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Effect Of Smoking Behaviour and The BMI On Ph Levels Of Saliva and Salivary Amylase Activity Among Male Students

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Abstract. [Smoking behaviour has a negative impact on health, especially oral health. One of the motivations for consuming tobacco cigarettes is stress condition. Many believe that smoking could reduce their stress. We are using purposive random sampling targeting male students who smoke at the faculty of social and political science. We find 40 individual smoking students as respondents. We measure the pH levels of saliva using universal indicators and then salivary amylase activity from the decrease of substrate (amylum) concentration. Here we find that smoking students have significantly more low salivary pH levels and also salivary amylase activity than control (non-smoking students). This could be an early diagnosis of the oral health issue. However, stress conditions could be indicated by relatively high salivary amylase activity. Our result predicted that smoking perhaps reduces the stress of the students because smoking lowers the salivary amylase rate. Moreover, stress conditions do not influence the saliva flow rate. We also use questionnaires to collect body weight and height to measure the BMI (Body mass index). The BMI data also shows most of the smoking student has a normal category of BMI. Nevertheless, there are no significant differences in Salivary pH levels and amylase activity among the BMI category. A previous study also reported that BMI has no correlation with saliva flow rate. We suggest the university should give education about the negative effect of smoking.]

Keyword: [Salivary Amylase, pH Levels, Smoking, Stress, and BMI]

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1 Introduction

Saliva is an essential substance for regulated the oral digestive system health [1] [2]. The amylase in the saliva catalyses the complex carbohydrate such as amylum, before reaching the oesophagus. This ezyme produce by amylase gene which has correlation with preferences diet [3]. Amylase is a group of enzymes including α-amylase, β-amylase and glucoamylase [4]. The enzyme α-amylase (EC 3.2.1.1) hydrolyzes the α-1,4-glycosidic bond. The β-amylase enzyme (EC 3.2.1.2) produces maltose from starch via hydrolysis of the α-1,4 glucan bond. Glucoamylase (EC 3.2.1.3)

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cuts α-1,4-glycosidic bonds and also α-1,6-glycosidic bonds [5]. Moreover, Bad habits in some cases could impact the quality of saliva for example smoking [6] [7] [8].

Smoking is a habit that often causes addiction and links to oral health issues, including salivary secretion [1] . Indonesia is one of a country that has a high population of smokers [9]. The smoker are including university students. The demand for tobacco cigarettes is related to their use as a suppressant of stress i.e. anxiety, tension, and despair [10]. In the end, many health issues emerge from the smoking habit, one of that is cancer [11]. One of the ways that could detect early damage in a smoker's body is by the test salivary amylase activity [1]. A previous study reported that tobacco smoking behaviour is responsible for decreasing the pH levels of the saliva [7]. This condition also decreases the activity of salivary amylase [8]. By far, indeed smoking is not the only cause that degrades saliva.

Stress is also a major factor that influences the quality of saliva [12] [13] [14]. Unlike smoking, stress might increases salivary amylase activity, but not the flow rate of saliva [12] [13] [14]. Considering that stress is one of the major motivations for people to smoke, probably we could predict the relationship between smoking as a stress suppressant with salivary amylase activity. In the end, it should be clear what is the most influencing salivary amylase activity. Here we take samples from students of social and political sciences as a study case.

2 Materials and Methods

We are using passive drool methods [15], to collect saliva samples from 50 male students of social and political sciences in total. We collect the saliva before lunch and also ask the respondent to fill in the questionnaire first. The universal indicator of pH is used for measuring saliva pH levels. We use solubilized amylum as an indicator to measure salivary amylase. Spectrophotometers are used to detect the solubilized amylum absorbent at 540 nm to predict the concentration. Iodin is used to help detect the absorbent. Before this, we already make an amylum standard curve as a reference. Then, we continue to mix the saliva with solubilized amylum for about 10 minutes. Next, we measure again the absorbant using Spectrophotometers [16]. We use this formulation to predict the activity of salivary amylase:

$$Amylase\ activity = \frac{solubilized\ amylum\ absorbant - mix\ amylum\ amylase\ absorbant}{solubilized\ amylum\ absorbant} x\ 100\%$$

SPSS 16 are used for analyzing the data. We chose the Shapiro-Wilk method to test the normality of the data [17]. Then we continue to analyse the significant differences between the saliva pH levels and salivary amylase activity between smoking respondents and control by using the Mann-Whitney method [18]. The significant differences between the saliva pH levels and salivary

amylase activity between the 4 categories of BMI (Body Mass Index) were also analysed by using the Kruskal-Wallis method [19].

3 Result and Discussion

Smoking behaviour is common among Indonesian university students, likewise students from the faculty of social and political sciences, at Universitas Sumatera Utara (USU). Many factors motivated this behaviour, and one of them is the suggestion of being a real man or increasing masculinity [20]. We measure the pH levels in saliva and also the percentage of salivary amylase activity among the 50 samples of male students. We found 40 students smoke more than 10 cigarettes per day. The mean of their saliva pH levels is about pH 6.3 lower than controls which have a pH of 6.8. This supports the previous report which mentioned that smoking made saliva more acidic [7] [8]. Moreover, the mean salivary amylase activity of smoking students is about 68% also lower than the control which is 75.5%. These results also support the previous reports that smoking could decrease salivary amylase activity [7] [8].

