

The Effect of Academic Stress on Salivary Flow Rate and Plaque Score in Dental Nursing Students of Palembang Health Polytechnic

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Academic stress can affect oral health by reducing the salivary flow rate in which causes an increase of plaque accumulation as the main cause of periodontal disease. The aim of this study is to determine the effect of academic stress on the salivary flow rate and plaque score. A cross-sectional study of 57 dental nursing students who met the inclusion criteria was conducted in May 2019. Academic stress was assessed using the Scale for Assessing Academic Stress (SAAS), and plaque scores were assessed using the O'Leary plaque control record. The effect of academic stress on the salivary flow rate and plaque score was analysed using one-way ANOVA test and Pearson correlation for the relationship between salivary flow rate and plaque score (95% confidence interval). Academic stress was found on 77.2% of students (56.1% mild and 21.1% moderate). The means of salivary flow rate and plaque score were 0:23 mL/minute and 0.1, respectively. There was a significant relationship between academic stress and the salivary flow rate ($p < 0.05$), but there was no correlation between academic stress and plaque scores ($p > 0.05$), and there were a relationship and negative correlation between salivary flow rate and the plaque score ($P < 0.05$; $r = -0.3361$). Academic stress affects the salivary flow rate but does not affect the plaque score. A decrease in the salivary flow rate causes an increase in the plaque score.

Keywords: *Academic stress, Salivary flow rate, Plaque score.*

Introduction

Stress is defined as the body's response that is not specific to the various demands of life or the events that disturb the environment because stress is not just a stimulus or response, but rather a process that can be seen and overcome (Oku et al., 2015; Alsulami et al., 2018). A



small amount of stress is normal and can help individuals become more active and productive. However, very high levels of stress experienced in a long time can cause mental and physical problems significantly (Al-Sowygh, 2013; Alsulami et al., 2018; Gautam, 2018),

Academic stress is the body's response to demands that exceed the related academic adaptive abilities of students. An estimated 10-30% of students experience some level of academic pressure during their academic career (Alsulami et al., 2018). Academic stress is the product of a combination of relevant academic demands exceed the adaptive resources available to individuals (Elani, 2004; Wilks, 2008). Students have many obstacles to overcome in order to achieve optimal academic performance. It takes more than just study hard to achieve a successful college career. There are various possible causes of stress such as time management, financial problems, lack of sleep, social activities, and for some students even having a child, all of which can pose their own threats against a student's academic performance (Dhakal, 2013; Shin, 2016)).

A wide variety of instruments have been developed to measure the level of academic stress, such as Perception of Academic Stress Scale (PAS) (Bedewy, 2015), Academic Stress Scale by Balaji Rao (Kadapatti, 2017), *Dental Environment Stress* (DES) (Gordon, 2016), *Assessment of Stress among Nursing Students* (ASNS) (Costa, 2014), and the Scale for Assessing Academic Stress (SAAS) (Sinha, 2001). SAAS has been used widely to measure the level of academic stress in various studies. SAAS items are based on five independent factors: cognitive, affective, physical, social, and interpersonal. An overall high score indicates a high level of academic stress and a low score indicates a low level of academic stress. Dentists and nurses have the experience that can be stressful for the duration of their education. At the school of dentistry, the highest prevalence of stress and depression experienced in the third year, amounting to 65.5% (Alfaris et al., 2016). Kumar et al. in India (2018) states that 96% of first-year students at the school of paramedics undergo stress, 94% in the form of the stress from mild to moderate and 2% experienced severe stress.

Academic stress effects on salivary secretion have been reported in several studies. Gomes et al. (2010) reported the impact of stress on student reduction in salivary flow. There are two mechanisms of how stress can affect oral health, biological and behavioural mechanisms. The biological mechanisms emphasise how stress can reduce immune system function and facilitate inflammation (Glassman & Miller, 2007; Sarid, Anson, Yaari, & Margalith, 2004; Shin, 2016), while behavioural mechanisms indicate that stress can improve poor health behaviours, such as smoking, drinking more often, eating unhealthy foods, brushing teeth in an irregular manner, bruxism, and neglect oral hygiene. Both of the above causes an increase in the accumulation of plaque, which are the main causes of periodontal disease and decreased resistance to damage from inflammation periodontium (Bulthuis, 2018; Lazar et al., 2017).



