

Stress Experienced during the COVID-19 Pandemic; Its Relationship with the Incidence of Recurrent Aphthous Stomatitis (RAS)

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Abstract

The COVID-19 pandemic has affected the lives of people around the world since March 2020. These sudden changes have caused an increase in stress, anxiety, and depression, especially in students who are making adjustments in their academic world. Therefore, this research aims to determine the relationship between the level of stress experienced during the COVID-19 pandemic and the incidence of Recurrent Aphthous Stomatitis (RAS).

This research involves an analytic survey with a cross-sectional approach. The populations used were students who are actively learning at the Faculty of Dentistry, University of Sumatra Utara. Sample selection method is by purposive sampling method, where the sample size is determined based on specific characteristics. Inclusion criteria: students with ID numbers in 2017 and 2018 who are willing to sign an informed consent. Determination of a minimum sample size of 130 students. Measurement of research variables was conducted using CPDI questionnaire, and RASDX questionnaire. Data collection is performed online by using Google Forms while data analysis is performed by Chi-square test.

In the RASDX test, 27.7% of the students were RAS-positive, 72.3% RAS-negative. There were 32.3% of students who had normal stress levels, 57.7% of students had mild-moderate distress, and 10% of students had severe distress. The major stressors used in this research were; the fear of contracting the virus (36.9%). Chi-square analysis showed p of 0.004, it was concluded that there was a significant relationship between stress during the COVID-19 pandemic and the incidence of RAS in college students.

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Introduction

Recurrent Aphthous Stomatitis (RAS) is a common oral disease which is characterized by benign, non-infectious ulcerative lesions that continuously recur.¹ Its prevalence varies from 0.9% to 78% of the World Population with an average of 20%.^{2,3} The prevalence of RAS in Indonesia is 8.0%, while specifically in North Sumatera Province is 9.1%.⁴

RAS is not life-threatening neither is it contagious, but due to its interference with mastication, swallowing, and speech can lead to discomfort while performing these actions.⁵ Although RAS is a self-limiting disease which do

not require any treatment, the pain it causes can lead to a reduction in appetite, hence, nutritional intake is impaired, decreased nutritional intake can lead to dehydration and malnutrition which can weaken the immune system if not properly checked.⁶ RAS can also cause disrupt the oral hygiene maintenance procedures such as brushing of teeth and gargling because of the pain while performing them. Research showed an association between RAS and imbalances in the oral mucosal microbiome.⁷⁻⁹ Broadly speaking, RAS can lead to a decrease in the sufferer's quality of life, but this depends on the severity and recurrence of RAS.¹⁰

The etiology of RAS is unknown, however, psychological disorders such as stress and anxiety have been known to perform a major role in the emergence and recurrence of RAS. Research by Gallo et al. in Brazil showed the direct relationship between stress and the onset of RAS, this was also supported by research of Sharma et al. which shows that 55% of dentistry

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students experience stress-related RAS.^{11,12}

Coronavirus spread rapidly around the world, causing an infectious respiratory disease that became known as Coronavirus Disease 2019 (COVID-19). In March 2020, the World Health Organization identified the disease as a public health problem and raised the contamination status to the COVID-19 pandemic.¹³ The COVID-19 pandemic carries not only the risk of death from viral infection, but also psychological stress for people around the world.¹⁴ This is supported by the research of Cao et al. who reported high levels of anxiety, stress, and depression in university students in China during the COVID-19 pandemic.¹⁵ The increasing number of positive cases of COVID-19 increases the risk of exposure of dental students during dental procedures. This results in the emergence of psychological stress that leads to anxiety in dental students.¹⁶ The purpose of this study was to examine the relationship between stress during the COVID-19 pandemic and the incidence of RAS in dental students at the Universitas Sumatra Utara.

Materials and methods

This research is an analytical survey with a cross-sectional approach. The sample population of this research is students of the Faculty of Dentistry, Universitas Sumatera Utara. The sample selection method used is purposive sampling method which is part of non-random sampling where the researcher determines the sample by establishing specific characteristics that are in accordance with the research objectives. The specific characteristics included in the inclusion criteria are the 2017 and 2018 students who are still actively learning and willing to sign the informed consent, while the exclusion criteria are students who do not suffer from systemic disease, do not use orthodontic appliances or dentures. These was used in the determination of the sample size which is 130 respondents. The research was conducted in January 2021 the measurement of the stress variable during the COVID-19 pandemic was carried out using the *COVID-19 Peritraumatic Distress Index* (CPDI) questionnaire which was validated with a Cronbach coefficient of 0.95 ($p < 0.001$). This questionnaire focuses on the psychological distress of students in the past week and collectively measures the stress on a

scale of 0-100 with 24 questions.¹⁷ The incidence of RAS was measured using the RASDX questionnaire, which is a useful diagnostic tool for measuring the lifetime prevalence of the disease and in research where clinical observations of RAS lesions are made.¹⁸ This research was conducted with permission from the Research Ethics Committee, bearing registration number 844/KEP/USU/2020.

