarette smoking for a short period of the

time also produces endothelial dysfunction, elevated blood pressure, and increased oxidative stress in the arteries and brain [15]. There is an association between certain demographic characteristics, such as age, gender, and socio-economic status, and the type of cigarette smoking (traditional or electronic) among students. For example, there is evidence that found that younger students are more likely to use e-cigarettes, while older students are more likely to use traditional cigarettes [16]. Similarly, male students are more likely to use both traditional cigarettes and e-cigarettes compared to female students [17]. Moreover, socioeconomic status may be associated with the choice of cigarette smoking among students. Students from lower socio-economic backgrounds are more likely to use traditional cigarettes, while students from higher socio-economic backgrounds are more likely to use e-cigarettes [18].

It is important to note that these associations may vary depending on the specific population being studied and the specific factors being considered, such as the availability and accessibility to cigarettes, the influence of peers, and family, mental health, and cultural and societal norms [19]. Moreover, the marketing and advertising of cigarettes can influence the prevalence and patterns of different types of smoking among students [20]. This study aimed to determine the prevalence of smoking both traditional and electronic cigarettes; in addition to its potential sociodemographic determinants among university students at King Abdulaziz University.

## Methods

A study design is a plan for conducting research. It includes the specific methods and procedures that will be used to collect and analyze data. There are several types of study designs, including observational studies, experimental studies, and randomized controlled trials [21]. In the present study, the cross-sectional observational study design was followed in order to gather data from a sample of King Abdul Aziz University students at a single point in time. It is particularly selected to describe the patterns of traditional and e-cigarette usage among students. The enrolled both male and female students at King Abdul

Aziz University, Jeddah, Saudi Arabia who are in their first, second, third, and fourth educational years were included in the cross-sectional observational study. The outside students who had not completed their formal university application process and those who were not present while the survey was being taken are not included in the survey. Moreover, the students who refused to fill out the informed consent were also not included in the study. In the year 2016, WHO estimated the worldwide frequency of cigarette smoke is around 21% amongst youngsters who are more than years of age. So, the minimal size of the sample is determined as follows, using an estimating error of 0.05 and a 95% level of confidence was 277 people after adjusting 10% to account for item non-response. In order to gather data, a self-generated online survey was disseminated via emails and SMS followed by reminder messages.

The data was analyzed statistically by using SPSS software. The p-values less than 0.05 are regarded as signs of statistically significant associations or differences. The usage of e-cigarettes and traditional cigarettes was taken as dependent variable while sociodemographic factors of the population such as gender, age, family income, marital status, and academic year were taken as independent ones. The authors outlined the purpose and goals of the study for the participants before asking for their signed consent. No identities were necessary to ensure privacy protection, and all details were kept private exclusively for the purpose of the current research study. Before conducting the study, formal ethical approval was obtained from the unit of biomedical ethics, King Abdul Aziz University, Jeddah.

## Results

A total sample of 392 students responded to the questionnaire, of them 62.2% were males. In the present research, different patterns of smoking were assessed. The baseline characteristics selected for the data collection process include gender, age (<20, 20-23, and >23), students of KAU, faculty, region of residence, marital and financial status as shown in Table 1. In the present study, the preliminary association between type of cigarette smoking and demographics of the students was assessed.

