Characteristics of Dental Health, Salivary Viscosity, pH and Flow Rate, Gum Hyperpigmentation, Malocclusion, Blood Pressure and Pulse Related to Body Mass Index of Vapers

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Abstract

An electronic cigarette (a Vape) is a battery-powered cigarette-shaped device containing a nicotine-based liquid that is vaporized and inhaled. It is used to stimulate the experience of smoking tobacco. As mentioned before, electronic cigarettes contain nicotine, which could damage blood vessels that could lead to higher blood pressure. The common effect of e-cigarette usage is dry mouth. The purpose of this study is to describe the DMF-T, stain, calculus, salivary viscosity, pH and flow rate, gum hyperpigmentation, malocclusion, blood pressure and pulse, body mass index of vapers.

This study was an observational descriptive research that involved 27 males and 3 females vaper in Bandung. The samples were determined by using convenience technique. Information about body weight and height, blood pressure and pulse are compiled for physical examination data. Intra oral examination were performed on the samples to determine dental health, and oral condition. The collection of saliva was carried out by implementing the passive drooling method for ten minutes. The pH of saliva was measured using pH meter.

The average salivary pH and flow rate were 6.82 and 0.42 ml/ minutes. Salivary viscosity was moderate (53.33%). The average blood pressure and pulse were 121/78 mmHg and 81. The average DMF-T was 7.06 (poor), the gum hyperpigmentation was mild (36.66%), calculus and stain were fair (53.33%). The most prevalent type of malocclusion was class 1 (83.33%). The BMI showed have an overweight (50%).

This study concludes that vapers have poor DMF-T in average, the gum hyperpigmentation and the viscosity of saliva were mild, fair calculus and stain, pH and flow rate of salivary were normal, the pulse and the blood pressure were normal, the malocclusion mostly class 1, and the BMI shows overweight results in most of them.

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Introduction

Smoking is a major public habit that causes health problems worldwide and considered as number one cause of death.[1] According to Riskesdas 2013, there was an increase in the number of smokers aged 15 years and over, namely 34.2% in 2007 to 36.3% in 2013.[2]

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Nowadays smokers are starting to realize the harmful effects of smoking. The biggest obstacle for a smoker to quit smoking is his heavy addiction to nicotine and a smoking ritual that is difficult to break. E-cigarettes exist as alternative to using tobacco cigarettes which are considered safer with the principle of harm reduction.[3] The principle of harm reduction has led to a rapid acceptance in the development of e-cigarettes in the community. According to researchers conducted by the International Tobacco Control Survey in America, Canada, Australia and the UK, the number of ex-smokers in 2010 who smoked e-cigarettes was 29%. It was estimated that there were 600,000 e-cigarette users in the UK in 2012, double than that in 2010.[4] E-cigarettes are becoming a

common cigarette product, especially among teenagers, with a nine-fold increase from 2011 to 2015 in the United States.[5] In Indonesia, data obtained from the Global Youth Tobacco Survey in 2014, of the total youth surveyed, it was found that 2.1% of teenagers smoked e-cigarettes. [2] Currently the number of e-cigarette users is increasing because it is recognized as an alternative to cigarette use and is considered safer because it does not contain tar, but it turns out that e-cigarettes still have several risks that can affect health.

Some studies suggest that acute e-cigarette use can affect vital signs such as pulse and blood pressure.[6] In addition, the nicotine content in electronic cigarettes circulating in the blood vessels can affect blood vascularization to the salivary glands, resulting in decreased function and altered gland morphology.[7] In addition, smoking has an effects on food consumption, this will be seen in BMI of the smokers. The purpose of this study was to determine the characteristics of the oral condition, blood pressure, pulse, BMI of e-cigarette users.

