

# The Relationship between Knowledge of the Effects of Electronic Cigarettes on Oral Health and the Use of Electronic Cigarettes among Students at the University of Jember

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## ABSTRACT

Electronic cigarettes, commonly known as Vapes, are electronic devices that resemble conventional cigarettes and can produce vapor as a result of liquid vaporization. The use of electronic cigarettes can have adverse effects on health, especially on oral and dental health, even though the vapor from electronic cigarettes does not leave stains on the tooth surface. Electronic cigarettes have a more significant impact on soft tissue damage, such as ulcers in the buccal, gingival, and palatal mucosa or damage to periodontal tissue. The purpose of this study is to determine the relationship between knowledge about the effects of electronic cigarettes on oral and dental health and the use of electronic cigarettes among students at the University of Jember. This study is analytical observational research with a cross-sectional approach using purposive sampling. There is a significant relationship between knowledge about electronic cigarettes' impact on oral and dental health and the use of electronic cigarettes among University of Jember students. This can be attributed to the presence of Propylene Glycol in electronic cigarettes, which has detrimental effects on enamel and soft oral cavity tissues. Hence, there is a connection between knowledge about the impact of electronic cigarettes on oral and dental health and the use of electronic cigarettes among University of Jember students.

**Keywords:** dental and oral health, electric cigarettes, knowledge

## INTRODUCTION

Electronic cigarettes, also known as Vapes, are electronic devices that resemble conventional cigarettes and produce vapor by vaporizing a liquid.<sup>[1]</sup> The World Health Organization (WHO) refers to them as Electronic Nicotine Delivery Systems (ENDS) because they deliver nicotine in vapor form, which users inhale.<sup>[2]</sup> The Indonesian community began to familiarize itself with electronic cigarettes in early 2014, and they gained popularity among young people as an alternative to traditional cigarettes.<sup>[3,4]</sup>

The use of electronic cigarettes is not only limited to conventional cigarette users looking to quit tobacco but is also adopted by new users who have never consumed tobacco.<sup>[5]</sup> Research conducted in the Surabaya Personal Vaporizer Community has also concluded that the majority of electronic cigarette users use the product as an alternative to quit smoking (80.6%), for experimentation (12.9%), and as a lifestyle choice (6.5%).<sup>[6]</sup>

The use of electronic cigarettes can have negative effects on health, especially oral

health. Although the vapor from electronic cigarettes does not leave stains on the tooth surfaces, electronic cigarettes have a greater impact on soft tissue damage, such as ulcers on the buccal, gingival, and palatal mucosa, as well as damage to periodontal tissues.<sup>[7]</sup> The use of electronic cigarettes can lead to throat irritation, burning sensation in the mouth, dry cough, changes in oral microflora, dry mouth (xerostomia), and even the potential for oral mucosa mutations and oral cancer.<sup>[8]</sup>

Research on the impact of electronic cigarettes on oral health is essential, considering that electronic cigarettes are one of the factors related to oral health. This research is conducted among students at the University of Jember. While many studies have examined the relationship between electronic cigarettes and oral health, there has been no research conducted on the relationship between electronic cigarettes and oral health among students at the University of Jember. This research is considered necessary to explore further information regarding the facts about the relationship between electronic cigarettes and oral health among students at the University of Jember.

## MATERIALS & METHODS

The research is of an analytical observational type with a cross-sectional approach. This research involves testing hypotheses regarding the use of electronic cigarettes among students at the University of Jember at a specific point in time. The sampling technique used is non-probability sampling, specifically purposive sampling. The research is conducted at the University of Jember and spans a period of three months, from February 2023 to April 2023. The research sample consists of approximately 27 students from each faculty, active undergraduate students from the 2018-2022 cohorts at the University of Jember, aged 18-24, who are active users of electronic cigarettes and are willing to participate as research respondents by filling out informed consent forms. This research

has previously obtained ethical clearance from the Research Ethics Commission for Health at the Faculty of Dentistry, University of Jember.

