



SCIREA Journal of Clinical Medicine

ISSN: 2706-8870

<http://www.scirea.org/journal/CM>

February 8, 2023

Volume 8, Issue 1, February 2023

<https://doi.org/10.54647/cm321001>

## Comparison Between Tobacco and Electric Cigarette Use on Migraine Headache

**Fabiola Patricia Ratih Puspita<sup>1</sup>, Hendyono Lim<sup>2</sup>, Tirta Darmawan Susanto<sup>3\*</sup>**

<sup>1</sup>Faculty of Medicine, Universitas Pelita Harapan, Tangerang, Indonesia

<sup>2</sup>Internal Medicine Department, Universitas Pelita Harapan, Tangerang, Indonesia

<sup>3</sup> Pharmacology Department, Universitas Pelita Harapan, Tangerang, Indonesia

\* *Corresponding author:* Tirta Darmawan Susanto, email : [tirta\\_1@yahoo.com](mailto:tirta_1@yahoo.com)

### Abstract

Cigarette has become the highest risk factor of death since 2017. The type of cigarette mostly used are kretek tobacco cigarette and electric cigarette (e-cigarette). Smoking cigarette can cause an impact on the neurological system, such as headache. Migraine is a primary headache that mainly occurs in age group between 15 and 49 years old. This research was carried out to find out the comparison between the use of tobacco cigarette and e-cigarette on migraine headache at the age of 18-24 years old.

The study design used is cross-sectional with 250 subjects aged 18-24 who agreed to be involved and met the research inclusion and exclusion criteria. Data measurements were done using Brinkman index questionnaire for the use of tobacco cigarette, the use of the e-cigarette questionnaire, and Migraine Screen Questionnaire (MS-Q). Data analysis was done using Statistical Package for the Social Science (SPSS) version 26. Chi square analysis showed a

difference on the occurrence of migraine between the use of tobacco and e- cigarette with p-value 0.006 and Odd Ratio 2.269 for tobacco cigarette. Chi square analysis about e- cigarette showed a difference on the occurrence of migraine between high and low usage of e – cigarette (p = 0.045) and OR 2.828 for high usage of e – cigarette. Chi square analysis about tobacco cigarette showed a significant difference on the occurrence of migraine between moderate and low usage of tobacco cigarette (p = 0.022) and OR 3.041 for moderate usage of tobacco cigarette. The multivariate logistic regression analysis showed that high usage of e-cigarette, mild, and moderate usage tobacco cigarette have 2.828-, 3.070-, and 9.333-times greater risk than low usage e-cigarette in the occurrence of migraine.

This study shows that tobacco cigarette usage has a greater effect on causing migraine headache compared to the use of the e-cigarette.

**Keywords:** e-cigarette, tobacco cigarette, migraine, adolescents

## 1. Introduction

The use of cigarettes is a risk factor for non-communicable diseases, the highest cause of death since 2017. The use or consumption of cigarette in Indonesia has started to occur since adolescence, namely at 10 to 24 years old. Based on the data, the highest cigarette use occurred at 15 to 19 years, followed by 10 to 14 years and 20 to 24 years, respectively. The use of cigarette from 2013-2018 has increased by 0.7% at the age of 10-14 years and 1.4% at the age of 15-19 years, as well as a decrease of 0.9% at the age of 20-24 years. Teenagers in Indonesia consume several types of cigarettes, ranging from kretek, white, rolled, shisha, and electric cigarette (e - cigarette). Kretek cigarette are in the first place among the types of cigarettes most often consumed by adolescents, namely 20-24 years and 15-19 years, respectively with a percentage of 58.6% and

57.2%<sup>1</sup>. The 2011 Global Adult Tobacco Survey (GATS) conducted in Indonesia revealed that 10.9% of individuals had heard of e-cigarettes and 14.4% of them were aged 15-24 years, other existing studies regarding the age of dominant use of e-cigarette also support this result<sup>2</sup>. The use of e-cigarette is mainly due to curiosity<sup>3</sup>. In contrast to tobacco, e-cigarette or commonly known

as vapes, are cigarette types that do not use tobacco leaves but use a liquid that will later be converted into steam<sup>4</sup>.

