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The Association of Stress with the Occurrence of Recurrent Aphthous Stomatitis (RAS) Amid the COVID-19 Pandemic in Students of Senior High School

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ABSTRACT

The most prevalent oral mucosal lesion is Recurrent Aphthous Stomatitis (RAS). SAR can occur due to local trauma, stress, drug use, hormonal changes, nutritional deficiencies, immunological factors, smoking, hereditary and genetic factors, microbial factors, food hypersensitivity, hematinic deficiencies, and human immunodeficiency (HIV) infection. RAS is a prevalent condition that is defined by the presence of round ulcers that appear as recurrent lesions, numerous, small, round, have a yellowish base, and are surrounded by an erythematous halo and can occur in young and adult ages. Specifically, the pandemic caused by COVID-19 has affected people's lives around the world, including senior high school students. The incidence of RAS in adolescents is categorized as high; according to the findings of RISKESDAS, the percentage is 8.7%. Stress is a contributing component to the development of RAS. The objective of this investigation was to ascertain the correlation between stress and the prevalence of RAS during the COVID-19 pandemic. This investigation employed a cross-sectional design and was observational analytic. A total of 104 research subjects were included in the study, which was conducted on students at SMA Negeri 6 in Yogyakarta. The results revealed 59 respondents with normal stress levels, of which 57 respondents (54.8%) were positive for RAS. The Spearman Rank correlation statistical test was employed to analyze the data, resulting in a significant value of p = 0.019 or <0.05, which denotes a correlation stress and the occurrence of RAS during the COVID-19 pandemic in students at SMA 6 Yogyakarta, serving as the conclusion.

Keywords: Recurrent Aphthous Stomatitis (RAS); stress; COVID-19 pandemic; senior high school students

Introduction

The presence of numerous small, round, or ovoid ulcers that recur with distinct borders and form a circle is a common symptom of Recurrent Aphthous Stomatitis (RAS) [1]. The etiology of RAS remains unclear. Many factors can cause RAS, such as mucosal trauma, gastrointestinal systemic diseases, and stress. The onset of RAS is also influenced by psychological disorders, such as stress [2]. RAS lesions will develop over several days, starting with

clinical lesions to become typical aphthous ulcers. Pain in RAS will peak before ulceration and will decrease in the healing phase. RAS lesions are self-limited, which usually heal within 1 to 2 weeks and will recur 3 to 6 times a year [3].

On the other hand, according to WHO (2020), the pandemic caused by Coronavirus (SARS-CoV-2) Disease (COVID-19) has had a bearing on people's lives around the world since March 2020

[4]. Research conducted in China evaluated that the COVID-19 outbreak had caused anxiety in approximately 24.9% of students, which was caused by high anxiety, stress, and depression. This psychological response might arise and be exacerbated by the lack of intrapersonal communication during social distancing. Distance learning has also been found to be associated with stress, as it involves problems in learning or academics [5].

One of the factors that predisposes individuals to RAS is stress, where the stress response instigates suppression of IgG, IgA, as well as neutrophil functions so that homeostasis is disrupted and then causes tissue to be susceptible to ulcers in the form of RAS in various mechanisms [6]. In the humoral response, the level of salivary IgA in patients with RAS exhibits an increase in the acute period and decreases in the regression and healing periods [4]. Therefore, the objective of this investigation is to ascertain the stress that individuals have encountered amid the COVID-19 pandemic as a predisposing component for RAS in students at senior high school.

The COVID-19 pandemic is also widely associated with anxiety and depression, but not much previous research has compared the association of the prevalence of oral diseases and psychological circumstances such as anxiety and depression. According to the given description, researchers need to investigate the association of stress with the incidence of RAS in students of SMA N 6 Yogyakarta amid the COVID-19 pandemic. These findings will provide valuable information to help schools understand their students' stress conditions related to RAS, thereby enabling them to plan and provide RAS treatment during the Covid pandemic.

