

DOES SMOKING CAUSE ORAL CANDIDA COLONIES GROWTH?

Sarah Mersil*

Department of Oral Medicine, Faculty of Dentistry
Universitas Prof. Dr. Moestopo (Beragama)

Naifadinaulia Lailiqonita

Faculty of Dentistry, Universitas Prof. Dr. Moestopo (Beragama)

*Correspondence: sarah.m@dsn.moestopo.ac.id

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ABSTRACT

Smoking is associated with a variety of changes in the oral cavity. Smoking has effects on oral commensal microorganisms, mainly Candida, which causes oral thrush. This infection disease is caused by oral candida colonies growth. How smoking affects oral candida colonies growth is still controversial. The aim of this study is to prove smoking causes oral candida colonies growth. This study is an observational analytic study. The sample of this study consisted of smokers and nonsmokers; oral candida is taken in the oral cavity using swab method. Candida is identified using sabouraud's dextrose agar (SDA) and incubated at 37°C for 24-48 hours. We are asking how to maintain oral hygiene and about oral complaints that carried out using a questionnaire. Oral candidal colonization are both higher in the smokers compared to the nonsmokers; however, the difference was not statistically significant. The p-value is 0.820 (p value > 0.05). Smoking does not cause oral candida colonies growth. Have a good habits of maintaining oral health may control oral candida colonies growth.

INTRODUCTION

Smoking is an activity where a person is enjoying the nicotine smoke produced from the burning tobacco. This habit is an activity that we often encounter in society. Not only in Indonesia but also in the world.(Ambarwati , Ayu Khoirotul U , Fifit Kurniawati , Tika Diah K, 2014) Smoking, basically enjoying the nicotine while its burned.(Drope et al., 2018) It is one of the biggest issues causing many health problems, killing more than 7 million people per year. More than 6 million of these deaths were the result of direct tobacco use, while around 890,000 of non-smokers being

exposed to secondhand smoke.(World Health Organization, 2014) Based on Riset Kesehatan Dasar (RISKESDAS) in 2018 show that the proportion of Indonesians aged 15 years and over who smoke every day around 24.3%. The prevalence of smoking was higher in men (47.3%) than in women (1.2%). The average number of cigarettes smoked per day by smokers in Indonesia is 12.8%.(Badan Penelitian dan Pengembangan Kesehatan, 2018)

The chemical components in cigarette smoke that has been identified reaches 4,800 types.(Drope et al., 2018) Cigarettes have amount number of active components

that can threaten health. The active ingredient components consist of 92% gas components and 8% particle components. The toxins in cigarette smoke cause many diseases such as sudden blood clots, heart attacks and strokes which can be triggered by tobacco smoke.(Rochadi, 2005)

Smoking causes pathological changes in the oral cavity and has various systemic and oral mucosa effects. The changes in the oral mucosa are caused by the many irritants, toxins, and carcinogens found in cigarettes. Smoking increases the risk of various oral diseases such as oral cancer, leukoplakia, oral submucosa, leukoedema, oral hairy, bacterial infections, tooth staining, rhomboid glossitis, halitosis, and oral thrush.(Trandafir et al., 2011) Tobacco use also suppresses the immune system's response to oral infections.(Petersen, 2003)

The increasing number and invasiveness of oral candida colonies, causes of oral thrush, is caused by many predisposing factors, which damage to the oral mucosa. Some of the factors are smoking habits, poor oral hygiene, denture wear, hypovitaminosis, iron deficiency, pregnancy, HIV infection, diabetes mellitus and debilitated patients such as those receiving antibiotics, steroids or cytotoxic therapy.(Muzurović et al., 2013) Smoking habits can also affect oral normal flora, including candida colonies, which shows a higher level of attachment to epithelial cells. Exposure to tobacco smoke has been shown to cause microbial biofilm formation, making smokers more susceptible to life-threatening oral infections including oral thrush. Tobacco smoke triggers an increase in the activity of oral pathogens against the host. One of them is to accelerate the activity of biofilm formation, adhesion, invasion, and infection against the host. One of the pathogens that have an effect on cigarette smoke is *Candida albicans*.(Semlali et al., 2014)

Study presented by Muzurovic et al. in 2013, the relationship between smoking and oral candida colonies in healthy adults in a dental clinic found that candida is the most

common microorganism found in the oral cavity of smoking people, around 82.5% of all examined subjects.(Muzurović et al., 2013) However, study presented by Becker et al. in 2015, the relationship between smoking habits and oral candida showed no significant correlation and found that smoking had little effect on the growth of candida colonies compared to other factors such as dry mouth, immune deficiency disorders or antibiotic treatment.(Becker, 2015) Darwazeh A et al. 2010 also found that smoking did not increase oral candida colonies in smokers who did not have systemic disease or were taking long-term medication.(Darwazeh et al., 2010)

All those studies show that not all smokers have a high number of candida colonies in the oral cavity. The aim of this study is to prove smoking causes oral candida colonies growth. Smoking has effects which causes oral thrush. This study can be used as an educational material for oral thrush prevention, and as a source of information for patients or community groups.