**Table (1): background characteristics of the respondents**

|                         | Overall (n=392) |
|-------------------------|-----------------|
| <b>Gender</b>           |                 |
| Male                    | 244 (62.2%)     |
| Female                  | 148 (37.8%)     |
| <b>Age</b>              |                 |
| <20                     | 58 (14.8%)      |
| 20-23                   | 194 (49.5%)     |
| >23                     | 140 (35.7%)     |
| <b>University_KAU</b>   |                 |
| No                      | 52 (13.3%)      |
| Yes                     | 340 (86.7%)     |
| <b>Faculty_Medicine</b> |                 |
| No                      | 243 (62.0%)     |
| Yes                     | 149 (38.0%)     |
| <b>Living_Region</b>    |                 |
| Mecca                   | 263 (67.1%)     |
| Al -Madinah             | 101 (25.8%)     |
| Riyadh                  | 18 (4.6%)       |
| Eastern                 | 4 (1.0%)        |
| Southern                | 6 (1.5%)        |
| <b>Marital</b>          |                 |
| Unmarried               | 355 (90.6%)     |
| Married                 | 36 (9.2%)       |
| <b>Living_Region</b>    |                 |
| Mecca                   | 263 (67.1%)     |
| Al -Madinah             | 101 (25.8%)     |
| Riyadh                  | 18 (4.6%)       |
| Eastern                 | 4 (1.0%)        |
| Southern                | 6 (1.5%)        |
| <b>Marital</b>          |                 |
| Unmarried               | 355 (90.6%)     |
| Married                 | 36 (9.2%)       |
| Absolute                | 1 (0.3%)        |
| <b>Living_With</b>      |                 |
| Family                  | 290 (74.0%)     |
| University              | 71 (18.1%)      |
| Relatives               | 16 (4.1%)       |
| Others                  | 15 (3.8%)       |
| <b>Expenses</b>         |                 |
| Family                  | 35 (8.9%)       |
| University              | 104 (26.5%)     |
| Family+University       | 240 (61.2%)     |
| Self Employed           | 13 (3.3%)       |
| <b>Income_Family</b>    |                 |
| Low                     | 42 (10.7%)      |
| Middle                  | 180 (45.9%)     |
| High                    | 170 (43.4%)     |
| <b>Nationality</b>      |                 |
| Saudi                   | 378 (96.4%)     |
| Non-Saudi               | 14 (3.6%)       |

The results showed that among smokers, 77% of males are involved in cigarette smoking as compared to 23% of females. Among 77% of males, 48% of them belong to 20-23 years of age in comparison to 11% and 42% of less than 20 and more than 23 years old respectively. While in the case of non-smokers, 55% are females and 45% are males. Most of these females belong to the 20-23 age group while most of non-

smoker males are 23-40 years old. So, it can be said that 20 to 23 years old males smoke more than females of the same age. While the results about the type of cigarette smoking showed that most people around 40%, 90%, 61%, and 52% people think that e-cigarettes are less harmful than regular cigarettes, electronic ones, both regular and electronic, and shisha respectively. So, it is concluded that most people have the perception that e-cigarettes are less dangerous than traditional ones as shown in Figure 1.

Moreover, the pattern of usage of regular cigarette smoking was evaluated. The present study found that usage of electronic cigarettes (45%) was higher than that of regular cigarettes (33%) and both (11%). The findings also depicted that 47% of people tried traditional cigarette smoking and currently 24 % of them are involved in it. The data also showed that 28% of individuals start smoking regular cigarettes. 85% of people smoke traditional cigarettes daily and among them around 23% smoke mostly 10 to 20 cigarettes as shown in Table 2. The current research also examined the perception of students about the hazards of e-cigarettes versus traditional smoking. The results showed that 40% of students think e-cigarettes are less dangerous than regular cigarettes, while 90% think e-cigarettes are less harmful than electronic cigarettes. Moreover, 39% and 45% of students said that e-cigarettes are not less harmful than regular and electronic cigarettes (both) and shisha. Overall, 90% of students have the perception that e-cigarettes are less hazardous as compared to traditional tobacco products as shown in Figure 2. The smoking patterns of e-cigarettes were also assessed. The findings showed that 85.1% of students' daily smoke regular cigarettes as compared to 71.4% who daily use an e-cigarette.

