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The relationship between academic stress and xerostomia in 12th grade high school students in Medan, Sumatera Utara

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Abstract

Several studies have shown that stress levels in high school students range from moderate to high. Theoretically, psychological conditions such as stress affect xerostomia complaints. This study aimed to determine the relationship between academic stress and xerostomia. This research was an analytic study with a cross-sectional design involving 68 subjects. The selection of subjects was using an accidental sampling method. Measurement of academic stress and xerostomia was carried out by interviewing subjects using the ESSA for academic stress and Fox questionnaires for xerostomia. The results showed that 13.2% of the subjects had xerostomia, and 86.8% of the subjects did not have xerostomia. More males experienced xerostomia (16.7%) than females (10.5%). 67.6% of subjects were at moderate stress levels and the rest were at severe stress levels. The stressor with the highest percentage was the self-expectation stressor at 60.3%. The results of the analysis regarding the relationship between academic stress and xerostomia using Chi-square showed significant results ($p = 0.049$). The stressor of pressure from study ($p = 0.042$) and the stressor of self-expectation ($p = 0.023$) had a significant relationship with xerostomia, while the other stressors did not show significant results ($p > 0.05$). The conclusion of this study shows that there is a relationship between academic stress and xerostomia in class 12th grade high school students in the Medan Kota sub-district.

Keywords: Academic stress, xerostomia, stressor, ESSA, fox

1. Introduction

While studying at school, students often experience stress due to their struggles to adapt to the school curriculum^[1, 2]. Psychological and physical disorders are the accumulation of stress experienced by students in the school environment^[2]. Academic demands that are considered too heavy, bad exam results, loads of assignments, and the social environment are many factors that cause stress in students^[3]. Academic stress is the stress experienced by students in the school environment due to being unable to deal with academic demands^[4-6]. The prevalence of stress in adolescents and young adults around the world is currently estimated to increase from 5% to 70%^[7]. Based on a survey by the Programme for International Student Assessment (PISA) in 2015 the average student in all member countries of the Organization for Economic Cooperation and Development (OECD) experiences stress at school, where 55% experience anxiety which is one indicator of stress^[8]. Liu's research shows that high school students in China experience high academic stress^[9] Research by Soeli *et al.* shows that school students experience stress^[10]. Veronika reported that class XII high school students in Yogyakarta are at moderate stress levels^[11].

Xerostomia is a subjective complaint of dry mouth that is not always associated with hyposalivation and hypofunction of the salivary glands^[12]. The prevalence of xerostomia in the population ranges from 5.5% to 46%^[7]. In addition, several studies conducted in young and older adult populations have shown differences in prevalence between them.^[13] Research conducted by Benn *et al.* showed that the prevalence of xerostomia was highest in the age group of 18-24^[14]. His findings explained that xerostomia can affect not only the elderly but also younger age groups, although in different proportions^[13].

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Several studies conducted in adolescents and adults have shown that xerostomia is related to stress. [15,16] Shigeyama *et al.* estimate that around 20-30% of the population aged 20 years have xerostomia and the likely reason is the increased use of antidepressants because xerostomia can be associated with depression and anxiety [17]. Veerabhadrapa *et al.* also reported the prevalence of xerostomia in psychological disorders, around 51% of patients suffering from anxiety experienced xerostomia [18]. Research by Atif *et al.* showed that dental students who experienced xerostomia subjectively had low-stress scores [19].

Based on these studies, it was found that research on the relationship between academic stress and xerostomia in school students is still limited. Many studies that have been conducted only discuss stress in school students but do not link its relationship with xerostomia [8-11]. Thus, this research was conducted to study the relationship between academic stress and xerostomia in school students.

Materials and Methods

This analytic research conducted with a cross-sectional design and carried out on 68 high school students in Medan, Sumatera Utara. The research was conducted in December 2022 - January 2023. The sampling technique for each school was the accidental sampling method according to the inclusion and exclusion criteria. The inclusion criteria of this study were 12th grade high school students who did not take any drugs that could affect saliva, did not smoke, agreed to be research subjects, and were willing to sign informed consent. Subjects who did not follow all research procedures were excluded from this study.