METHOD

An observational analytic study. The sample of this study consisted of 15 smokers and 15 nonsmokers, oral candida colonies is taken from the oral cavity using swab method. *Candida* is identified using sabouraud's dextrose agar (SDA) and incubated at 37°C for 24-48 hours The inclusion criteria of this study are males and 18-25 year old, without systemic disease, and not on taking long-term drugs also signs the informed consent. The exclusion criteria of this study are males who were not cooperative and who vomited while taking samples. We are asking how to maintain oral hygiene and about oral complaints that carried out using a questionnaire. Those questions are habit of brushing their tongue, using dental floss, using mouthwash, frequency of brushing their teeth twice a day, and complaints of dry mouth or xerostomia.

Limitation of this study is a relative minority of participants. The average age of smokers in the study group was relatively low. A more varied age group might demonstrate higher expression of the oral candida counts, but old age might express diverse factors such as compromised health, prescribed medications, etc. Another limitations in terms of duration and amount of smoking may affect certain species more than others and investigating this aspect of the association between smoking and oral candida colonies growth might demonstrate valuable results.

Data were analyzed using Mann-Whitney test to find out whether there was a difference in the number of oral candida colonies between the smoker and nonsmoker groups.

RESULT AND DISCUSSION

Table 1 shows the average number of oral candida colonies in the smokers group are 568 cfu / ml and the average number of oral candida colonies in the nonsmokers group are 557 cfu / ml. It shows the average number of oral candida colonies in the oral cavity is higher in smokers group than nonsmokers.

Table 1. Oral Candida colonies count among smokers and nonsmokers

No	Groups	n	P Value
1	Smokers	15	0,820
2	Non Smokers	15	

Source: analyzed by author, 2021.

Table 2 shows the results of the Mann-Whitney test p value = 0.820. This proves that the test results do not show a statistically significant difference between the smoker and nonsmoker groups, so it can be seen that there is no significant difference in the number of oral candida colonies between smokers and nonsmokers. The basis for the decision, if the p value is <0.05, there is a significant difference in the number of oral candida colonies between smokers and nonsmokers and if the p value is > 0.05, there is no significant difference in the number of oral candida colonies between smokers and nonsmokers.

Table 2. Candidal colonies count among smokers compared with nonsmokers group

No	Groups	n	Number of oral candida colonies
1	Smokers	15	568 cfu/ml
2	Non Smokers	15	557 cfu/ml

Source: analyzed by author, 2021.

Table 3 shows that as many as 9 smoker samples (60%) have habit of brushing their tongues, followed by 7 nonsmoker samples (46.6%). As many as 8 smoker samples (53.3%) have habit of using dental floss, followed by 5 nonsmoker samples (33.3%). As many as 6 nonsmokers samples (40%) have habit of using mouthwash, followed by 3 smoker samples (20%). As many as 15 smoker samples (100%) have a frequency of brushing their teeth twice a day, followed by 12 nonsmoker samples (80%). A total of 2 smoker samples(13.3%) have complaints of dry mouth, followed by nonsmoker samples as many as 4 samples (26.6%).

Table 3. Maintain Oral Hygiene Habit and Oral Complaints among Smokers and Nonsmokers

	Brushing tongue		Flossing		Using mouthwash		Frequency of brushing teeth		Dry mouth	
	Yes	No	Yes	No	Yes	No	Less than twice a day	Twice a day	Yes	No
Smokers	9	6	8	7	3	12	0	15	2	13
	60%	40%	53,3%	46,6%	20%	80%	0%	100%	13,3%	86,6%
Non smokers	7	8	5	10	6	9	3	12	4	11
	46%	53,3%	33,3%	66,6%	40%	60%	20%	80%	26,6%	73,3%

Source: analyzed by author, 2021.