Method

This study is a cross-sectional study to analyse the effects of academic stress on the mean salivary flow and plaque score. The study was conducted in May 2019 in Dental Nursing student of polytechnic Palembang. The sample was 57 people who were freshmen to third-year students and was taken by proportional stratified random sampling.

Inclusion criteria are no smoking more than six months (Gholami et al., 2017; Jaiswal & Jaiswal, 2015), no factors that can affect oral health (pregnancy, diseases of the immune system Chronic: Sjögren's syndrome, rheumatoid arthritis, and lupus erythematosus systemic, diabetes mellitus, use of antibiotics in the last four weeks), no use of drugs immunomodulatory, anti-inflammatory, an antagonist of sodium, or anticonvulsants, and no undergoing dental/orthodontic (Bhumika et al., 2011; Deinzer et al., 2005; Navazesh & Kumar 2008).

Academic stress was measured using the Scale for Assessing Academic Stress (SAAS) from Sinha, which has been translated into Indonesian and has been tested for validity and reliability. The questionnaire consisted of 30 items covering five aspects: cognitive, affective, physical, social/interpersonal, and motivation. It was answered with a "Yes" or "No", which was coded as 1 and 0, respectively for the level of academic stress. It was categorised based on the score obtained, namely: normal (score 0-7), mild (score 8-15), moderate (score of 16-23), and severe (score > 23). The collection of saliva was done in the morning (8:00 to 11:00) 17 and respondents were asked not to eat, drink, smoke, and brushing teeth at least 90 minutes earlier to avoid stimulation of saliva secretion (Gholami et al., 2017). Plaque score was calculated using the O'Leary plaque control record.

ANOVA test was used to analyse the influence of academic stress on salivary flow rate and plaque score. The relationship between salivary flow rate and plaque score was tested using linear regression and Pearson correlation with 95% confidence intervals. Normality of the data was tested with the Kolmogorov-Smirnov test.

This study was conducted after obtaining permission from the subject of research in the form of informed consent and ethical approval from the Ethics Committee for Health Research Health Polytechnic Makassar No. 274 / KEPK-PTKMKS / IV / 2019.

Results

Table 1. Academic stress, salivary flow rate, and the plaque score (N = 57)

Characteristics	Frequency	%
Academic stress		
There is no	13	22.8
Light	32	56.1
Moderate	12	21.1
Salivary flow rate (mL / min), the mean (\pm SD)	0,265 (\pm 0.21605)	
Plaque score, the mean (\pm SD)	0.1046 (\pm 0.06395)	

Table 1 shows that most of the research subjects experiencing academic stress (77.2%) during their education and only 22.8% with no academic stress (normal). The mean salivary flow rate obtained was 0.265 mL/min with plaque score of 0.1. Academic stress distribution by the education level of students is shown in Table 2.

Table 2. Distribution of academic stress level based on years of education (n = 57)

Years of education	Stress Academic Degrees					
	Normal		Light		Moderate	
	N	%	N	%	n	%
First year	3	15.8	10	52.6	6	31.6
Second year	7	36.8	9	47.4	3	15.8
Third year	3	15.8	13	68.4	3	15.8
Total	13	22.8	32	56.1	12	21.1

Table 2 shows that 87.2% of nursing students experience academic stress, and the majority (56.1%) experience mild stress. Freshmen and third-year students experience more stress than students in the second year. Mild academic stress is most prevalent in third-year students, while the stress of academic degrees was most often found in first-year students.

Table 3. Distribution of causes of stress of academic degree students based on aspects of SAAS and years of education (n = 57)

Level of education	SAAS									
	Cognitive		Affective		Physical		Social		Motivation	
	n	%	n	%	n	%	n	%	n	%
First year	8	42.1	3	15.7	2	10.5	5	26.3	1	5.26
		1	9		3		2			
Second year	5	26.3	4	21.0	7	36.8	1	5.26	2	10.5
		2	5		4		1			3
Third year	9	47.3	1	5.26	2	10.5	2	10.5	5	26.3
		7			3		3		2	
Total	22	38.5	8	14.0	11	19.3	8	14.0	8	14.0
		9		4		4		4		4

Table 3 shows that main experiences of academic stress come from cognitive aspect for first-year and third-year students and the physical aspect for second-year students.

Analysis using ANOVA test between academic stress and salivary flow rate obtained value of $p < 0.05$, meaning that there is a significant relationship between the two, but there is no correlation between academic stress and plaque score ($p = 0.209$; CI 95%).