Exposure to the content in tobacco cigarette and e-cigarette such as nicotine, can have several health effects, ranging from the gastrointestinal, respiratory, cardiovascular, and neurological systems. One of the effects that occur quickly on the neurological system is a headache, the most common health problem<sup>3,5</sup>. According to the International Headache Society, headache is divided into two, without lesions called primary headache and secondary headache accompanied by organic disorder<sup>6</sup>. One type of primary headache is a migraine headache.

Migraine is a headache characterized by a throbbing feeling that is usually only located on one side of the head that can be in moderate to severe intensity<sup>7</sup>. According to the 2016 GBD (Global Burden of Disease), migraine is listed as the 16th leading cause of DALYs (Disability-adjusted life-years)<sup>8</sup>. In addition, the 2016 GBD also show data that migraine headache occurs more in women than men and are most common in the age range of 15-49 years in both women and men<sup>9</sup>. Based on research conducted by WHO, it was found that half to three-quarters of people in the world aged between 18-65 years had experienced headache in the last year, and at least 30% of them were migraine-type headache<sup>7</sup>.

Research conducted by Adinda F in 2018 and conducted by Dama in 2021 showed a significant relationship between smoking and migraine headache, but both of the studies did not compare the use of tobacco cigarette and e-cigarettes to migraine<sup>10,11</sup>. Research conducted by Lorensia et al. in Surabaya in 2017 related to e-cigarettes stated that headache were not a health problem related to the use of e-cigarette<sup>12</sup>. Other studies, such as those conducted by King et al. in the US in 2018 and 2020 gave contradictory results, namely that e-cigarettes cause health problems such as headache or migraine<sup>13,14</sup>.

So it is necessary to find out the comparison between the usage of tobacco cigarette and e-cigarette on the incidence of migraine headache. In addition, smoker's age must be at least 18 years old, so the research will be conducted on adolescents aged 18-24.

## 2. Method and Materials

### 2.1 Research design

The study design used in this research is a cross-sectional study design.

### 2.2 Research population and sample

The population of this study is individual who smoke using tobacco cigarette or e-cigarettes in the adolescent age group between the age of 18-24 years old. The inclusion criteria in this research are individual who smoke using tobacco cigarette or e-cigarettes and the adolescent age group between the age of 18-24 years old. The exclusion criteria in this research are person who had head injury in the last 3 months, person with fever and intracranial infection, and person who had family history with migraine. In this research 250 respondents included and meet the inclusion and exclusion criteria.

### 2.3 Data analysis

Data analysis was carried out using SPSS version 26. Bivariate analysis were done using chi square statistical analysis and multivariate analysis were done using multivariate logistic regression statistical analysis.

## 3. Results

In this study, 306 respondents were willing to participate, but 56 of them were excluded because of the exclusion criteria, so that only 250 respondents met the inclusion criteria in this study.

The characteristics of 250 respondents can be seen in table.1. Respondent's age in this study was dominated by 21 years old respondents (25.2%), and gender was dominated by men (58.8%). There are 147 users of tobacco cigarette which are dominated by mild tobacco cigarette usage (79.2%) and 113 users of e-cigarette which are dominated by low e-cigarette usage (52.2%). Many of respondents in this research did not experience migraine (69.6%).

**Table 1. Characteristics of Respondents**

Variable		n	Percentage (%)
Age	18	4	1.6%

	19	11	4.4%
	20	57	22.8%
	21	63	25.2%
	22	41	16.4%
	23	33	13.2%
	24	41	16.4%
<b>Gender</b>	Male	147	58.8%
	Female	103	41.2%
<b>Cigarette Type</b>	Tobacco Cigarette	137	54.8%
	Mild Usage	112	79.2%
	Moderate Usage	25	20.8%
	E-cigarette	113	45.2%
	Low Usage	65	52.2%
	High Usage	48	47.8%
<b>Migraine Headache</b>	Non-migraine	174	69.6%
	Migraine	76	30.4%

Bivariate analysis using chi square between the level of cigarette use and the occurrence of migraine headache show a statistically significant relation with p-value 0.000 ( $p < 0.05$ ), indicate a significant relationship between the level of cigarette use and the occurrence of migraine headache (table.2).