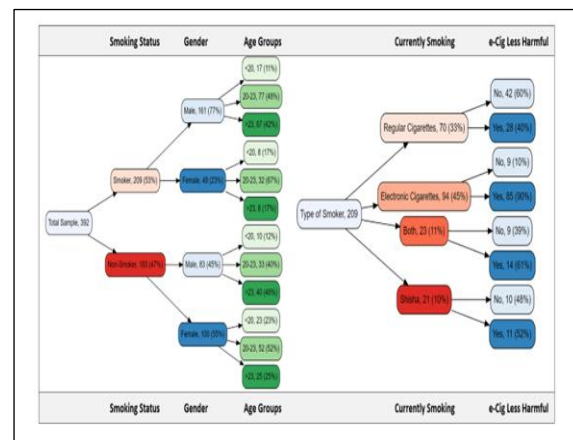
The mean (SD) value in the case of regular cigarette and e-cigarette smoking is 1.5 and 0.7 respectively. However, 28% of students started smoking with regular cigarettes and 6.9% with e-cigarettes. Among those who smoke regular cigarettes, 24.3% did not try to stop smoking regular cigarettes while 28.4%, 38.5%, and 8.8% tried one, 2 to 5, and more than 5 times respectively. In the case of quitting e-cigarettes, 52.3 % did not try to quit, however, 32.9%, 14.1%, and

0.7% tried one, 2 to 5, and more than 5 times respectively. Upon asking smoke e-cigarettes regarding if they have ever tried e-cigarettes, 48.5% of students gave a positive response. Among them, 33.9% are currently involved in e-cigarette smoking, and mostly around 71.4% smoke e-cigarettes daily. While most of them (27.6%) use those e-cigarettes that contained 4-6 mg of nicotine as illustrated in Table 3. The contemporary study illustrated the pattern of usage of e-cigarettes. The findings revealed that 63% students tried e-cigarettes while 50% are addicted to them. Amongst them, 755 used them daily.

Most e-cigarette smokers use those vapes that contain 4-6 and/or 30mg of nicotine and majorly consume 2 to 4 mg of nicotine. The variations in trends observed for trying e-cigarettes ever, currently smoking e-cigarettes and consuming e-cigarettes daily were found statistically significant, while the result for the question about the e-cigarette smoking years showed a non-significant p-value of 0.83 as depicted in Table 4.

### Discussion:

This section provides a comprehensive review by comparing the results obtained and the existing literature available relating to the key objectives of this contemporary research. In this regard, the discussion is categorized into three primary categories and analyzes the results in these categories based on the research objectives of the study. The first two objectives of the study establish the first category which intends to explore the current, previous, and lifetime usage of traditional e-cigarettes among the students at King Abdul-Aziz University. Results as depicted in table 2 determined that nearly 85% of the participants are likely to smoke traditional cigarettes and about 23% of them regularly smoke 10 to 20 times a day. However, it was also reported that contemporary trends are inclining toward smoking e-cigarettes having more than 11% of the margin. These findings are depicted by a study that reflects the emergence of the smoking trend of e-cigarettes after 2014 [12]. It has been revealed that consumption of e-cigarettes is continuously increasing, hence acting a contributory factor to a diverse range of lung and nasal complexities. Thus, the findings are correlated with



**Figure 1** Distribution of smoking status by gender, age groups, type of current smoking and perception about e-cigarettes.

the previous research outcome. The second category describes the analysis of research objective with respect to the key findings of this contemporary research regarding patterns of smoking e-cigarettes among students.

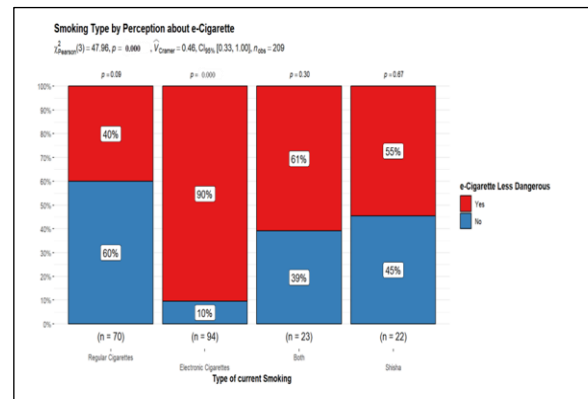
The results, as depicted in Tables 3 and 4, provide details of the factual information of patterns for both traditional and e-cigarettes. The results indicate a slightly higher proportion of traditional smokers than of e-cigarette smokers, valuing 85.1% as compared to 71.4%. Most smokers started smoking with traditional cigarettes and a lesser number of students were found to start smoking with e-cigarettes. Also, more than 80% of e-cigarette smokers have daily dependance on it. These findings also align with the outcomes of a few previous pieces of literature which explore the same research domain [14][15]. It was inferred that though e-cigarettes are found less harmful than traditional cigarettes short-term use may lead to endothelial dysfunction, elevated blood pressure, and increased oxidative stress in the arteries and brain considering the wide patterns of both the smoking mediums. These studies also support the contemporary finding that students who smoke e-cigarettes are more likely to get addicted to them than ones with traditional cigarettes. The third category is related to the objective of the study which determines association between demographic characteristics and type of cigarette.