Table 4. Results of Anova

		Number Squares	Degrees of Freedom	Central Squares	F	Sig.
Saliva Flow Rate (mL/min)	Between groups	.612	2	0.306	8.257	0,001
	In Group	2,002	54	0,037		
	Total	2.614	56			
Plaque score	Between groups	0,013	2	0,006	1,611	.209
	In Group	.216	54	0,004		
	Total	.229	56			

The linear regression test found a significant correlation between salivary flow and plaque score ($p = 0.006$; 95% CI) and the Pearson correlation test obtained a negative correlation between salivary flow and plaque score ($r = -0.361$; $p < 0.05$), which means that the reduction in salivary flow causes an increase in plaque score as shown in Figure 1.

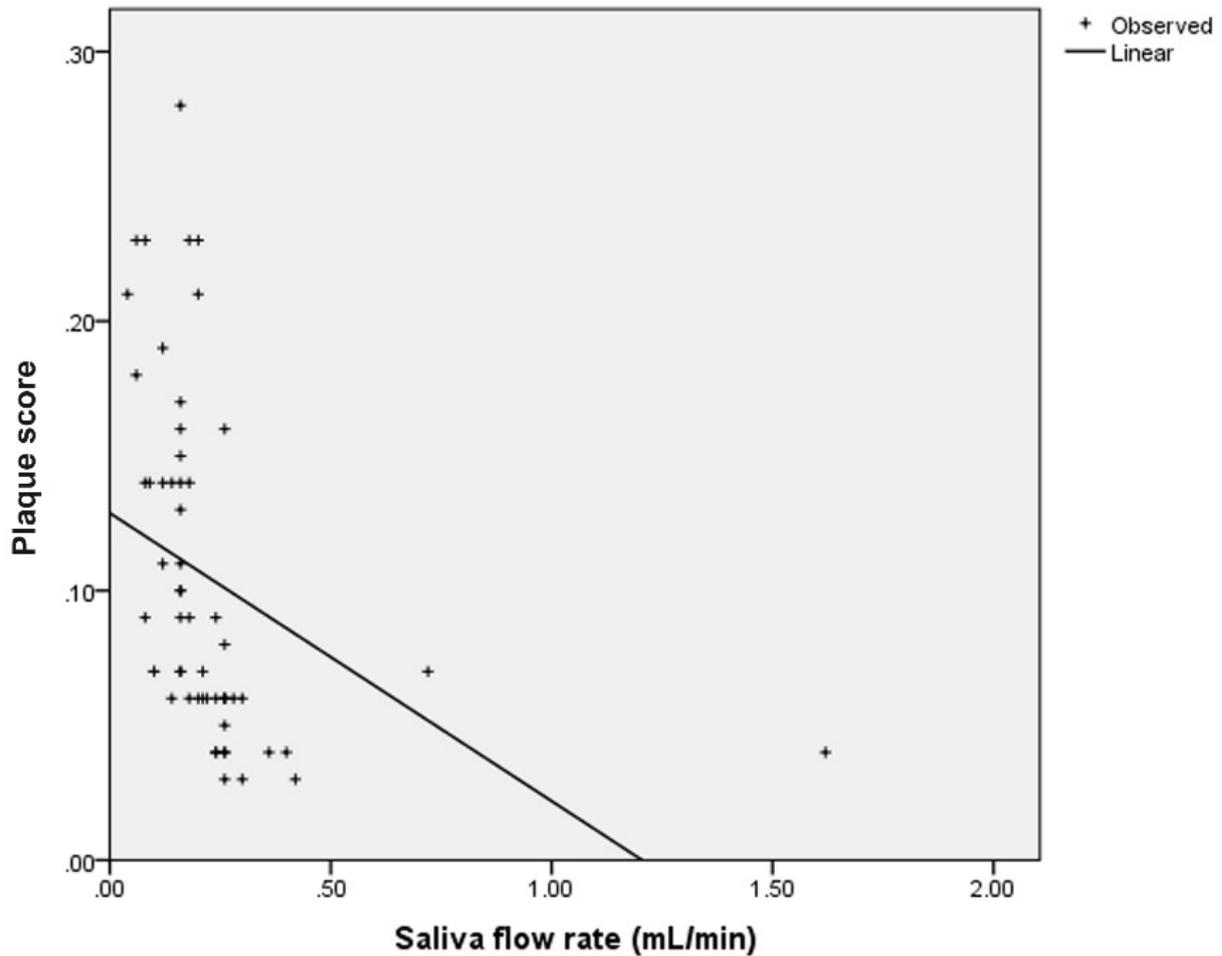


Figure 1. Correlation between salivary flow and plaque score

Discussion

From the results of academic stress level measurement using the Scale for Assessing Academic Stress (SAAS), the majority of dental nursing students experience academic stress during their education, although only from mild to moderate levels. This figure is lower than the results of Kumar et al. in India (2018) of the students in the school of paramedics that is equal to 96%. At least academic stress occurred for students in the second year more than students in the first and third year. These results are consistent with the results of research Harris et al., which concluded that the student dental hygiene and dental therapy in the first and the third year are more stressful than students in the second year. The different results are presented by Sinha, Sharma and Kaur (2011), where the highest prevalence of academic stress of college nursing students is found for students in the second and third year. The results of this study indicate that first-year student experience more academic stress on cognitive aspects, due to the process of adaptation to the educational system from high school to higher education level and the adaptation to campus and student dormitories. Second-year students experience more academic stress on the physical aspect as a result of activities of

clinical practice that requires physical condition fitter. However, according to Harris et al., the clinical practice factor, such as targets to be met and the shortness of time, is not a major stress factor (Harris et al., 2017). While the third-year students also experience more academic stress on cognitive aspects, but more due to exams before graduation and lack of preparedness competency test or a dental nurse and concerns ketidakpercayaan of their capabilities as they work.

Salivary secretion is mainly under the control of the autonomic nerves, sympathetic and parasympathetic nerves. Physiological response to emotional stimulation is controlled by a complex system involving the limbic system, particularly the amygdala, hypothalamus and reticular formation. There is an increase in stress conditions due to the influence of catecholamines systemic sympathetic nerve caused by increased secretion of the adrenal glands. The increase in catecholamine secretion will increase the glucocorticoid