Table 2.
Respondents' characteristics on the basis of age and gender with RAS incidence

Characteristic		Positive RAS		Negative RAS		Total	
		n	%	n	%	n	%
Respondent Age	14 years old	1	1	0	0	1	1
	15 years old	14	13.4	2	1.9	16	15.1
	16 years old	67	64.4	5	4.8	72	69.2
	17 years old	12	11.5	3	2.9	15	14.4
Gender	Male	36	34.6	6	5.8	42	40.4
	Female	58	55.8	4	3.8	62	59.6

Methods

The research design used was observational analytic, with a cross-sectional approach, namely observational research that analyzes data from a population over a certain period of time. The research subjects were part of the population that met the inclusion and exclusion criteria that had been set, namely 104 students, who were selected by purposive sampling. Subjects were asked to fill out a consent form containing detailed information before the study began, as proof of their agreement to participate. Stress level assessment was carried out using the CPDI (Covid-19 Peritraumatic Distress Index) questionnaire to see psychological distress in the past week with a score scale of 0-100 as many as 24 questions. The score is calculated by adding up the scales that the respondents have chosen between 0-4. A score between 28 and 51 indicates mild to moderate distress. A score of more than or equal to 52 indicates severe distress, a score of less than 28. The CPDI questionnaire has been validated with a Cronbach's α coefficient value of 0.95 ($p < 0.0001$) indicating mild distress. Measurement of RAS incidence was performed using the Recurrent Aphthous Stomatitis Diagnosis (RASDX) questionnaire. This questionnaire is a diagnostic tool to perform direct clinical observation measurements of RAS lesions that are not possible. The questionnaire contains questions about the history of RAS with the answers "YES" and "NO". The data results were then analyzed using the Spearman Rank correlation test.

Results and Discussion

Table 1. Respondents' characteristics on the basis of age and gender with stress levels

Characteristic		Stress Level						Total	
		Normal		Mild-Moderate		Severe			
		n	%	n	%	n	%	n	%
Respondent Age	14 years old	0	0	1	1.0	0	0	1	1.0
	15 years old	11	10.6	5	4.8	0	0	16	15.4
	16 years old	41	39.4	28	26.9	3	2.9	72	69.2
	17 years old	7	6.7	4	3.8	4	3.8	15	14.4
Gender	Male	28	26.9	14	13.5	0	0	42	40.4
	Female	31	29.8	24	23.1	7	6.7	62	59.6

Table 3.
Distribution of stressors experienced by students during the COVID-19 pandemic

Category	Frequency (n)	Percentage (%)
Concern about contracting the virus	31	29.8
Discomfort due to limited face-to-face social interaction	58	55.8
Discomfort during online school/distance learning	83	79.8
Not being able to do hobbies as usual	50	48.1
Concern about financial conditions	45	43.3
Taking vitamins regularly	7	6.7
Using mouthwash	0	0.0
Having stomach disease	9	8.7
Other things	8	7.6

The study was conducted after ethical approval number 093/EC-FKIK UMY/III/2022 was issued. The study revealed that respondents experienced the most severe stress at the age of 16 to 17 years, mild-moderate stress occurred more at the age of 16 years with the results of 28 respondents (26.9%), and severe stress was more at the age of 17 years as many as 4 respondents (3.8%). Female respondents had higher levels of severe stress than males, as many as 7 students (6.7%). The normal stress level in this study obtained the highest results compared to mild-moderate and severe stress in the characteristics of gender and age. This is explained in Table 1 below.

Furthermore, an analysis of the distribution of age and gender characteristics with the incidence of RAS was conducted. According to the distribution of the respondents' ages, students aged 16 years experienced more RAS, with the result that 67 respondents were positive for RAS (64.4%). The age that experienced RAS the least was 14 years, with 1 respondent (1%). The characteristics of respondents on the basis of gender in this research uncovered that females experienced more RAS with 58 respondents (55.8%). This is explained in Table 2 below.

Additionally, the distribution of stressors experienced by senior high school students during the COVID-19 pandemic reported eight causes. The results demonstrated that most respondents experienced discomfort during online school or distance learning, as many as 83 respondents (79.8%), as detailed in Table 3 below.

Bivariate analysis to test the relationship between stress and RAS events was conducted using the Spearman Rank correlation test. The results of the statistical test unveiled a relationship between RAS events and stress levels, with a significant value ($p = 0.019 < 0.05$). The correlation coefficient yielded a value of 0.230, indicating that the relationship between RAS events and stress levels was positive, with a weak relationship strength, as seen in Table 4 below.