Materials and methods

The type of this research was observational descriptive, performed on vape users in Bandung with the following criteria: 1) age 18-55 years; 2) the subjects had been using e-cigarettes at least 1 year; 3) The subject did not suffer from any systemic diseases; 4) they did not consume alcohol; 5) Did not consumes drugs that could affect blood pressure measurements such as angiostenin-converting enzyme inhibitors, venlafaxine, calcium channel blockers, beta-blockers and others. Sampling was done by convenience method and the number of the sample was 30. Data of body weight and height of the subjects were compiled. Intra oral examinations to determine dental health, and oral conditions were performed on the samples such as DMF-T, calculus, stain, gum hyperpigmentation, malocclusion; salivary viscosity, pH and flow rate. Furthermore, blood pressure and pulse of the subjects were also measured. To collect the saliva, the subjects were ask to gargle with distilled water to remove any food remnants, then they were ordered to drool the saliva passively into the beaker glass for 10 minutes. The volume of the saliva collected was then measured. pH meter was

immersed in such a way in a beaker glass until it showed a stable pH value. The viscosity of the saliva was determined by placing a mouth mirror under the tongue and let the saliva stagnate. The mouth mirror was then lifted to decide whether the saliva was thick or thin.

Results

The youngest subject respondents in this study was 18 years old. The characteristics of the respondents based on age are presented in table 1. Most of the subjects (46.7%) belonged to the aged group of 26 to 35 years.

Data on vaper habits and the duration of smoking and nicotine dose are related to the flow rate of saliva and pH can be found in Tables 2 and 3, then oral condition, blood pressure, pulse and BMI in table 4.

Category	Frequency	Percentage (%)
Age (year)		
18-25	9	30
26-35	14	46.66
36-45	6	20
46-55	1	3.33
Gender		
Male	27	90
Female	3	10
Total	30	100

Table 1. Characteristics of respondents.

	Category					
	Vape duration		Nikotin level (mg)			
	0-2 year	>2 year	<5	5-10	10-15	>20
Frequency	15	15	22	4	2	2
Percentage	50%	50%	73.33%	13.33%	6.66%	6.66%
SFR	0.48	0.37	0.44	0.52	0.28	0.24
pH	6.83	6.44	6.74	7.4	6.2	6.2
Systolic	118	124	116	131	123	139
Diastolic	75	82	77	79	83	85

Table 2. Distribution of the research subject based on pH, salivary flow rate, blood pressure.

	SFR	pH	DMF-T	Systolic	Diastolic	Pulse	BMI
The lowest	0.12	5.44	0.00	89.00	57.00	64.00	17.36
The highest	0.94	7.36	11.00	185.00	120.00	103.00	38.25
Mean	0.42	6.82	7.06	121.00	78.00	81.48	31.00

Table 3. Distribution of the research subject based on SFR, pH, DMF-T, Blood pressure Pulse, BMI.

Category	Frequension	Percentage (%)
Calculus		
Free	4	13.33
Fair	16	53.33
Poor	10	33.33
Gum Hyperpigmentation		
0	4	13.33
1	4	13.33
2	4	13.33
3	11	36.66
4	7	23.33
Salivary Viscosity		
Moderate	16	53.33
Poor	14	46.66
Classification malocclusion		
Class 1 tipe 1	22	73.33
Class 1 tipe 2	1	3.33
Class 1 tipe 3	1	3.33
Class 1 tipe 4	1	3.33
Class 2	2	6.66
Class 3	3	10.00
Stain		
Free	4	13.33
Fair	16	53.33
Poor	10	33.33
Body Mass Index		
Underweight	1	3.33
Normal	8	26.66
Overweight	15	50.00
Obesity	6	20.00

Table 4. Characteristic of Oral condition and BMI of Vapers.

Discussion

The sample of the study were 30 respondents consisting of 27 males and 3 females vapers residing in Bandung, Indonesia (table 1). This is consistent with Volesky's research, which states that electric cigarette users are dominated by men.[8] The majority of the subjects (46.7%) belonged to the age group of 26 to 35 years. This result is in accordance with the survey conducted by the National Health Survey in 2013 where the most respondents age were around 30-40 years old (33.4%). The same result was also obtained from Levy's research where the most prevalent age group smoked e-cigarettes were dominated between ages 19-34 years.[9]