**Table (2): Smoking usage patterns of regular smoking among the students**

| Characteristic                     | n (%)       |
|------------------------------------|-------------|
| Type Currently smoking             |             |
| Regular Cigarettes                 | 70 (33%)    |
| Electronic Cigarettes              | 94 (45%)    |
| Both                               | 23 (11%)    |
| Shisha                             | 22 (10.5%)  |
| Tried regular cigarettes (Yes)     | 183 (47%)   |
| Currently regular cigarettes (Yes) | 95 (24%)    |
| Times using regular cigarettes     |             |
| Daily                              | 86 (85%)    |
| Weekly                             | 9 (8.9%)    |
| Specific Occasions                 | 6 (5.9%)    |
| Times daily regular                |             |
| > 5 cigarettes                     | 23 (23%)    |
| 6-10                               | 33 (33%)    |
| 10-20                              | 39 (39%)    |
| >20                                | 5 (5.0%)    |
| Smoking Time Years                 |             |
| Mean (SD)                          | 2.94 (1.54) |
| Started with regular (Yes)         | 63 (28%)    |

smoking among students at King Abdul Aziz University. Figure 1 represented the most relevant demographic details of the smoker students at King Abdul Aziz University. More than three-quarters of the students involved in smoking were males and the remaining were females. Nearly half of the male smokers were aged between 20 and 23 and more than half of the female smokers were also found in the same age range. Perceptions regarding e-cigarettes being less harmful among students are also very common and more acceptable in the university students.

A significant comparison can be made with research evidence which revealed that youngsters are highly likely to smoke e-cigarettes and get addicted to them whereas the older population is more inclined towards smoking traditional cigarettes [16][17][18]. The male population is also the largest category that smokes both traditional and e-cigarettes in and out of educational practices matching the key findings of the contemporary research in terms of gender demographics.

**Figure (2): Perception of different smoking types among the students**

## Conclusions

In a nutshell, this study has drawn few significant conclusions after analyzing current prevalence of smokers for both traditional and e-cigarettes among the students at King Abdulaziz University. The results have found a demographic association, especially in terms of age and gender, for the prevalence of smoking both traditional and e-cigarettes, demonstrating that male students are more addicted to both types of cigarettes. Moreover, the age groups show a substantial difference between use of traditional and e-cigarettes as the former is used by older individuals and the latter is consumed by youngsters. It is recommended to the Saudi government and particularly the ministry of education and health to pay more focus to the present trends of smoking among the young population. Appropriate educational policies must be introduced and implemented in the university that limits these practices on the premises of the educational institutes and improves the perceptions of students related to the health risks related to e-cigarettes..

## Conflict of interests

The authors declared no conflict of interests.

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Table (3): Smoking pattern of usage of e-cigarette smoking