This study involved 104 respondents. The study was conducted on students of SMA N 6 Yogyakarta, who during the pandemic, their school activities were carried out online or remotely, making them more susceptible to stress. Quarantine activities, online learning, lack of social interaction, lack of social support, and the presence of COVID-19 stressors have more or less affected the psychological and mental conditions of students [7]. The results showcased that the age of 16 to 17 years had the highest results in age characteristics associated with stress levels. The age of 16 years was higher in experiencing mild-moderate stress, with 28 respondents (26.9%), and the age of 17 years was higher in experiencing severe stress, with 4 respondents (3.8%). In addition, the age of 13-18 years was the age range of early adolescence with the characteristic of wanting to find their identity.

Factors that cause high stress in adolescents are due to social demands, adapting to a new environment, and lack of preparation for change [8]. In this study, females experienced higher levels of severe stress than males, with as many as 7 respondents (6.7%). Research on the impact of the COVID-19 pandemic on psychology uncovered similar results that females are more likely to experience stress than males [9]. This is corroborated by other studies, demonstrating that females are more anxious than males due to concerns about contracting the COVID-19 virus [10]. Exposure to stressors causes the HPA (Hypothalamic Pituitary Adrenal) system in females to secrete more Adrenocorticotropic Hormone (ACTH) than males, thereby increasing the amount of cortisol [11].

During the COVID-19 pandemic, students' stress levels exhibited that students in the normal category were more likely to have gender and age characteristics. Research that has been conducted also revealed a higher normal category, with a percentage of 40% compared to mild (39%), moderate (17%), and severe (4%) [12]. On the other hand, distance learning does not cause significant stress to students; this is because, in essence, adolescents already understand technology and are easy to adapt [13].

Respondents in this study were aged between 14 and 17 years, where the majority were in the 16-year-old age category, with as many as 72 respondents (69.2%). The age most likely to experience RAS was 16 years old at 69.2%. Related to that, the teenage years are the transitional age from childhood to adulthood, causing hormonal, emotional, psychological, physical, and social changes, which occur sequentially. Other studies report that hormonal changes affect the occurrence of RAS due to decreased progesterone levels [14].

In this research, there were more female respondents, as many as 62 respondents (59.6%). Females were more likely to have RAS, with a prevalence of 59.6%, due to hormonal changes during menstruation in the luteal phase, which causes a decrease in progesterone and estrogen hormones. This aligns with research reporting results that RAS sufferers are more in females than males, i.e., 70% in females and 30% in males [6]. A decrease in estrogen hormone causes a decrease in the degree of epithelial creatinine, making it more susceptible to ulcers on the mucosa. Reduced progesterone hormone leads to a decrease in self-limiting factors, a decrease in polymorphonuclear-leukocytes (PMNs), and vascular permeability that undergoes vasodilation due to the influence of estrogen hormone. These changes make it easier for bacteria to enter and cause ulcers in the oral cavity [15]. In another study, it was also stated that in RAS sufferers, progesterone and testosterone hormones were abnormal [14].

The highest stressor in this study was discomfort during online school/distance learning (79.8%), followed by discomfort due to limited face-to-face social interaction (55.8%) and not being able to carry out hobbies as usual (48.1%) (Table 3). In this sense, students will experience stress amidst the change from traditional in-person instruction to remote online education; this can happen because students are aware that they must prepare internet quota and a good network to participate in learning activities [16]. With online learning, a student interacts less directly with the environment, causing stress in students [17]. Other studies have stated that RAS is precipitated by psychological stress [18].

Furthermore, the incidence of RAS in pupils of SMA N 6 Yogyakarta was significantly correlated with stress amid the COVID-19 pandemic, as evidenced by the findings of statistical tests. Previous studies have also explained that it can be predicted that if someone has an elevated stress level, the greater the chance of RAS occurring [19]. In line with other studies, it has been reported that the pathophysiology of RAS is influenced by stress and anxiety [20].

The findings of this study also revealed that out of 59 respondents with normal stress levels, 57 (54.8%) of them were positive for RAS. According to other studies, it is stated that respondents with normal stress levels may have other predisposing factors that cause stress, such as systemic diseases, genetics, trauma, allergies, and others [21]. Students who experienced mild-moderate stress were 38 students, with 31 (29.8%) students experiencing positive RAS. Out of 7 students experiencing severe distress, 6 (5.8%) students experienced positive RAS. Based on the results of the study, students with severe distress were the most likely to experience RAS compared to those who were negative for RAS.