Academic stress was measured using the Educational Stress Scale for Adolescents (ESSA) questionnaire, while xerostomia was measured using the Fox questionnaire. The ESSA questionnaire has five aspects which are indicators of stress, including pressure from study, workload, worry about grades, self-expectations, and despondency.

The research plan was approved by Institutional Ethical Committee No. 1251/KEPK/USU/2022. The selection of research subjects was carried out by accidental sampling technique, according to the inclusion and exclusion criteria. Research subjects were given explanation regarding research procedures and subjects who were willing to participate, were asked to sign an informed consent. Researchers provided sheets of academic stress questionnaires and xerostomia questionnaires and then asked the questionnaires to be filled out and collected on the same day. Filling out the

questionnaire sheets was observed and assisted by researchers. The data obtained were processed then analyzed using Chi-square test.

Results

The results showed that 86.8% of subjects did not experience xerostomia (Table 1). The 16.7% of men experienced xerostomia and 83.3% of men did not experience xerostomia. Whereas in women, 10.5% had xerostomia and 89.5% did not experience xerostomia (Table 2).

Table 1: The prevalence of xerostomia in 12th grade high school students in Medan

Xerostomia	Frequency	
	n	%
Yes	9	13,2
No	59	86,8
Total	68	100

Table 2: The prevalence of xerostomia in 12th grade high school students in Medan based on gender

Gender	Xerostomia					
	Yes		No		Total	
	n	%	n	%	n	%
Male	5	16.7	25	83.3	30	100
Female	4	10.5	34	89.5	38	100

Measurement of stress levels showed 22 subjects (32.4%) were at a severe level, 46 subjects (67.6%) were at a moderate level, and 0 subjects (0%) were at a mild level (Table 3). Based on the distribution of stressors, the aspect of learning pressure shows that 50% of the subjects are at a high stress level, the task load aspect shows that 51.5% of the subjects are at a moderate stress level, the aspect of worrying about grades shows 50% of the subjects are at a moderate stress level, the self-expectation aspect shows 60.3% of the subjects were at a moderate stress level, and 57.4% of the sadness aspects were at a severe stress level (Table 4).

Table 3: Percentage of stress levels in 12th grade high school students in Medan

Stress Levels	Frequency	
	n	%
Severe	22	32,4
Moderate	46	67,6
Mild	0	0
Total	68	100

Table 4: Distribution of stressor frequencies experienced by 12th grade high school students in Medan

Stress Levels	Stressors									
	Pressure from study		Workload		Worry about grades		Self-expectation		Despondency	
	n	%	n	%	n	%	n	%	n	%
Severe	34	50	16	23,5	31	45,6	15	22,1	39	57,4
Moderate	28	41,2	35	51,5	34	50	41	60,3	24	35,3
Mild	6	8,8	17	25	3	4,4	12	17,6	5	7,4
Total	68	100	68	100	68	100	68	100	68	100

Stressors were divided into pressure from study, workload, worry about grades, self-expectation and despondency. From this study, it was found that there was a relationship between the stressor of learning pressure and the stressor of self-

expectation towards xerostomia with p values of 0.042 and 0.023 ($p < 0.05$) respectively. Whereas the stressor of task load, stressor of worry about grades, and stressor of despondency have no relationship with xerostomia. (Table 5).