The data source for this research is derived from the information gathered through the completion of questionnaires containing knowledge of oral health and its relation to the use of electronic cigarettes. The questionnaire used in this study comprises two sections: the first part contains general information, while the second part consists of 15 questions. The research findings will be presented in the form of tables and percentages.

## RESULT

The total of respondents consists of 403 active undergraduate students from the 2018-2022 cohorts at the University of Jember, aged 18-24, who are active users of electronic cigarettes.

Table 1. Characteristics of Electronic Cigarette Users among University of Jember Respondents

Characteristics of Respondents	Quantity (n)	Percentage (%)
<b>Gender</b>		
Man	358	88,9
Woman	45	11,1
<b>Total</b>	<b>403</b>	<b>100</b>

Table 1 shows that the total number of respondents in this study is 403, with differences in gender distribution. The number of male respondents is 358 (88.8%), and female respondents are 45 (11.1%).

Table 2. Characteristics of Respondents Based on the Age of Electronic Cigarette Usage at the University of Jember

Age	Quantity (n)	Percentage (%)
18 years	34	8.40%
19 years	45	11.2%
20 years	70	17.3%
21 years	117	29.1%
22 years	45	11.2%
23 years	86	21.3%
24 years	6	1.50%
<b>Total</b>	<b>403</b>	<b>100</b>

Table 2 shows the characteristics of electronic cigarette users among University of Jember respondents based on age. The age characteristics exhibit a varied distribution among adolescents. The number of respondents within the age range of 18 years is 34 (8.4%), 19 years is 45 (11.2%),

20 years is 70 (17.3%), 21 years is 117 (29.0%), 22 years is 45 (11.2%), 23 years is 86 (21.3%), and 24 years is 6 (1.50%).

**Table 3. Characteristics of Respondents Based on the Faculty of Electronic Cigarette Usage at the University of Jember**

Faculty of Origin		
Faculty of Law	28	6,94
Faculty of Economics and Business	28	6,94
Faculty of Culture Science	25	6,20
Faculty of Social and Political Science	26	6,45
Faculty of Teacher Training and Education	27	6,69
Faculty of Computer Science	27	6,69
Faculty of Mathematics and Science	26	6,45
Faculty of Agriculture	27	6,69
Faculty of Pharmacy	27	6,69
Faculty of Public Health	27	6,69
Faculty of Nursing	22	5,45
Faculty of Medicine	27	6,69
Faculty of Dentistry	26	6,45
Faculty of Agricultural Technology	29	7,19
Fakultas Engineering	31	7,70
<b>Total</b>	<b>403</b>	<b>100</b>

Table 3 shows that the respondents come from 15 different faculties at the University of Jember, distributed evenly as follows: the Faculty of Law with 28 respondents (6.94%), the Faculty of Economics and Business with 28 respondents (6.94%), the Faculty of Humanities with 25 respondents (6.20%), the Faculty of Social and Political Sciences with 26 respondents (6.45%), the Faculty of Teacher Training and Education with 27 respondents (6.69%), the Faculty of Computer Science with 27 respondents (6.69%), the Faculty of Mathematics and Natural Sciences with 26 respondents (6.45%), the Faculty of Agriculture with 27 respondents (6.69%), the Faculty of Pharmacy with 27 respondents (6.69%), the Faculty of Public Health with 27 respondents (6.69%), the Faculty of Nursing with 22 respondents (5.45%), the Faculty of Medicine with 27 respondents (6.69%), the Faculty of Dentistry with 26 respondents (6.45%), the Faculty of Agricultural Technology with 29 respondents (7.19%), and the Faculty of Engineering with 31 respondents (7.69%).