The normality test show if the data of pH levels of saliva (shown in table 2) and salivary amylase activity (shown in table 3) has non-normal distribution (p-value<0.05). Then, we continue to analyse the data using Mann-Whitney Test. The results show significant differences ($p<0.05$) between the pH levels of saliva from smoking students and control (shown in table 4) and also salivary amylase activity from smoking students and control (shown in table 5).

Table 1 Age Distribution of Respondent Who Smoke

Age	Number of Students	Percentage (%)
17	1	2
18	12	29
19	16	38
20	6	15
21	4	10
22	0	0
23	0	0
24	1	5
TOTAL	40	100

We found 40 male students from 50 sample students who smoke. Most of them were around age 18 until 19 years. The youngest is 17 years and the oldest is 23 years (shown in table 1).

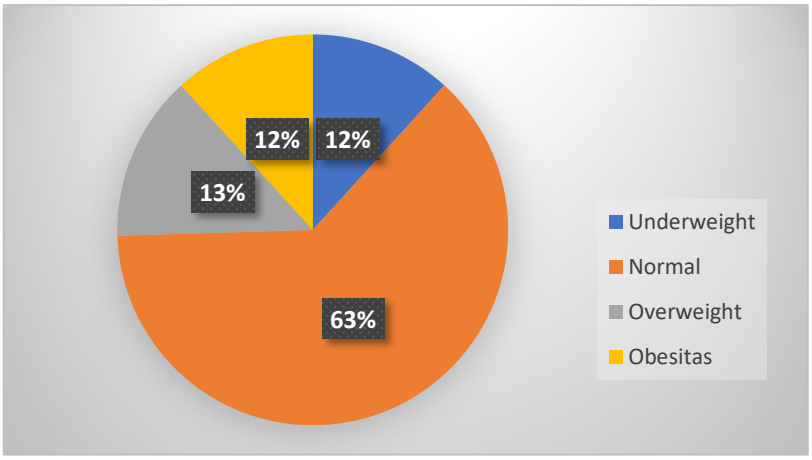

Fig 1. BMI category percentage of smoking students

We also found that more than 60% of the smoking students' BMI is within the normal category (between 18.5-25) (shown in fig.1). It seems smoking might have a correlation with BMI. Previous reports also suggest that falling smoking could increase body weight, although not a major factor [21]

Table 2 Shapiro-Wilk Normalitity test on the saliva pH levels

Respontent	Statistic	df	Sig.
Smoking Students	.753	40	.000
Control	.594	10	.000

Table 3 Shapiro-Wilk Normalitity test on the salivary amylase activity

Respontent	Statistic	df	Sig.
Smoking Students	.931	40	.017
Control	.867	10	.091

Table 4 Mann-Whitney Test on the saliva pH levels between smoker and control

Category	pH saliva
Smoking Students	6.3
Control	6.8
Z	-2.039
Asymp. Sig. (2-tailed)	.041
Exact Sig. [2*(1-tailed Sig.)]	.070a

Table 5 Mann-Whitney Test on the salivary amylase activity between smoker and control

Category	Salivary amylase activity
Smoking Students	68 %
Control	76 %
Z	-2.784
Asymp. Sig. (2-tailed)	.005
Exact Sig. [2*(1-tailed Sig.)]	.004a

The other factors such as the BMI do not show significant differences ($p>0.05$) neither in the saliva pH levels nor the salivary amylase activity between the category (shown in table 6). However, we still find differences in the mean salivary amylase activity among the BMI category. The mean salivary amylase activity of underweight, normal, overweight, and obese is 69.7%, 69.5%, 70.8%, and 73.3% respectively. Indeed, a previous research report that no correlations between BMI and salivary amylase activity [22]. Moreover, the saliva flow rate also has no correlation with BMI [23]. Nevertheless, smoking did help reduce the increase in BMI [21], but the correlation to salivary amylase activity is still unclear.

Table 6 Kruskal-Wallis Test on the salivary amylase activity between the BMI category

Category	Salivary amylase activity
Underweight	69.7 %
Normal	69.5%
Overweight	70.8 %
Obesitas	73.3 %
Chi-Square	1.159
Df	3
Asymp. Sig.	.763

4 Conclusion

We find that smoking makes saliva more acidic and is a major factor in decreasing salivary amylase activity among male students. Stress is one of the motivations to smoke, besides wanting to look more masculine. Stress indeed increases salivary amylase activity but smoking makes it low, perhaps it's indicating that smoking might suppress the stress condition. Most of the students who smoke have the normal category of BMI. Smoking in some cases could limit the increase in body weight. Nevertheless, no correlation between BMI and salivary amylase activity.

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