**Table.2. Bivariate Analysis of Cigarette Use on Migraine Headache**

Cigarette Use	Migraine		Total	P-value
	Non-Migraine	Migraine		
Low Usage e-Cigarette	56	9	65	0.000
High Usage e-Cigarette	33	15	48	
Mild Usage Tobacco Cigarette	75	37	112	
Moderate Usage Tobacco Cigarette	10	15	25	

Total	174	76	250
-------	-----	----	-----

Chi square analysis of the relationship between the type of cigarette and the occurrence of migraine headache show a significant p-value 0.006 ( $p < 0.05$ ), indicate a significant relationship between the type of cigarette and the occurrence of migraine headache (table.3).

**Table.3. Bivariate Analysis of Cigarette Type on Migraine Headache**

Cigarette Type	Migraine		Total	P-value	OR (95% CI)
	Non-migraine	Migraine			
E-cigarette	89	24	113	0.006	2.269 (1.286-4.002)
Tobacco Cigarette	85	52	137		
Total	174	76	150		

Analysis of the relationship between degree of tobacco use and migraine headache gave a p-value of 0.022 ( $p < 0.05$ ), indicating a significant relationship between the degree of tobacco use and migraine headache and gave an OR value of 3.041 (95% CI: 1,246-7,417) ( table 4).

**Table 4. Bivariate Analysis of Tobacco Cigarette Use on Migraine Headache**

Tobacco Cigarette	Migraine		Total	P-value	OR (95% CI)
	Non-migraine	Migraine			
Mild Degree	75	37	112	0.022	3.041 (1.246-7.417)
Moderate Degree	10	15	25		
Total	85	52	137		

Analysis of the relationship between the use of e-cigarette and migraine headache gave a p-value of 0.045 ( $p < 0.05$ ), indicating a significant relationship between the degree of e-cigarette use and migraine headache and gave an OR value of 2.828 (95% CI: 1.114-7.180) (table 5).

**Table 5. Bivariate Analysis of E-Cigarette Use on Migraine Headaches**

E-cigarette	Migraine		Total	P-value	OR (95% CI)
	Non-migraine	Migraine			
Low Usage	56	9	65	0.045	2.828

High Usage	33	15	48	(1.114-7.180)
Total	89	24	113	

Multivariate analysis in this study showed that the e-cigarette and tobacco cigarette variables could explain migraine headache by 10.6%. There is a significant relationship with a p-value of 0.001 for low usage e-cigarette, 0.029 for high usage e-cigarette, 0.006 for mild usage tobacco cigarette, and 0.000 for moderate usage tobacco cigarette. When compared with low usage e-cigarette, the OR values were 2.828 (1.114-7.180) for high usage e-cigarette, 3.070 (1.370-6.876) for mild usage tobacco cigarette, and 9.333 (3.215-27.093) for moderate usage tobacco cigarette (table 6).

**Table 6. Multivariate Analysis**

Variable	Nagelkerke R <sup>2</sup>	P-value	OR	95% CI
Low Usage e-Cigarette	0.106	0.001		
High Usage e-Cigarette		0.029	2.828	1.114-7.180
Mild Usage Tobacco Cigarette		0.006	3.070	1.370-6.876
Moderate Usage Tobacco Cigarette		0.000	9.333	3.215-27.093

Analysis of the opportunity of experiencing migraine headache was 13.85% for low e-cigarette users and 60.01% for moderate tobacco cigarette users. Moderate usage tobacco cigarette had a 4.3 times greater risk of experiencing migraine headache than user of low usage e-cigarette (Table 7).