Smoking is also associated with periodontal disease. The consequences of the longer duration time of smoking that occurs in the oral cavity is gum hyperpigmentation and tooth staining. The results of this study show that the gum hyperpigmentation is severe (23.33%), while the hyperpigmentation of the gum is mild (50%), the fair type and no gum hyperpigmentation was 13.33% respectively. This proves that cigarette usage is associated with changes in the oral mucosa, one of which is gum hyperpigmentation. Hot smoke from cigarettes that is continuously in the oral cavity stimulates changes in blood flow and reduces salivary secretion. The temperature in cigarettes is 30^0C, while the burnt tip of the cigarette can reach 900^0C. This causes dry mouth and is more anaerobic condition, making it easier for anaerobic bacteria to grow in plaque. This finding is consistent with a research in Saudi Arabia, that active smokers can experience smokers melanosis (43.28%) which is seen as gum hyperpigmentation.[10] Smoking is also associated with periodontal disease and has a high risk of developing periodontitis.[13] Smokers have greater chances of developing periodontal diseases than nonsmokers.[14] In this study, the oral findings for severe calculus is 33.33%, fair calculus is 53.33%, and 13.33% have no calculus.

Smoking has many risks of pathological conditions in the oral cavity such as tooth staining, caries and tooth loss.[11,12] This study shows that 33.33% of the respondents have heavy teeth stain. 53.33% have fair stain, and 13.33% have no stain. Meanwhile, the average DMF-T is 7.06 (poor). This means that respondents have around 1-8 teeth with caries (table 3). The reason for this condition is that the subjects have been smoking for a quite a long time and they do not have the awareness in taking care of the health of their teeth. This may also related to the case that the majority of the subjects have class 1 type 1 malocclusion (73.33%). The teeth are then difficult to clean because of the crowding of the anterior teeth.

Smoking has a negative effects on systemic conditions, one of which is cardiovascular disease.[6] Table 2 shows the average blood pressure is 121/78 mmHg. The lowest systolic and diastolic pressure values are 89 mmHg and 57 mmHg respectively. The highest systolic and diastolic pressure value are 185 mmHg and 127 mmHg respectively. The average blood pressure is higher in respondents that use electronic cigarette for more than two years, however they are still within a normal category. Respondents that use an electric cigarettes less than two years have normal blood pressure. Furthermore, respondents that use an electric cigarettes that consume nicotine in a high

dosage have higher blood pressure. This is thought to be the result of frequent nicotine consumption associated with endothelial cell dysfunction, inflammation and increased sympathetic nerve activity which causes blood pressure to rise.[15] Tables 3 shows the average pulse is still normal limits, namely 81 beats per minute (bpm). This finding is consistent with Andrea's research, which states there is not pulse increase in electric cigarette usage.[16] The oral cavity is the first part that is exposed to the effects of smoking.[14] The most common side effects that often occur in vape users are dry mouth, coughing, headaches, and minor respiratory problems. One of the side effects of vaping in the oral cavity is the decrease in saliva secretion.[17] This can be seen from the results of this study, which is presented In table 3. Respondents aged 20 years old who have been using e-cigarette for 4 years with nicotine level of 18 mg / ml, they have salivary flow rate 0.12 ml / minute. However, in general, the average salivary flow rate is still within normal limits, namely 0.42 ml / minute. Salivary secretion affects salivary flow rate. This salivary flow rate is a modulator of salivary pH. If the salivary flow rate decreases, the amount of bicarbonate ions produced will be decreased, resulting in low salivary pH.(aku) Those who inhale nicotine more than 10 mg/ml have salivary pH of 6.2 in average, while 22 respondents who used nicotine less than 5 mg / ml have salivary pH of 6.74. In his research, Elter (2013) stated that the nicotine contained in vaper's saliva consist of nicotine which is almost equal to the saliva of tobacco smokers.[19] Kanwar et al. stated that there was an alteration of ion and electrolyte of saliva which then affected the pH of saliva.[20] Decrease of salivary flow rate in obese person is associated in periodontal disease.[21,22] Table 4 shows the Body Mass Index of the respondents in this study. In general, 15 respondents were overweight (50%), 8 respondents were normal (26.66%), 1 respondent was underweight (3.33%), and 6 respondents were obese (20%).

Conclusions

This study concludes that vapers, in average have poor DMF-T, gum hyperpigmentation was mild and the viscosity of saliva was mild, fair calculus and stain, pH and flow rate of salivary were normal, the pulse and the blood pressure were normal, the malocclusion mostly class 1, and the BMI show overweight results in the most of them.

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The article is original, it has never been published before.

Declaration of Interest

The authors confirm that there are no known conflict of interest associated with this publication.

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