**Table 4. Characteristics of Respondents Based on the Reasons for Using Electronic Cigarettes at the University of Jember**

Reasons for Using Electronic Cigarettes		
- Electronic cigarettes have become an alternative for smoking cessation therapy	94	23,32
- Electronic cigarettes for lifestyle	73	18,11
- Trying electronic cigarettes out of curiosity about a new product and innovation	236	58,57
<b>Total</b>	<b>403</b>	<b>100</b>

Table 4 indicates that the respondents are also categorized based on their reasons for using electronic cigarettes, with 94 respondents (23.32%) using electronic cigarettes as an alternative for smoking cessation therapy, 73 respondents (18.11%) using electronic cigarettes for lifestyle, and 236 respondents (58.56%) trying electronic cigarettes out of curiosity about new products and innovations.

**Table 5. Distribution of respondents based on their level of knowledge about oral health and its relation to the use of electronic cigarettes**

Category	Quantity (n)	Percentage (%)
Subcategory	46	11,41
Intermediate	107	26,55
Satisfactory	250	62,03
<b>Total</b>	<b>403</b>	<b>100</b>

Table 5 shows that the level of knowledge about oral health and its relation to the use of electronic cigarettes is mostly good, with a score of 12-15, which accounts for 250 respondents (62.03%). 107 respondents (26.55%) have a moderate level of knowledge with scores ranging from 8 to 11, and 46 respondents (11.41%) have a poor level of knowledge with a score of less than 8.

**Table 6. Distribution of respondents based on the frequency of electronic cigarette usage**

Category	Quantity (n)	Percentage (%)
3 - 11 <i>dripping/day</i>	313	77,66
12 - 20 <i>dripping/day</i>	90	22,33
<b>Total</b>	<b>403</b>	<b>100</b>

Table 6 demonstrates that the frequency of electronic cigarette usage is mostly 3 - 11 *dripping/day*, with 313 respondents (77.66%), while 12 - 20 *dripping/day* are 90 respondents (22.33%).

**Table 7. Cross-tabulation between knowledge about the impact of electronic cigarettes on oral health and the use of electronic cigarettes among University of Jember students**

		Frequency of electronic cigarette usage		Total
		3 – 11 dripping/day	12 – 20 dripping/day	
Knowledge of the impact of electronic cigarettes	Subcategory	15	31	46
	Intermediate	73	34	107
	Satisfactory	225	25	250
<b>Total</b>		313	90	403

Table 7 indicates that based on the cross-tabulation results between knowledge about the impact of electronic cigarettes on oral health and the use of electronic cigarettes among University of Jember students, there are 15 respondents with poor knowledge and a frequency of 3 - 11 *dripping/day* of electronic cigarette usage, 31 respondents with poor knowledge and a frequency of 12 - 20 *dripping/day* of electronic cigarette usage. There are 73 respondents with

moderate knowledge and a frequency of 3 - 11 *dripping/day* of electronic cigarette usage, 34 respondents with moderate knowledge and a frequency of 12 - 20 *dripping/day* of electronic cigarette usage. There are 225 respondents with good knowledge and a frequency of 3 - 11 *dripping/day* of electronic cigarette usage, 25 respondents with good knowledge and a frequency of 12 - 20 *dripping/day* of electronic cigarette usage.

**Table 8. The Relationship Between Knowledge of the Impact of Electronic Cigarettes on Oral Health and the Use of Electronic Cigarettes Among University of Jember Students**

			Frequency of electronic cigarette usage
Spearman's rho	Knowledge of the Impact of Electronic Cigarettes	Correlation Coefficient	-.422**
		Sig. (2-tailed)	.000
		N	403

Table 8 shows the correlation results regarding the impact of electronic cigarettes on oral health and the use of electronic cigarettes among University of Jember students using the Spearman rank correlation statistical test. The obtained significance value or Sig. (2-tailed) is 0.000 ( $p < 0.05$ ), meaning there is a significant relationship between knowledge of the impact of electronic cigarettes on oral health and the use of electronic cigarettes among University of Jember students. The correlation value obtained is  $r = -0.422^{**}$ , with a negative value. This implies that the two variables have an inverse relationship, meaning that the better the level of knowledge among University of Jember students regarding the impact of electronic cigarettes on oral health, the lower the use of electronic cigarettes, with a moderate level of correlation.