receptor stimulation and release of neurotransmitters such as adrenaline, noradrenaline, and serotonin (Ekström et al., 2012), decrease the number of lymphocytes, reduced lymphocyte proliferation and reduce the production of antibodies. Meanwhile, increased levels of adrenaline and noradrenaline will cause a decrease in blood flow to the salivary glands and cause a decrease in salivary secretion. The majority of previous studies have shown that stress, depression and anxiety have a significant association with the rate of unstimulated salivary flow and xerostomia (Gholami et al., 2017). Emotional states, such as depression, can cause a reduction in salivary flow (Malathi et al., 2013; Naumova et al., 2012). Conversely, positive moods can increase salivary flow. Although mental stress can affect the salivary flow rate, the results of Naumova et al. (2013) showed that stress that occurs acutely does not affect the flow rate of saliva, so it can be assumed that the feeling of dry mouth after mental stress acute is not caused by a decrease in salivary flow, but rather a change in the composition of saliva (Naumova and colleagues, 2013). The influence of academic stress on salivary flow has been reported in several studies. Gomes et al. (2010) reported the effects of stress on reduction in the salivary flow of students. Similarly, the results of research by Al-Nuaimy et al. (2010) also concluded that the effect of stress on salivary flow rate is found on 23 dental students at the University of Mosul in Iraq.

This research shows the relationship between academic stress with the decreased salivary flow, but not directly related to the increase in plaque score. These results are consistent with Deinzer et al. (2005) who argued that academic stress causes an increase in plaque accumulation, but not the direct result of academic stress itself but academic stress cause changes in behaviour that ignored the oral hygiene (Deinzer et al., 2005).

Limitations of this study are the number of subjects is too small, and the *Scale for Assessing Academic Stress* (SAAS) conducted by research subjects is not accurate in measuring the level of academic stress.



Conclusion

Academic stress affects the reduction in salivary flow but does not directly affect the score of the plaque. There was a significant correlation between salivary flow and plaque score, and there was a negative correlation between the two in which the reduction in salivary flow caused an increase in plaque score. Further research is needed to determine whether the stress experienced by students is the result of academic pressures or stress caused by factors other than academic factors.

The high prevalence of academic stress in nursing students in the teeth needs to be addressed by increasing the role of academic lecturers so that students can go through the process with a good education, as well as the need to restore the system orientation for new students to enable them to adapt in a new environment.



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