Previous research elucidates that the presence of stress factors causes the fact that Arginine vasopressin (AVP) and Corticotropin-Releasing Factor (CRF) are released by the hypothalamus, which subsequently induces the anterior pituitary to release Adrenocorticotropin Hormone (ACTH). Following that, the adrenal cortex is stimulated by ACTH to secrete cortisol, which subsequently enhances Th-2 activity through IL-4. Basophils, mast cells, and plasma cells are stimulated by IL-4, which results in the production of IgE, resulting in an anaphylactic reaction in the tissue so that injury is easy to occur. This is what allows someone who experiences stress to experience RAS [22]. Stress can also cause someone to have a bad habit of biting the oral mucosa, which causes ulceration. Stress and RAS are mutually reinforcing; when someone experiences RAS, it will cause someone to have difficulty eating and pain. This can cause someone to experience stress [23].

The results of the study showed that 37 students (39.3%) experienced positive stress and positive RAS, 8 students (8.5%) experienced positive stress and negative RAS, and 57 students (54.8%) experienced normal stress and positive RAS. The research that has been conducted shows that the Spearman Rank correlation test shows a statistically significant relationship ($p = 0.019 < 0.05$) between stress experienced by students in the midst of the COVID-19 pandemic and the occurrence of RAS in them. Based on previous research, the stress domain that has the most influence on the occurrence of RAS is psychological stress [11].

The findings and analysis of this study confirm the hypothesis that there exists a correlation

between stress and the occurrence of RAS among SMA N 6 Yogyakarta students amid the COVID-19 pandemic.

Conclusion

Recurrent Aphthous Stomatitis (RAS) was found to be associated with stress among SMA N 6 Yogyakarta students amid the COVID-19 pandemic, according to a study that included 104 students as respondents. Besides, the most dominant cause of stress is due to discomfort during online school/distance learning in 83 respondents (79.8%).

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References

[1] M. Chavan, H. Jain, N. Diwan, S. Khedkar, A. Shete, and S. Durkar, "Recurrent aphthous stomatitis: a review," *J. Oral Pathol. Med.*, vol. 41, no. 8, pp. 577–583, Sep. 2012, doi: 10.1111/j.1600-0714.2012.01134.x.

[2] S. K. Saikaly, T. S. Saikaly, and L. E. Saikaly, "Recurrent aphthous ulceration: a review of potential causes and novel treatments," *J. Dermatolog. Treat.*, vol. 29, no. 6, pp. 542–552, Aug. 2018, doi: 10.1080/09546634.2017.1422079.

[3] R. Z. Cui, A. J. Bruce, and R. S. Rogers, "Recurrent aphthous stomatitis," *Clin. Dermatol.*, vol. 34, no. 4, pp. 475–481, Jul. 2016, doi: 10.1016/j.clindermatol.2016.02.020.

[4] R. K. Sari, D. S. Ernawati, and B. Soebadi, "RECURRENT APHTHOUS STOMATITIS RELATED TO PSYCHOLOGICAL STRESS, FOOD ALLERGY AND GERD," *ODONTO Dent. J.*, vol. 6, p. 45, Jul. 2019, doi: 10.30659/odj.6.0.45-51.

[5] W. Cao *et al.*, "The psychological impact of the COVID-19 epidemic on college students in China," *Psychiatry Res.*, vol. 287, p. 112934, May 2020, doi: 10.1016/j.psychres.2020.112934.

[6] A. Sulistiani, S. Hernawati, and A. M. P, "Prevalensi dan Distribusi Penderita Stomatitis Aftosa Rekuren (SAR) di Klinik Penyakit Mulut RSGM FKG Universitas Jember pada Tahun 2014," *Pustaka Kesehat.*, vol. 5, no. 1, pp. 169–176, 2017.

[7] T. Elmer, K. Mepham, and C. Stadtfeld, "Students under lockdown: Comparisons of students' social networks and mental health before and during the COVID-19 crisis in Switzerland," *PLoS One*, vol. 15, no. 7, p. e0236337, Jul. 2020, doi: 10.1371/journal.pone.0236337.

[8] I. Samsugito and A. N. Putri, "GambaranTingkat Stres Sebelum dan Sesudah Terapi Seft pada Remaja di SMAN 14 Samarinda," *J. Kesehat. Pasak Bumi JKPBK*, vol. 2, no. 2, 2019, doi: ttp://dx.doi.org/10.30872/j.kes.pasmi.kal.v2i2.3506.