Table 5: Relationship between stressors and xerostomia in 12th grade high school students in Medan

Stressors	Stress Levels	Xerostomia		Total	p - value
		Yes	No		
Pressure from study	Severe	8 (23, 5%)	26 (76, 5%)	34 (100%)	0,042
	Moderate	1 (3,6%)	27 (96, 4%)	28 (100%)	
	Mild	0 (0%)	6 (100%)	6 (100%)	
	Total	9 (13, 2%)	59 (86, 8%)	68 (100%)	
Workload	Severe	4 (25%)	12 (75%)	16 (100%)	0,103
	Moderate	5 (14, 3%)	30 (85, 7%)	35 (100%)	
	Mild	0 (0%)	17 (100%)	17 (100%)	
	Total	9 (13, 2%)	59 (86, 8%)	68 (100%)	
Worry about grades	Severe	4 (12, 9%)	27 (87, 1%)	31 (100%)	0,769
	Moderate	5 (14, 7%)	29 (85, 3%)	34 (100%)	
	Mild	0 (0%)	3(100%)	3 (100%)	
	Total	9 (13, 2%)	59 (86, 8%)	68 (100%)	
Self-expectation	Severe	5 (33, 3%)	10 (66, 7%)	15 (100%)	0,023
	Moderate	4 (9, 8%)	37 (90, 2%)	41 (100%)	
	Mild	0 (0%)	12 (100%)	12 (100%)	
	Total	9 (13, 2%)	59 (86, 8%)	68 (100%)	
Despondency	Severe	6 (15,4%)	33 (84, 6%)	39 (100%)	0,651
	Moderate	2 (8,3%)	22 (91, 7%)	24 (100%)	
	Mild	1 (20%)	4 (80%)	5 (100%)	
	Total	9 (13,2%)	59 (86, 8%)	68 (100%)	

Based on the results of the analysis, there is a relationship between academic stress and xerostomia with a p-value of 0.049 (p <0.05) (Table 6).

Table 6: Relationship between academic stress and xerostomia in 12th grade high school students in Medan.

Academic Stress	Xerostomia						p
	Yes		No		Total		
	n	%	n	%	n	%	
Severe	6	27,3	16	72,7	22	100	0,049
Moderate	3	6,5	43	93,5	46	100	
Mild	0	0	0	0	0	0	
Total	9	13,2	59	86,8	68	100	

Discussion

Xerostomia is a subjective complaint of dry mouth [20]. Not all xerostomic patients experience hyposalivation or changes in the quality and quantity of saliva [21]. Lack of lubrication and protection of saliva causes the oral cavity to become dry and more prone to irritation [21]. Xerostomia is the most common complaint found among patients experiencing anxiety, stress, drugs, radiation therapy, chemotherapy, and systemic disease [20].

Several previous studies reported that stress was found in school children [8-11]. Sympathetic nerves from the autonomic nervous system can be affected and block the parasympathetic nervous system because there is stimulation in the form of stress, despair, or fear so that salivary secretion decreases and causes the mouth to become dry [22, 23]. Parasympathetic stimulation causes the release of watery saliva in large amounts and is rich in enzymes [24]. Sympathetic stimulation produces a much smaller volume of saliva with a thick and mucus-rich consistency [25]. The mouth feels drier than usual when the sympathetic nerves are dominant [24, 25].

In this study, it was shown that more respondents did not experience xerostomia compared to subjects who suffered from xerostomia (Table 2). The prevalence of xerostomia in the age category under 20 years is less than those who do not experience xerostomia [26]. The prevalence of xerostomia increases with age. This shows that the younger age group will have a smaller prevalence of xerostomia compared to the adult to old age group. As we get older, medical conditions,

drug use, salivary conditions, and nutritional intake can affect the condition of the oral cavity, one of which is xerostomia.

This study reports that xerostomia was more common in men (Table 3). This is in line with Abdullah's study, which reported that the percentage of xerostomia in men under 20 years old was greater than in women [26]. This could be because women have a better water intake pattern than men [27]. There are more women in the optimal hydration category and the urine osmolality of women is lower than men, indicating that there is more or sufficient fluid in the female body [27]. A study conducted by the Asian Food Information Center showed that boys in the 15-24-year-old category drank 1.5 liters of fluids per day, while women drank 1.6 liters per day. [28] A study conducted by Rosinger and Herrick also reported that men only consumed 30% of water, while women consumed 34% water of their total daily water intake (water, diet fluids, or other liquids) [29].

