

Differences of salivary pH, viscosity, and volume between young adult smokers and non-smokers

Dias Mareta Kusumaningrum¹, Sri Tjahajawati^{1*}, Ervin Rizali¹

¹Department of Oral Biology, Faculty of Dentistry Universitas Padjadjaran, Indonesia

ABSTRACT

Introduction: Smoking is a behaviour that is very detrimental to health, not only has a systemic effect but can also cause pathological conditions in the oral cavity. It is essential to know how smoking affects health, especially in the oral cavity. Salivary pH, viscosity and volume play an important role in maintaining tooth and oral tissue integrity. The purpose of this research was to evaluate the difference of young adult smokers and non-smokers saliva reviewed by its pH, viscosity and volume. **Methods:** The research sample consisted of 28 smokers and 24 non-smokers. Saliva was collected by spitting method then the pH, viscosity and volume were measured. The data were analysed using independent sample t-test and chi-square. **Results:** The result indicated that there was a significant difference in the mean value of salivary pH on smokers and non-smokers with p-value 0.000 ($p < 0.05$). There was a significant difference in the mean value of salivary viscosity on smokers and non-smokers with p-value 0.000 ($p < 0.05$.) There was a significant difference in the mean value of salivary volume on smokers and non-smokers with p-value 0.000 ($p < 0.05$). **Conclusion:** Salivary pH of smokers was lower than non-smokers, salivary viscosity of smokers was higher than non-smokers, and salivary volume of smokers was fewer than non-smokers.

Keywords: Salivary pH, salivary viscosity, salivary volume, smokers, non-smokers.

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INTRODUCTION

Cigarette is one of the most significant threat to public health in the world. According to World Health Organization, up to six millions people in a year died of smoking, where more than five millions (83%) among them are active smokers. $\pm 80\%$ smokers in the world are from low and mediate income country, including Indonesia.¹⁴

Nationally, the smoker prevalence in 2010 is 34.7%. The highest prevalence is 43.2% in the Middle Kalimantan, and the lowest is 28.3% in Southeast Sulawesi. The smoker prevalence is high on the age between 25 to 64 in the amount of 37.0-38.2%, while the age between 15 to 24 who smokes everyday reach 18.6%.⁵

Smoking is a behaviour that is very detrimental to health, but this behaviour continues

*Corresponding author: Sri Tjahajawati, Department of Oral Biology, Faculty of Dentistry Universitas Padjadjaran, Indonesia. Jalan Sekeloa Selatan I, Bandung, West Java, Indonesia 40132. Phone: +62 818-226-664; Email: sri.tjahajawati@fkg.unpad.ac.id

to be maintained by most smokers. An individual usually starts trying to smoke as a teenager. They will become regular smokers if they have smoked their fourth cigarette.¹⁰ Therefore education regarding the dangers of smoking for teenagers is essential.

World Health Organization (WHO) stated that the environment of cigarette smoke is the cause of many diseases for active and passive smokers. The relation between smoking and many illnesses such as lung cancer, cardiovascular disease, the risk of larynx neoplasm, oesophagus, and others has been widely studied. Smoking raises not only a systemic effect but also causing pathological condition in the oral cavity.¹³

The appearance of various pathological systemic or local condition in the oral cavity is caused by the reduction of molecule function, including saliva. The damage of component and antioxidant function of saliva affect the acidity level of saliva (pH) followed by the decrease in saliva's volume and poor saliva's viscosity.⁹ Previous research showed that some parameter of saliva such as IgA, buffer capacity and pH of smokers is lower than non-smokers.¹¹ Another study also showed that saliva's viscosity of smokers are worse and saliva's quantity of smokers is lower than non-smokers.¹²

Based on the description above, the authors feel interested in researching differences in pH, viscosity, and salivary volume between smokers and nonsmokers in the young adult age. The reason the author chose young adults is that smoking has a dose-response effect, which means the more youthful the smoker, the higher the effect. The purpose of this research was to evaluate the difference of young adult smokers and non-smokers saliva reviewed by its pH, viscosity and volume.