[9] Z. Hakami *et al.*, "Psychological impact of the coronavirus disease 2019 (COVID-19) pandemic on dental students: A nationwide study," *J. Dent. Educ.*, vol. 85, no. 4, pp. 494–503, Apr. 2021, doi: 10.1002/jdd.12470.

[10] A. Agius *et al.*, "Self-reported dental student stressors and experiences during the COVID-19 pandemic," *J. Dent. Educ.*, vol. 85, no. 2, pp. 208–215, Feb. 2021, doi: 10.1002/jdd.12409.

[11] N. A. Hutajulu, "Hubungan Pengalaman Stres Selama Pandemi Covid-19 Dengan Kejadian Sar Pada Mahasiswa Fkg Usu Tahun 2020," 2020.

[12] H. S. Lingawi and I. K. Afifi, "COVID-19 Associated Stress Among Dental Students," *Open Dent. J.*, vol. 14, no. 1, pp. 554–562, Nov. 2020, doi: 10.2174/1874210602014010554.

[13] Y. R. S. Elizabeth, "Tingkat Stres Remaja dalam Menghadapi Pembelajaran Daring Akibat Pandemi Covid-19," 2021.

[14] F. Lavaee, Z. Ranjbar, M. Jalalian, and M. A. Amiri, "Comparison of the sex hormones' serum level in women with recurrent aphthous stomatitis and healthy population: a cross-sectional study," *BMC Oral Health*, vol. 21, no. 1, p. 551, Dec. 2021, doi: 10.1186/s12903-021-01812-9.

[15] S. Sumintarti and E. Marlina, "Hubungan antara level estradiol dan progesterone dengan stomatitis aftosa rekuren Relation between estradiol and progesterone hormone level with recurrent aphthous stomatitis," *J. Dentomaxillofacial Sci.*, vol. 11, no. 3, p. 137, Oct. 2012, doi: 10.15562/jdmfs.v11i3.327.

[16] M. D. Nurmala, T. U. S. H. Wibowo, and A. Rachmayani, "Tingkat Stres Mahasiswa

Dalam Pembelajaran Online Pada Masa Pandemi Covid-19," *J. Penelit. Bimbing. dan Konseling*, vol. 5, no. 12, 2020.
[17] D. L. K. Dewi and M. Muslikah, "HUBUNGAN COPING STRES DAN DUKUNGAN SOSIAL DENGAN STRES AKADEMIK PADA PEMBELAJARAN JARAK JAUH," *Counsenesia Indones. J. Guid. Couns.*, vol. 2, no. 02, pp. 121–129, Dec. 2021, doi: 10.36728/cijgc.v2i02.1534.
[18] A. Dhopte, G. Naidu, R. Singh-Makkad, R. Nagi, H. Bagde, and S. Jain, "Psychometric analysis of stress, anxiety and depression in patients with recurrent aphthous Stomatitis-A cross-sectional survey based study," *J. Clin. Exp. Dent.*, pp. 0–0, 2018, doi: 10.4317/jced.55012.
[19] S. Ziaudeen, "Assessment of Oxidant-Antioxidant Status and Stress Factor in Recurrent Aphthous Stomatitis Patients: Case Control Study," *J. Clin. DIAGNOSTIC Res.*, 2017, doi: 10.7860/JCDR/2017/22894.9348.
[20] L. Nadendla, V. Meduri, G. Paramkusam, and K. Pachava, "Relationship of salivary cortisol and anxiety in recurrent aphthous stomatitis," *Indian J. Endocrinol. Metab.*, vol. 19, no. 1, p. 56, 2015, doi: 10.4103/2230-8210.131768.
[21] S. O. Akintoye and M. S. Greenberg, "Recurrent Aphthous Stomatitis," *Dent. Clin. North Am.*, vol. 58, no. 2, pp. 281–297, Apr. 2014, doi: 10.1016/j.cden.2013.12.002.
[22] C. Tsigos, I. Kyrou, E. Kassi, and G. P. Chrousos, *Stress: Endocrine Physiology and Pathophysiology*. 2000. [Online]. Available: http://www.ncbi.nlm.nih.gov/pubmed/19488073
[23] M. Sharma, R. Gupta, and S. Singh, "Correlation of psychological stress with recurrent aphthous stomatitis among dental students in an educational institution," *Int. J. Appl. Dent. Sci.*, vol. 3, no. 4, pp. 455–458, 2017.