Results

Age	Frequency (n)	Percentage (%)
19	4	3.1%
20	35	26.9%
21	72	55.4%
22	16	12.3%
23	3	2.3%
Total	130	100%

Table 1. Frequency Distribution of the Subjects based on Age.

Gender	Frequency (n)	Percentage (%)
Male	21	16.2%
Female	109	83.8%
Total	130	100%

Table 2. Frequency Distribution of the Subjects by Gender.

Student ID numbers	Frequency (n)	Percentage (%)
2017	98	75.4%
2018	32	24.6%
Total	130	100%

Table 3. Frequency Distribution of the Subjects Based on Student ID Numbers.

Stress level	Frequency (n)	Percentage (%)
Normal	42	32.3%
Mild- moderate distress	75	57.7%
Severe distress	13	10.0%
Total	130	100%

Table 4. Stress Levels during the COVID-19 Pandemic among Students of the Faculty of Dentistry, Universitas Sumatera Utara.

Stressors	Frequency (n)	Percentage (%)
Worried about contracting the virus because of the ever-increasing number of spreads	48	36.9%
Discomfort due to limited social interaction (difficulty communicating face to face)	29	22.3%
Discomfort during online lectures/distance learning	33	25.4%
Worries about the financial condition	15	11.5%
Discomfort of not being able to carry out hobbies as usual	2	1.5%
Other things	3	2.3%
Total	130	100%

Table 5. Distribution of Stressors Experienced by Students during the COVID-19 Pandemic.

RAS	Frequency (n)	Percentage (%)
RAS Positive	36	27.7%
RAS Negative	94	72.3%
Total	130	100%

Table 6. RAS Incidence Rates in students of the Faculty of Dentistry, Universitas Sumatra Utara.

Stress Level	SAR incident				Total		p-value
	RAS Positive N (%)	RAS Negative n (%)	n (%)	(%)			
Normal	6	14.3	36	85.7	42	32.3	0.004
Mild-moderate distress	22	29.3	53	70.7	75	57.7	
Severe distress	8	61.5	5	38.5	13	10.0	
Total	36	27.7	94	72.3	130	100	

Table 7. Relationship between Stress during the COVID-19 Pandemic and RAS.



Figure 1. Recurrent Aphthous Stomatitis.

Discussion

The research was conducted on the students of dentistry because dentistry students were observed to be more susceptible to stress due to competition in the dental field which was tight, competitive, and had emotional, psychological, and physical demands on students.¹⁹ The results indicate that the respondents are in the age range of 19-23 years, with the majority of respondents aged 21 years (55.4%) (Table 1). The frequency distribution

based on student ID numbers shows that 98 respondents (75.4%) came from student ID numbers in 2017 and 32 respondents (24.6%) from student ID numbers in 2018 (Table 3). This research was conducted on student ID numbers in 2017 and 2018; based on the theory that RAS will increase with age during the second to third decades of life.¹⁰ Research by Patil et al. also stated that the peak appearance of RAS occurs most often in the second decade of life.²⁰

There are 16.2% male and 83.8% female respondents in this research (Table 2). There are more female respondents on average because dentistry courses are more dominated by women than men. This research reports that RAS is more common in women with a percentage of 91.67%, which is appropriate with the research by Smith et al. and Abdullah which stated that RAS is more common in women.^{21,22} The higher incidence of RAS in women is often associated with decreased levels of the hormones progesterone and estrogen in the luteal phase, which is considered to be the susceptibility factor. While there is a decrease in estrogen, the degree of epithelial keratinization tends to decrease, this can increase the chance of developing RAS. Meanwhile, progesterone hormone levels which are reduced by up to 80% during menstruation lead to reduced self-limiting factors, prostaglandin production, polymorphonuclear leukocytes, and vascular permeability, this change in permeability makes it easy for bacteria to invade the oral mucosa.^{1,23} Research has also reported that RAS is often influenced by the hormone estrogen, where the expression of estrogen receptor in the oral mucosa is associated with severity of minor RAS.^{24,25} This is also influenced by stress levels which tend to be higher in women than men.. Zaki et al. research shows that higher levels of stress are found in women, specifically on dental students during the pandemic, who showed statistically higher levels of stress, anxiety, and depression than men.²⁶ This is also supported by Agius et al. that women were significantly more anxious.²⁷ Research pointed out citing the higher sensitive nature of the female HPA (Hypothalamic Pituitary Adrenal) system which secretes more ACTH (Adrenocorticotrophic Hormone) when exposed to stressors and this increases cortisol production more in females than males.²⁸

In this research, there are 27.7% positive for RAS and 72.3% negative for RAS (Table 6),

which shows that more students do not suffer from RAS than those who suffer. Furthermore, Al-Johani's research at King Abdulaziz University showed the prevalence of RAS in dental students to be 21.7%.²⁹