METHODS

This research was descriptive. The sampling method used in this research was proportionate stratified random sampling. The population were male students of the Faculty of Geology Universitas Padjadjaran University (Unpad) Jatinangor, batch 2015. The samples were those who fit the criteria. Inclusion criteria: 1) The subject was batch 2015 male student of the Faculty of Geological

Engineering, aged 18-25 years; 2) The subject had a habit of smoking 11-20 cigarettes/day; 3) Subjects did not suffer from systemic diseases that could affect the amount of salivary flow; 4) The subject was not taking drugs that could affect the amount of salivary flow; 5) Subjects did not use dentures or orthodontics; 6) Subjects were willing to follow the research. Exclusion criteria: 1) The subject suffered from diseases such as fever, diarrhoea, diabetes, chronic kidney failure, and other systemic conditions that can inhibit the flow of saliva; 2) The subject was taking drugs that can cause dry mouth such as analgesics, anticonvulsants, antiemetics, antihistamines, antihypersensitivity, antinauseants, antiparkinson, antipyretics, diuretics, decongestants, expectorants, muscle relaxants, psychotropics, sedatives, and antispasmodics.

The data were analysed using independent sample t-test for normally distributed data or using a chi-square test for ordinal data to observe the difference of salivary pH, viscosity, and volume between young adult smokers and non-smokers.

The subjects were instructed to collect saliva for five minutes then spit them out by spitting method. Unstimulated saliva collected in the measuring cup was then measured using calibrated digital pH meter. The salivary pH that has been measured then observed under the light to see the viscosity. The subjects then instructed to chew gum for five minutes then spit saliva into measuring cup every 15-20 seconds. The mark of the measuring cup showed the volume of stimulated saliva.

RESULTS

Table 1. Subject characteristics

Characteristics	n	%
Age of smokers		
18 years	0	0
19 years	7	0.25
20 years	10	0.36
21 years	11	0.39
Age of non-smokers		
18 years	5	0.21
19 years	11	0.45
20 years	5	0.21
21 years	3	0.13