Most of 12th grade high school students experienced moderate stress (Table 4). This result is consistent with research conducted by Kinantie *et al.*, Astuti *et al.* research, and Veronica Wulandari's research regarding academic stress experienced by 12th grade high school students [11, 30, 31]. The stress management carried out by the school and the preparation of the students themselves give the impression that the demands/stressors experienced are not too disturbing so that the stress that is felt is classified as moderate. students do not always lead to negative responses [31, 32]. Stress can also have a positive impact that can improve student performance in learning [31, 32].

The stressors experienced by students were study pressure, workload, worry about grades, self-expectations, and despondency. The results of this study indicate that of all stressor percentages, the highest percentage is in self-expectation stressors (Table 5). In contrast to Putri and Hariastuti's research which reported that the highest percentage was in stressors concerned about grades [33]. This could be due to differences in research subjects. The research subjects in this study were subjects only from 12th grade, while in Putri and Hariastuti's research, the subjects were more varied, namely including 10th, 11th, 12th grade students. This can also happen because Putri's research is carried out during the online learning period which can increase anxiety

and pressure on students. Many students feel that pressure from study increases because they do not understand the material from the explanations given online^[33].

Academic stress is reviewed based on five aspects, namely pressure from study, workload, worry about grades, self-expectations, and despondency^[33]. Pressure from study is the pressure that comes from external factors of students the pressure received when individuals are studying at home or school can come from parents, school friends, exams, and the next level of education^[33]. Circumstances where there is a discrepancy between environmental demands and the competencies possessed can cause feelings of pressure.^[34] Workload relates to tasks that must be completed by individuals. Worries about grades regarding the individual's ability to accept new knowledge. Self-expectation, concerning the individual's ability to have expectations of himself. Someone with low self-expectations can be said to experience academic stress such as feeling like a failure when the academic scores obtained do not match their expectations. Despondency relates to the emotional response given by individuals when they feel unable to achieve the goals to be achieved, individuals who feel stressed will think they cannot master the learning material and are unable to complete the tasks assigned^[33].

Cross-tabulation showed that there was a significant relationship between the stressors of pressure from study and self-expectation stressors with xerostomia in 12th grade high school students in Medan, while other stressors did not show a significant relationship (Table 6). Pressure originating from matters related to learning can cause pressure within oneself which is called stress^[34, 35]. Too high expectations and positive or negative academic self-perceptions impact on academic competence and can cause pressure so that it becomes a source of stress^[35].

Workload, despondency and worried about grades can be a source of stress in students^[2, 32, 34]. However, the academic stress experienced can be responded to positively (eustress) so that the attitude towards the workload is positive^[36]. Self-efficacy can help individuals deal with difficulties and stressful situations, this also influences individuals in determining effective ways of managing and coping with the stressors they face^[37]. Self-efficacy refers to an individual's confidence in his ability to act to achieve his goals^[37].

This study shows that there was an increase in the number of respondents who have xerostomia along with an increase in stress levels (Table 6). At the level of severe stress, it was seen that more subjects experienced xerostomia than those who did not experience xerostomia.

This study also shows a significant relationship between academic stress and xerostomia in 12th grade high school students in Medan. A study showed that stress has an effect on xerostomia^[38]. Stress can affect the sympathetic nerves of the autonomic nervous system and block the parasympathetic nervous system so that salivary secretion decreases and causes dry mouth^[22, 23]. Sympathetic stimulation produces a much smaller volume of saliva with a thick, mucus-rich consistency^[25]. The mouth feels drier than usual when the sympathetic nerves are dominant^[24, 25].

This study is limited in diagnosing xerostomia, future studies are expected to use clinical examination methods to xerostomia determination.

Conclusion

The conclusion of this study is that there was a relationship between academic stress and xerostomia in 12th grade high

school students in Medan and the higher the stress level, the higher the risk of xerostomia.

Conflict of Interest

Not available

Financial Support

Not available

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