Discussion

Smoking is the habit of enjoying nicotine smoke from burning tobacco and is a habit that is very common and widespread in society.(Rochadi, 2005) The nicotine produced is a chemical substance that is addictive and causes dependence.(Kusuma et al., 2012) Candida is part of the normal flora that can be found in the oral cavity of individuals healthy with a number of <100 colony forming units per milliliter.(Alanazi et al., 2014; Darwazeh et al., 2010) This study is conducted to see whether smoking habits are related to the number of oral candida colonies compared to nonsmokers. Study presented by Becker T et al. 2015 on The Association Between Smoking Habit and Candida in The Oral Cavity, showed that there was no relationship between smoking and candida in the oral cavity.(Becker, 2015)

Table 1 shows the average number of oral candida colonies in the smokers group are 568 cfu / ml and the average number of oral candida colonies in the nonsmokers group are 557 cfu / ml. It shows the average number of oral candida colonies in the oral cavity is higher in smokers group than nonsmokers. The average number of oral candida colonies in this study is higher than the study presented by Darwazeh A et al in 2010, which carried out oral candida taking using the concentrated oral rinse method. Darwazeh A et al showed that the average number of oral candida colonies in smokers

was 333 cfu / ml and nonsmokers was 268 cfu / ml.(Darwazeh et al., 2010) This may be due to the method of taking candida in the oral cavity in this study as well. In contrast, taking oral candida in this study used a swab technique that localized to the dorsal tongue, where the candida was mostly attached to the surface of the tongue because the surface of the tongue had a rough texture that contributed to the invasion process, including involvement in adhesion, proliferation, and hyphal formation from Candida Cells.(Majima et al., 2014)

Based on the results of this study, table 2 shows that there is no significant difference in the number of oral candida colonies between smokers and nonsmokers (p value = 0.820 (p> 0.05)), according to study presented by Becker T et al in 2015 where there was no significant difference in the number of candida colonies in the oral cavity between smokers and nonsmokers. In their study, Becker T et al. in 2015 also said that smoking has a small effect on the growth of candida colonies in the oral cavity, compared to other factors such as dry mouth, immune deficiency disorders or antibiotic treatment.(Becker, 2015) This study is also in accordance with study presented by Darwazeh A et al in 2010 where there was no significant relationship between smoking and the number of candida colonization in the oral cavity in smokers who did not have systemic disease

or took long-term drugs. In their 2010 study, Darwazeh A et al. said the association between candida and tobacco smoking developed when candida carriers were present before the onset of smoking, with tobacco only contributing to increased yeast concentration by inducing changes in mucous membranes.(Darwazeh et al., 2010)

This study is different from study presented by Muzurovic S et al in 2013 in a respondent's age between 18-60 years old where smoking was significantly associated with the number of candida colonies in the oral cavity ($p < 0.05$) with the results of the number of oral candida colonies in smokers 55 % and 45% non-smokers.(Muzurović et al., 2013) This might be the age of the respondents were more varied, reached 60 years, which includes extreme age which is one of the predisposing factors for candida infection due to weakened immunity.(Patil et al., 2015)

In this study, we are asking how to maintain oral hygiene such as the habit of brushing the tongue, the habit of using dental floss, the frequency of brushing teeth in one day, and also asking about complaints of dry mouth or xerostomia. Table 3 shows that 60% smokers have a habit of brushing their tongue is higher than nonsmokers, around 46.6% in 15 smokers. A habit of using dental floss, smokers are higher, around 53.3% compared to nonsmokers, around 33.3%. A habit of using mouthwash, the smokers are lower, around 20% compared to nonsmokers, around 40%. For the frequency of brushing teeth twice a day, smokers are higher, around 100% than nonsmokers, around 80%. Table 3 also shows that the complaints of dry mouth or xerostomia experienced by smokers are only 13.3%. Based on the questionnaires, group of smokers have maintained good oral hygiene and those who experienced complaints of dry mouth or xerostomia are only 2 out of 15 samples. Poor oral hygiene can be a good place for oral candida growth and xerostomia are a local predisposing factors for candida infection.(Patil et al., 2015) Similarly, a studied by Majima T et al

in 2014 provided a questionnaire on how to maintain oral and dental hygiene, such as the frequency of brushing teeth and the method of brushing teeth used.(Majima et al., 2014) It is possible that in this study is no significant difference in the number of oral candida colonies between smokers and nonsmokers because the samples on average have a good level of dental and oral hygiene and have not complaints of dry mouth or xerostomia.

CONCLUSION

In this study, smoking does not cause oral candida colonies growth. Have a good habits of maintaining oral health may control oral candida colonies growth. We wish to note that our basic findings about the early steps of prevent oral candida colonies growth in the oral cavity may suggest that frequent oral care treatment, which removes oral candida cells from this cavity, is very important for prophylaxis and avoidance of oral thrush.

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