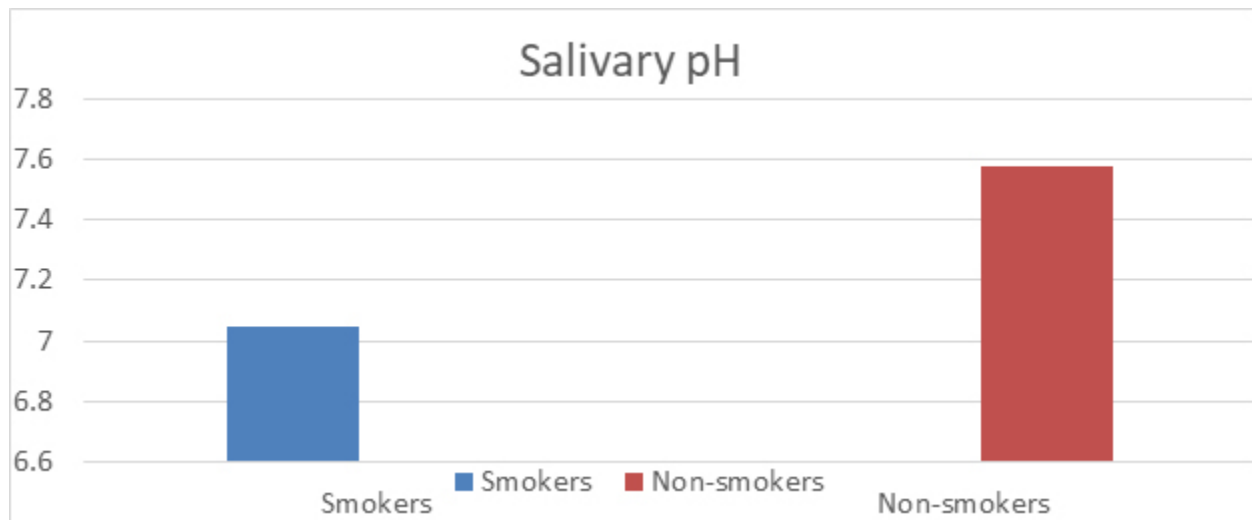


Figure 1. The mean difference of salivary pH between smokers and non-smokers

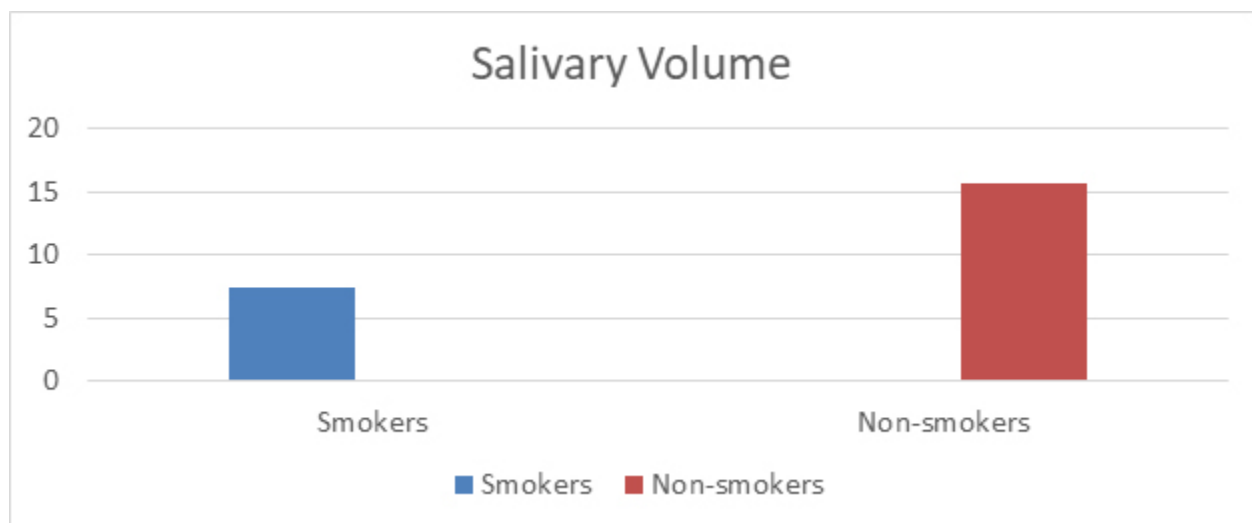


Figure 2. The mean difference of salivary volume between smokers and non-smokers

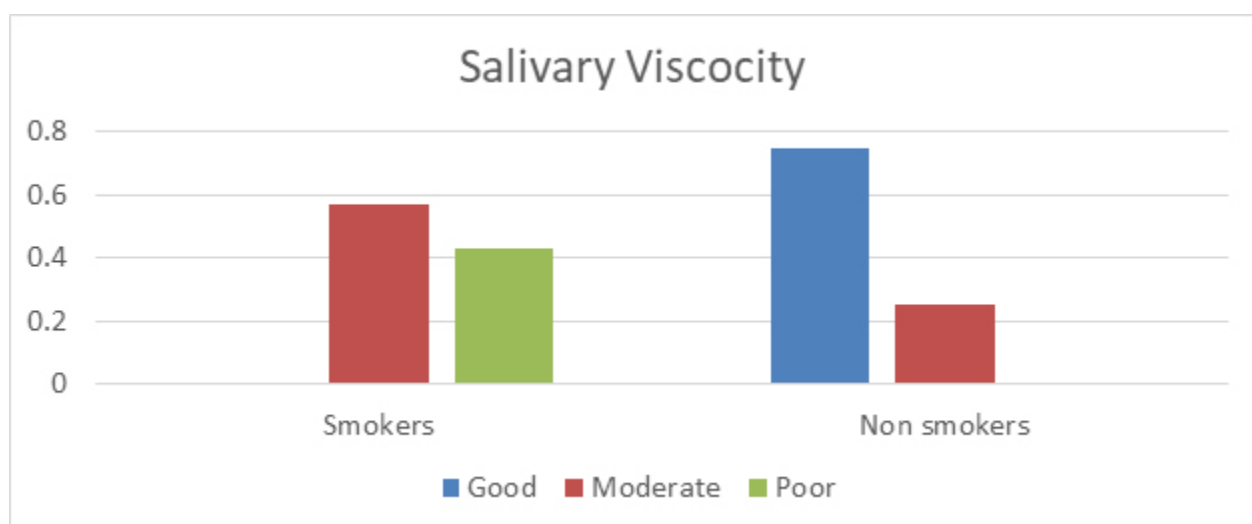


Figure 3. The mean difference of salivary viscosity between smokers and non-smokers

DISCUSSION

The results showed a difference between pH, viscosity and salivary volume in smokers and nonsmokers. The average saliva pH of smokers was 7.049, lower than the average non-smoker pH of 7.577. Similarly, smokers average salivary volume was 7.393, lower than the average volume of saliva in non-smokers of 15.625. For saliva viscosity, there were 28 smokers, 16 people (57%) were included in the category of moderate saliva viscosity, 12 people (43%) were included in the category of poor saliva viscosity, and none were included in the good saliva viscosity category. In the nonsmokers' group of 24 people, 18 people (75%) were included in the good saliva viscosity category, 6 people (25%) were in the moderate saliva viscosity category, and none were included in the poor saliva viscosity category.

The results of this research were following the previous research in 2001 conducted by Reibel reported that salivary pH would increase while smoking but will decrease after a long period in comparison to non-smokers.⁸ That statement also supported by the research in 2013, which compared the group of smokers and non-smokers consisted of 20 samples for each group showed that the smoker's group have lower pH than non-smokers. However, the pH from both group were still in the normal category. Kanwar et al. concluded that there was an alteration of ion and electrolyte of saliva which then affected the pH of saliva.⁶