|                                       | n (%)       |
|---------------------------------------|-------------|
| <b>Times_using_regular_cigarettes</b> |             |
| Daily                                 | 86 (85.1%)  |
| Weekly                                | 9 (8.9%)    |
| Specific Occasions                    | 6 (5.9%)    |
| <b>Smoking_Time_Years</b>             |             |
| Mean (SD)                             | 2.9 (1.5)   |
| Range                                 | 1.0 - 10.0  |
| <b>Started_with_regular</b>           |             |
| Yes                                   | 63 (28.1%)  |
| <b>When_Stop_regular_years</b>        |             |
| Mean (SD)                             | 1.8 (0.8)   |
| Range                                 | 1.0 - 3.0   |
| <b>Times_stop_regular</b>             |             |
| I did not try                         | 36 (24.3%)  |
| 1 time                                | 42 (28.4%)  |
| 2-5 times                             | 57 (38.5%)  |
| >5 times                              | 13 (8.8%)   |
| <b>Ever_tried_ecigarettes</b>         |             |
| Yes                                   | 190 (48.5%) |
| <b>Currently_smoking_ecigarettes</b>  |             |
| Yes                                   | 133 (33.9%) |
| <b>Times_using_ecigarettes</b>        |             |
| Daily                                 | 95 (71.4%)  |
| Weekly                                | 16 (12.0%)  |
| Monthly                               | 5 (3.8%)    |
| Specific Occasions                    | 17 (12.8%)  |
| <b>Amount_nicotin</b>                 |             |
| Nicotine-free                         | 10 (7.5%)   |
| 4-6 mg                                | 37 (27.6%)  |
| 25 mg                                 | 30 (22.4%)  |
| 30 mg                                 | 35 (26.1%)  |
| 50 mg                                 | 22 (16.4%)  |
| <b>Consumage_ecig_daily</b>           |             |
| > 2mg                                 | 28 (20.9%)  |
| 2-4                                   | 55 (41.0%)  |
| 5-6                                   | 41 (30.6%)  |
| >6 mg                                 | 10 (7.5%)   |
| <b>Smoking_ecig_years</b>             |             |
| Mean (SD)                             | 1.9 (0.8)   |
| Range                                 | 1.0 - 6.0   |
| <b>Started_with_ecig</b>              |             |
| Yes                                   | 27 (6.9%)   |
| <b>When_Stop_ecig_years</b>           |             |
| Mean (SD)                             | 1.5 (0.7)   |
| Range                                 | 1.0 - 3.0   |
| <b>Times_stop_ecig</b>                |             |
| I did not try                         | 78 (52.3%)  |
| 1 time                                | 49 (32.9%)  |
| 2-5 times                             | 21 (14.1%)  |
| > 5 times                             | 1 (0.7%)    |

**Table (4): Frequency and intensity of e-cigarettes smoking**

|                                            | No          | Yes         | Test Statistic, P-value     |
|--------------------------------------------|-------------|-------------|-----------------------------|
| Ever <i>tried</i> e-cigarettes: Yes        | 0.3 56/180  | 0.6 134/212 | $\chi^2=40.15$ , $P<0.01^1$ |
| Currently <i>smoking</i> e-cigarettes: Yes | 0.1 25/180  | 0.5 108/212 | $\chi^2=59.62$ , $P<0.01^1$ |
| Times <i>using</i> e-cigarettes            |             |             | $\chi^2=3.91$ , $P=0.27^1$  |
| Daily                                      | 0.6 14/25   | 0.8 81/108  |                             |
| Weekly                                     | 0.2 5/25    | 0.1 11/108  |                             |
| Monthly                                    | 0.0 1/25    | 0.0 4/108   |                             |
| Specific Occasions                         | 0.2 5/25    | 0.1 12/108  |                             |
| Amount of nicotine                         |             |             | $\chi^2=3.02$ , $P=0.55^1$  |
| Nicotine-free                              | 0.0 0/25    | 0.1 10/109  |                             |
| 4-6 mg                                     | 0.3 7/25    | 0.3 30/109  |                             |
| 25 mg                                      | 0.3 7/25    | 0.2 23/109  |                             |
| 30 mg                                      | 0.2 6/25    | 0.3 29/109  |                             |
| 50 mg                                      | 0.2 5/25    | 0.2 17/109  |                             |
| Consumption of <i>e-cig</i> daily          |             |             | $\chi^2=8.01$ , $P=0.05^1$  |
| > 2mg                                      | 0.4 10/25   | 0.2 18/109  |                             |
| 2-4                                        | 0.4 10/25   | 0.4 45/109  |                             |
| 5-6                                        | 0.2 4/25    | 0.3 37/109  |                             |
| >6 mg                                      | 0.0 1/25    | 0.1 9/109   |                             |
| Smoking <i>ecig</i> years                  | 1.0 2.0 3.0 | 1.0 2.0 2.8 | $F=0.05$ , $P=0.83^2$       |