**Table 7. Migraine Headache Formula and Opportunity**

Formula	$1.828 + 1.040 * \text{HighElectric} + 1.122 * \text{MildTobacco} + 2.2344 * \text{ModerateTobacco}$
Opportunity	$\frac{1}{1 + \text{Exp}^{-(1.828 + 1.040 * \text{HighElectric} + 1.122 * \text{MildTobacco} + 2.2344 * \text{ModerateTobacco})}}$

$\frac{1 + \text{Exp}^{-(-1.828 + 1.040*0+1.122*0+2.234*0)}}{1}$ $\frac{1}{1 + \text{Exp}^{-(-1.828)}}$ $\frac{1}{1 + 6.221}$ <p>13.85%</p>	$\frac{1}{1 + \text{Exp}^{-(-1.828 + 1.040*0+1.122*0+2.234*1)}}$ $\frac{1}{1 + \text{Exp}^{-(-0.406)}}$ $\frac{1}{1 + 0.666}$ <p>60.01%</p>
RR	$\frac{60.01\%}{13.85\%} = 4.3$

#### 4. Discussion

Tobacco and electric cigarette have a significant relationship with migraine headache. These results are in line with several previous studies. The use of tobacco cigarette is in line with research conducted by Adinda F in 2018, which resulted in the use of tobacco cigarette increasing the frequency of more severe migraine attacks and by Dama in 2021, which gave the results that smoking had a significant relationship to the occurrence of migraines<sup>10,11</sup>. The use of e-cigarettes is in line with research conducted by Hua et al. 2022 and King et al. in 2018 and 2020, which showed that migraine became the second most common disease in the neurological system and is one of the symptoms caused by the use of e-cigarette<sup>13,14</sup>. Moderate usage of tobacco cigarette gives an odd ratio of 3.041 of causing migraine headache compared to mild tobacco cigarette use. High usage e-cigarette give an odd ratio of 2.828 of causing migraine headaches when compared to low usage e-cigarette.

Compared with low usage e-cigarettes, high usage e-cigarettes give an odd ratio of causing migraine by 2.828, mild tobacco cigarette by 3.070, and moderate tobacco cigarette by 9.333. These results indicate that tobacco cigarette use has a more significant effect on causing migraine headache when compared to e-cigarette. This is probably due to differences in the composition of tobacco cigarette and e-cigarette. The composition of nicotine, carbon monoxide and lead in tobacco cigarette and electric cigarette has different levels. A tobacco cigarette depends on the cigarette brand used, while an electric cigarette depends on the form of the electric cigarette and the type of liquid used. A study on the levels of carbon monoxide in an e-cigarette that compared several forms of e-cigarette and types of liquid used showed that there were differences in the



carbon monoxide produced<sup>15</sup>. Moderate usage of tobacco cigarette has a 4.3 times greater risk of experiencing migraine headache compared to low usage of e-cigarettes.

## **5. Conclusion**

The use of tobacco cigarette has a greater effect on causing migraine headache compared to the use of e-cigarettes.

## **Acknowledgments**

### **Limitations of the study**

The age of respondents in this study was limited only done in 24 years old respondents, so that there were no heavy tobacco user. The composition of the cigarette used, such as the nicotine content in the cigarette were not asking specifically. The composition can be known by asking about the brand of cigarette used for tobacco user or the form and type of liquid used by e-cigarette user. This study also did not ask specifically about the length of time of the e-cigarette use.

### **Ethical considerations**

The Ethics Committee of the Faculty of Medicine, Pelita Harapan University, has approved this study through recommendation letter No. 101/K-LKJ/ETIK/II/2022.

## **References**

- [1] Arjono S. Atlas Tembakau Indonesia. Soewarso K, Siregar H, Kusuma MAPN, Hikmah L, Fauzi R, Antoyo A, editor. Tobacco Control Support Center-Ikatan Ahli Kesehatan Masyarakat Indonesia (TCSC-IAKMI), 2000.
- [2] Harjdo H, Kadarmanto, Sinha DN, Palipudi KM, Wibisana W, Tarigan I. Global Adult Tobacco Survey: Indonesia Report 2011. Kosen S, editor. Jakarta: National Institute of Health Research and Development Ministry of Health, 2012.