The results for salivary viscosity and volume were consistent with the study conducted by Voelker et al., which showed that salivary viscosity for smokers are thicker and salivary volume for smokers was lower than non-smokers.¹² Kushartanti stated that some smokers can be classified having good quality or viscosity of saliva and added that there was a connection between the amount of smoking's period with salivary viscosity of a smoker.⁷ Previous research by Boedi in 1990 resulted the salivary viscosity of 32 smokers had significant difference compared to 30 non-smokers. There was also a strong connection between the amount of cigarette each day with the amount of *Candida* species colony in the oral cavity.³

Judging by the effects caused by smoking indeed can not be separated from the characteristics of smokers used in this study, including the length of time smoking and consumption of the number of cigarettes per day. As many as 28 smokers were moderate smokers who consumed between 11-20 cigarettes per day and have been consuming cigarettes for less than 5 years. Smoking effects that arise are influenced by a large number of cigarettes smoked, the duration of smoking, the type of cigarette smoked, even related to the depth of cigarette smoking carried out.¹ Permanent effects of smoking can be seen in the lungs, liver, eyes, mouth, throat, urinary tract, digestive organs, bones and skin after a person smokes more than 5 years, even after the smoker stops smoking.⁴

Salivary pH, viscosity, and volume are important tools in maintaining the integrity of teeth and oral tissues. These three things affect the process of demineralisation and remineralisation of hard tissue. In a small amount of saliva and viscosity of thick saliva, there will be a decrease in salivary pH which creates an acidic atmosphere. This acidic atmosphere will increase the demineralisation process of tooth elements so that the frequency of caries will also increase.²

CONCLUSION

Salivary pH of smokers was lower than non-smokers, salivary viscosity of smokers was higher than non-smokers, and salivary volume of smokers was fewer than non-smokers.

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