Measurement of stress levels during the pandemic showed students who experienced mild to moderate distress (57.7%) to be more than those with normal stress levels (32.3%) and severe distress (10%) (Table 4). This is appropriate with research conducted by Lingawi et al. on the stress level of dental students in Saudi Arabia, it was reported that 39% of students experienced mild stress, 17% moderate stress, and 4% severe stress.³⁰

This research shows that the highest stressor is the fear of contracting the virus because the spread rate is continuously increasing (36.9%) followed by discomfort during online lectures/distance learning (25.4%), and difficulty communicating face-to-face (22.3%) (Table 5). This is supported by research conducted at the Faculty of Dentistry, University of Malta, the biggest stressor experienced by dental students there during the pandemic was fear of a family member being infected with the COVID-19 virus (77.2%), worries about disrupted lecture life during the pandemic (76.1%), as well as difficulty meeting friends and colleagues (64.8%).²⁷ These worries which became the major stressors is a natural phenomenon because during collecting data, positive cases of COVID-19 were increasing rapidly, this is evidenced by the cumulative data on January 22, 2021, reaching 13,632 cases in one day with an average 7-day case of 12,477.³¹ The ease of transmission and rapid spread of the virus have made it possible for students to be worried about contracting the virus. Gaballah's research states that people who are more worried about the transmission of the COVID-19 virus are thought to be more likely to have a poor mental condition.¹⁶

The second stressor with the largest percentage in this research is discomfort during online lectures/distance learning (25.4%) (Table 5). This was also reported by Al Ateeq et al. through research on stress in college students during the pandemic virtual classroom. They reported that 55% of students experienced moderate stress and 30.2% experienced severe stress.³² Distance learning due to the pandemic is a new learning experience for students. The

change being too fast and sudden confuses students. Moreover, the obstacles encountered by students during the online learning process causes stress, these obstacles include unsupportive signals, lack of internet quota, distractions when studying at home, feeling less focused on learning without direct interaction with lecturers and other students, many learning assignments, and the difficulty of materials delivery.³³

The cross-tabulation shows that there is a significant relationship between stress experienced during the pandemic and the incidence of RAS in the 2017 and 2018 Faculty of Dentistry, Universitas Sumatra Utara students. This is supported by research of Soto-Araya et al. which found a higher incidence of RAS in individuals experiencing psychological stress.³⁴ Furthermore, research by Ziaudeen and Rathy predicted that the higher the level of stress experienced by a person, the greater the chance of developing RAS.³⁵

Out of 42 respondents with normal stress levels, only 6 (14.3%) experienced RAS. This may be caused by other predisposing factors, such as genetic, local trauma, hormonal changes, and so on. Students who experienced mild-moderate distress and RAS are 22 (29.3%), which are an increase in the number of students who are positive for RAS along with the increase in stress levels. Meanwhile, in students with severe distress, there are 61.5% who experienced RAS. This shows that more students experience RAS than those who do not.

This research shows that stress factors can cause the hypothalamus to secrete CRF (*Corticotropin-Releasing Factor*) and AVP (*Arginine vasopressin*) which stimulates the anterior pituitary to secrete ACTH (*Adrenocorticotropin Hormone*), which then stimulates the adrenal cortex to secrete glucocorticoid hormones (cortisol). This cortisol hormone will increase T Helper type 2 (Th-2) activity through Interleukin 4 (IL-4) which will stimulate mast cells, basophils, and plasma cells to produce Immunoglobulin E (Ig E), causing anaphylactic reactions in the tissue which makes it susceptible to injuries and prone to RAS.³⁶ Research also suggests that stress can lead to habits that damage the oral mucosa, such as biting the inner cheek and lips, which eventually leads to ulceration in the oral cavity and can interfere with daily activities, such as eating,

hence, this can cause RAS.^{11,12}

This research shows a significant relationship between the stress experienced during the pandemic with the incidence of RAS in Faculty of Dentistry, Universitas Sumatera Utara students which is evidenced by the Chi-square analysis where the p-value (0.004) < 0.05. It is also supported by research of Gallo et al. which states that the stress domain that has the most influence on RAS is psychological stress with significant results $p < 0.05$.¹¹

Conclusions

This research concludes that there is a relationship between stress experienced during the pandemic and the incidence of RAS in Faculty of Dentistry, University Sumatra Utara students with a significant result $p < 0.005$, while some are positive for SAR and others are negative. Meanwhile, research on stress levels during the pandemic shows 3 groups of students including students with normal conditions, experiencing mild to moderate distress, and experiencing severe distress. Stressors (causes of stress) in students includes concerns about contracting the virus due to the ever-increasing number of cases, discomfort due to limited social interactions (difficulty communicating face to face), online lectures/distance learning, financial conditions, worries about their usual hobbies, and other things as stressors.

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Clinical implications: In this research, the trigger factor for the occurrence of *Recurrent Aphthous Stomatitis* is stress. It would take time to adapt to the stressful conditions experienced during the COVID-19 pandemic.

Declaration of interest

The author declares that there is no conflict of interest regarding the publication of this paper.

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