

The evaluation of taste sensitivity between conventional and electric smokers

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ABSTRACT

Background: Taste has an important role in human life because of the sense of taste, humans have an ability to taste various flavors of food. Decreased taste sensitivity can affect the quality of life and cause a person to consume excessive taste substances. One of the factors associated with decreased taste sensitivity is smoking. Currently, a new type of cigarette (electric cigarette or e-cigarette) is being developed which is favorable to young people because it has a different content, shape, and taste compared to conventional cigarettes. E-cigarettes are considered safer because aerosol does not contain the tobacco content of conventional cigarettes and is an alternative to smoking cessation programs. The purpose of this study is to evaluate the difference in taste sensitivity between conventional smokers and e-smokers.

Method: This research is an analytical observational study using a cross-sectional design. The research subjects were conventional and electric smokers who were students of Universitas Muhammadiyah Yogyakarta. The research subjects were obtained by purposive sampling, a total of 32 people who had met the inclusion criteria. Data analysis used frequency tables for univariate data and an-independent sample T-test for bivariate data.

Result: The results of the bivariate analysis showed a significant value between conventional and electric smokers with $p = 0.036$ (< 0.05) for sweet, salty, and sour tastes, while for bitter tastes $p = 0.031$ (< 0.05).

Conclusion: Taste sensitivity in conventional smokers is less sensitive than in electric smokers. Sensitivity to bitter tastes in both treatment groups is less sensitive than sweet, salty, and sour tastes.

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INTRODUCTION

The tongue is a taste organ that plays an important role in human life because it can taste food, and it becomes a pleasure to taste the foods.¹ Taste cells are mostly in the taste buds, which are mostly found on the papillae of the tongue.² Taste perception has great benefits, specifically, for regulating food intake so that the body gets the sufficient energy and nutrients.¹ Taste receptors in humans divided into five main tastes: sweet, salty, sour, bitter, and umami.³ Biologically, humans will tend to choose foods with a sweet taste that is useful for energy sources, a salty taste that is useful for adjusting diet to electrolyte stability and an umami taste that is useful for detecting savory tastes.⁴ The sour taste is generally rejected by humans, which indicates the food is still raw, while the bitter taste is useful for detecting toxic substances.⁵

Decreased taste sensitivity may affect the quality of life and cause a person to consume excessive taste substances.¹ It means that the sense of taste helps humans to choose foods that suit the body's needs, avoid toxic foods and control food intake so as not to exceed as needed.⁶ Decreased sensitivity of the taste bud can be caused by many factors, one of which is smoking habits.⁷ Cigarette products such as nicotine, condensed in cigarette smoke will enter the oral cavity and affect the taste buds thereby blocking the receptors to interact with food substances.⁸ According to previous research conducted by Chérueil, *et al.*, it was stated that smokers experience decreased taste sensitivity due to significant changes in the shape, size, vascularity of the fungiform papillae and a decrease in the number of taste buds. The nicotine content in cigarettes can affect the work of the sympathetic and parasympathetic nerve ganglions so that it has an impact on the salivary glands which causes reduced

saliva production.¹⁰ As a result of decreased saliva production, the tasting process will be disrupted because food substances can be felt when dissolved in saliva, and saliva plays a role in the mechanism of stimulating the sense of taste.¹¹

Currently, people have developed a new type of cigarette – electronic cigarette, which is in great demand by young people because it has a different content, shape and taste compared to conventional cigarettes. E-cigarettes are considered safer because their aerosol does not contain tobacco like conventional cigarettes and are an alternative to smoking cessation programs. The aim of this study was to evaluate taste sensitivity between conventional and e-cigarette smokers.¹³

RESEARCH METHOD

This research used an analytic observational design with a cross-sectional approach. The number of research subjects was 32 people, obtained by simple random sampling. The inclusion criteria were undergraduate students from Universitas Muhammadiyah Yogyakarta, male, aged 18-22 years, willing to sign the informed consent, smoking conventional and/or electric smoking.

Research starts at 07.30-11.30. One hour before the research started, research subjects were prohibited from brushing their teeth, smoking, eating and drinking besides mineral water. The materials used are taste strips, sucrose solution with a concentration of 0.4, 0.2, 0.1, 0.05 g/ml for sweet taste, citric acid solution with a concentration of 0.05, 0.09, 0.16, 0.3 g/ml for sour taste, sodium chloride solution with a concentration of 0.25, 0.1, 0.04, 0.016 g/ml for salty taste and quinine hydrochloride solution with concentrations of 0.0004, 0.0009, 0.0024 and 0.006 g/ml. Assessment of taste sensitivity used a scoring system. Subjects who can feel the taste with the

lowest concentration will get a score of 4. If they cannot feel the taste, the research is repeated using a higher concentration. Subjects who cannot taste the taste to the lowest concentration are given 0 as the smallest score.