- [3] Lukito PK, Hidayati N, Endang E, Hutabarat M, Damayanti L, Ginting WB, et al. *Kajian Rokok Elektronik di Indonesia*. 2nd Ed. Jakarta: Direktorat Pengawasan Narkotika, Psikotropika dan Zat Adiktif, 2017.
- [4] P2PTM Kemenkes RI. Apa itu Rokok Elektrik. 2018. Available from: <http://p2ptm.kemkes.go.id/infographic-p2ptm/penyakit-paru-kronik/apa-itu-rokok-elektrik>
- [5] Junaidi I. *Mencegah & Mengatasi Sakit Kepala, Mengupas Sakit Kepala dari Migrain, Vertigo Hingga Tumor Otak & Meningitis disertai Terapi Sakit Kepala pada Bumil, Busui, dan pada Anak*. Yogyakarta: Rapha, 2021.
- [6] Kharisma Y. *Tinjauan Umum Penyakit Nyeri Kepala*. 2017
- [7] P2PTM Kemenkes RI. Adakah Sobat Sehat yang Pernah Mengalami Migrain. 2018. Available from: <http://p2ptm.kemkes.go.id/infographic-p2ptm/stroke/adakah-sobat-sehat-yang-pernahmengalami-migrain>
- [8] Mboi N, Surbakti IM, Trihandini I, Elyazar I, Smith KH, Ali B, et al. On the Road to Universal Health Care in Indonesia, 1990-2016: a Systematic Analysis for the Global Burden of Disease Study 2016. *Lancet*. 2018 Aug 18;392(10147):581-91.
- [9] Stovner LJ, Nichols E, Steiner TJ, Abd-Allah F, Abdelalim A, Al-Raddadi RM, et al. Global, Regional, and National Burden of Migraine and Tension-type Headache, 1990-2016: a Systematic Analysis for the Global Burden of Disease Study 2016. *Lancet Neurol*. 2018 Nov 1;17(11):954– 76.
- [10] Adinda F. *Hubungan Merokok dengan Frekuensi Serangan Migren dan Intensitas Nyeri pada Pasien Migren Kronis*. Fakultas Kedokteran Universitas Sumatera Utara. 2018.
- [11] Dama IDEE. *Karakteristik dan Prevalensi Migren pada Mahasiswa Fakultas Kedokteran Universitas Pelita Harapan Angkatan 2018 = Characteristic and Prevalence of Migren in Students of the Medicine Faculty Universitas Pelita Harapan batch 2018*. 2021 Apr 20.
- [12] Lorensia A, Yudiarso A, Herwansyah FR. Persepsi, Efektifitas dan Keamanan Penggunaan Rokok Elektrik (e-cigarette) oleh Perokok Aktif Sebagai Terapi dalam Smoking Cessation: Mixed Methods dengan Pendekatan Studi Kuantitatif dan Kualitatif. *Tropical Pharmacy And Chemistry*. 2017;4(2).
- [13] King JL, Reboussin BA, Wiseman KD, Ribisl KM, Seidenberg AB, Wagoner KG, et al. Adverse Symptoms Users Attribute to e-cigarettes: Results from a National Survey of US Adults. *Drug Alcohol Depend*. 2019 Mar 1;196:9–13.

- [14] King JL, Reboussin BA, Merten JW, Wiseman KD, Wagoner KG, Sutfin EL. Negative Health Symptoms Reported by Youth e-cigarette Users: Results from a National Survey of US Youth. *Addictive Behaviors*. 2020 May 1;104:106315.
- [15] Son, Y., Bhattarai, C., Samburova, V., & Khlystov, A. (2020). Carbonyls and Carbon Monoxide Emissions from Electronic Cigarette Affected by Device Type and Use Patterns. *International Journal of Environmental Research and Public Health*. 2020 Apr 2;17(8). <https://doi.org/10.3390/IJERPH17082767>