## DISCUSSION

The research results on respondent characteristics show that there are more male respondents, with a total of 358, while

the female respondents amount to 45. This is consistent with the findings of the Global Adult Tobacco Survey (GATS) 2021, which reported that in Indonesia, electronic cigarette users are predominantly male, with 5.8% compared to females at 0.3%. The age of the respondents in this study ranges from 18 to 24 years, which is in line with the inclusion criteria for this research, as it focuses on active University of Jember students from the 2018 - 2022 cohorts. Several factors influence smoking habits in individuals within this age range, which involve a complex interplay of personal, social, and cultural factors. Curiosity and the desire to explore new things are essential factors that influence individuals to try electronic cigarettes. Age is a chronological indicator that starts from an individual's birth and progresses over the years. The older an individual gets, the greater their cognitive maturity. Age is often used as a measure of a person's capabilities in dealing with various situations, even though age does not always correlate with an individual's abilities. However, the level



of understanding is often judged based on a person's age. As explained in Hurlock's theory, the adolescent phase is a period characterized by emotional turmoil and imbalances, marked by the stress of identity discovery. Adolescents experience conflicts both within themselves and with their environment, as they base their values on societal standards and peer values. Individuals who start using electronic cigarettes at the age of 18 typically do so as an act of self-discovery during their adolescent years, where they experiment with new things.[9]

The study also assessed the reasons why respondents chose to use electronic cigarettes. A total of 236 respondents (58.56%) opted for electronic cigarettes out of curiosity about new products and innovations, 94 respondents (23.32%) used electronic cigarettes as an alternative for smoking cessation therapy, and 73 respondents (18.11%) chose electronic cigarettes as a lifestyle choice. Electronic cigarettes are marketed as smoking cessation aids, and they lead users to believe that electronic cigarettes are safer than conventional cigarettes. In McQueen's study and their colleagues, it was found that adult smokers are more inclined towards seeking sensation compared to non-smokers. This suggests that smokers may be more inclined to try new things and engage in potentially risky behaviors, including the use of electronic cigarettes or conventional cigarettes.[10]

Several studies have demonstrated that smoking conventional tobacco is a risk factor for periodontal disease and dental caries. According to a study by Pushalkar et al., conducted on 119 respondents, it was found that there were more gram-negative Porphyromonas bacteria in electronic cigarette users compared to conventional cigarette users or non-smokers. This was marked by an increase in the levels of pro-inflammatory cytokines (IL-1b, IL-6, IFN-g, TNF-a, and MMP-8) in the oral cavity.[11] Another study also indicated an increase in gingival inflammation (gingivitis) when

someone switches from conventional cigarettes to electronic cigarettes within 2 weeks.[12] Regarding dental caries, an in vitro study suggested that the combination of liquid viscosity in electronic cigarettes and certain sweet flavors may lead to an increased cariogenic risk.

Propylene glycol is a carrier product found in electronic cigarettes and has a detrimental effect on enamel and oral soft tissues. This component leads to a decrease in saliva flow and results in dry mouth. Saliva plays a crucial role in the self-cleansing of the oral cavity. Therefore, a reduction in saliva flow can lead to various conditions such as dental caries, gum inflammation (gingivitis), and others. Other components that have adverse effects on oral health include glycerin and flavoring agents. Glycerin and flavoring agents can increase biofilm production and microbial adhesion on tooth enamel. Nicotine is a key component in electronic cigarettes and plays a pathogenic role in tooth loss, as it can modify genetic signaling, activate inflammatory pathways, and affect tooth mineralization.[12]

## **CONCLUSION**

The results of this study reveal a correlation between knowledge of the impact of electronic cigarettes on oral health and the use of electronic cigarettes among University of Jember students. Further research is needed to investigate the relationship between knowledge of the impact of electronic cigarettes on oral health and electronic cigarette usage, considering a wider range of dripping frequencies and variations in e-liquid products.

### ***Declaration by Authors***

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