The results of the univariate data obtained will be analyzed using a frequency table, and then

the bivariate data will be analyzed using the independent sample T-Test.

RESULT

The results of the study on the evaluation of taste sensitivity in conventional and electric smokers showed in Table 1.

Table 1. The average value of taste sensitivity tests in conventional and electric smokers

Smoking Status	Flavors			
	Sweet	Sour	Salt	Bitter
Conventional Smoker	3.06	3.06	3.06	2.50
Electronic Smoker	3.63	3.63	3.63	3.56

Table 2. The significance value of taste sensitivity test in conventional and electric smokers

Smoking Status	Flavors			
	Sweet	Sour	Salt	Bitter
Conventional Smoker	0.036	0.036	0.036	0.031
Electronic Smoker				

Based on table 1, the average value of taste sensitivity in conventional smokers is lower than electric smokers for all tastes. In addition, the sensitivity to bitter taste in both groups had a lower value when compared to the other flavors. Furthermore, to determine whether there was a statistical difference in taste sensitivity between the two groups, an independent sample t-test was conducted. The results of the different tests are shown in Table 2.

Based on table 2, the significance value for sweet, salty, and sour taste was $p = 0.036$, while for bitter taste $p = 0.031$ (< 0.05), means that there was a statistically significant difference between the two groups.

DISCUSSION

Evaluation of taste sensitivity in conventional and electric smokers in this study shows that descriptively the average value of taste sensitivity of conventional smokers has a lower value when

compared to electric smokers as shown in Table 1. Smoking is an activity of inhaling and exhaling vapors from cigarette burning or vaping heating results. It has been reported that one of the effects of smoking in the oral cavity is a decrease in taste sensitivity.¹²

There are two types of cigarettes in the market, namely conventional cigarettes made from tobacco and electric cigarettes which are operated using a vape and liquid. In conventional smokers, decreased taste sensitivity is influenced by a number of harmful chemicals in tobacco such as nicotine, tar, and carbon monoxide. The content of these chemicals can affect sensory cells in the taste receptors.⁹ In addition, it is also reported that prolonged exposure to nicotine can cause a decrease in the number of tongue papillae.¹³ Nicotine levels of 4-6 milligrams/day can have an addictive effect.¹⁴ Nicotine will condense into the oral cavity and stick to the tongue, taste buds and taste buds. Repeated exposure to these

substances can cause thickening of the oral mucosal tissue which will result in reduced taste sensitivity.¹² In addition to nicotine, carbon monoxide can also disrupt cell metabolism in the tongue, thereby inhibiting its regeneration.¹⁵

In e-cigarettes, the chemical content in the liquid consists of nicotine, diacetyl, propylene glycol, glycerol, flavorings, and other harmful chemicals.¹⁶ Other researchers who examined 54 samples of e-cigarette liquids reported that the average e-cigarette liquid contained nicotine, glycerol, propylene glycol, and ethylene glycol. These studies show that the liquid in e-cigarettes also contains nicotine, although at lower levels. Nicotine levels in one conventional cigarette range from 1.54-2.60 mg, while the nicotine levels in e-cigarette liquids range from 0.025-0.77 mg for 15 puffs.¹⁷ This possibility causes the taste sensitivity of conventional smokers to be lower than that of e-smokers. This study is in line with previous studies which stated that the difference in taste sensitivity between conventional and e-cigarette smokers was due to the aerosol in e-cigarettes containing less nicotine than conventional cigarettes.¹⁸

In this study, it was also seen that the bitterness scores in both groups were lower when compared to sweet, salty, and sour tastes. The bitter taste is formed by two organic substances, namely nitrogen and alkaloids. Bitter taste when it arises with a certain intensity usually makes humans or animals avoid it. One of the ingredients in conventional and liquid cigarettes in e-cigarettes is nicotine. Nicotine is an organic alkaloid compound that has a strong and simultaneous effect on the human body and gives a bitter taste.^{19,20} Nicotine is found in large amounts in tobacco leaves.

Generally, smoking is accompanied by the habit of drinking coffee. Coffee contains caffeine, a xanthine alkaloid compound and tastes bitter. The

tongue has the ability to adapt to a taste. If the bitter taste is consumed continuously, the tongue will adapt to the bitter taste, therefore bitter taste threshold increased.³ These two factors are likely to cause a lower sensitivity to bitter taste when compared to other flavors.

CONCLUSION

Our findings show that the taste sensitivity in conventional smokers is less sensitive than in electric smokers. Sensitivity to bitter tastes in both treatment groups is less sensitive than sweet, salty, and sour tastes.

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