Stress is a problem that often occurs in humans. This is because stress has become a part of life that cannot be avoided. Stress can also affect anyone, children, adolescents, adults and the elderly. Stress can also occur in the school environment, work, family and also the environment around the house. In other words, stress can happen to anyone and anywhere.1,2

The incidence of stress is still high and varies widely in various groups in Indonesia. Riskesdas 2013 based on the prevalence of mental emotional disorders (psychological distress) in Indonesia in the population reached 11.6% or around 19 million of the total population nationally. The results of research by Kamso et al. stress in working groups was between 15% and 35% with an average of 25%. The incidence of stress in young executives reaches 25%.3

Stress is a stressful condition experienced by a person, the impact of the work environment and / or psychosocial environment that is detrimental to the. Strengthened by Nasir & Muhith, states that stress is an unpleasant condition for humans where humans see demands in a situation as burdens or beyond their ability to meet these demands.
Recurrent aphthous stomatitis often occurs due to trauma, hormonal changes, physical or psychological stress and chemical irritation.\textsuperscript{11,12}

Several studies have shown that there is an association between stress and recurrent aphthous stomatitis. According to Tangglidan, that professional education students of the Dental Education Study Program (PSPDG) of the Faculty of Medicine, Sam Ratulangi University, show that 59.7\% of students with SAR experiences have high levels of stress. According to Wowor et al. proved that there is a significant relationship between stress and recurrent aphthous stomatitis in PSPDG students. According to Junhar et al. there is a relationship between stress and recurrent aphthous stomatitis in prisoners.\textsuperscript{8,11,14}

**MATERIALS AND METHODS**

This research is an analytic observational study with a cross-sectional approach. The research was conducted at the Department of Dental Health, Jakarta Health Polytechnic I in March 2021. The sampling technique used a total sampling of 36 respondents, namely all third-level students who are working on their final scientific paper. The independent variable in this study was academic stress and the dependent variable was the incidence of recurrent aphthous stomatitis.

Academic stress data collection is measured by a checklist of questionnaire sheets, validity and reliability tests have been carried out by the same previous researcher who examined stress.\textsuperscript{15} The incidence of recurrent aphthous stomatitis was measured by observing it by examining the oral cavity directly. The stages of the activity include: students filling out the consent informed sheet first as an agreement that they are willing to be research respondents, then doing it before carrying out oral examinations on all respondents in turn and giving an academic stress questionnaire that is filled out via google form.

Data analysis was performed using the SPSS statistical program for univariate analysis and presented in the form of a frequency distribution. After that, bivariate analysis with chi-square was carried out to measure the relationship of academic stress to the incidence of recurrent aphthous stomatitis in students.

**RESULT**

**Table 1: Frequency distribution of respondent characteristics**

| No. | Variable | N   | Percentage (%) |
|-----|----------|-----|----------------|
| 1   | Age      |     |                |
|     | 20 years | 20  | 55.6           |
|     | 21 years | 9   | 36.1           |
|     | 22 years | 3   | 8.3            |
|     | Total    | 36  | 100            |
| 2   | Gender   |     |                |
|     | Male     | 2   | 5.6            |
|     | Female   | 34  | 94.4           |
|     | Total    | 36  | 100            |

Table 1 shows that most respondents in the study were from the age of 20 years (55.6\%) with female gender, namely 34 respondents (94.4\%).

**Table 2: Frequency distribution level of academic stress**

| No. | Level of academic stress | N   | Percentage (%) |
|-----|--------------------------|-----|----------------|
| 1   | Low                      | 17  | 47.2           |
| 2   | High                     | 19  | 52.8           |
|     | Total                    | 36  | 100            |

Table 2 shows that respondents with a low level of academic stress were 17 respondents (47.2\%) and as many as 19 respondents (52.8\%) with a high level of stress.

**Table 3: Frequency distribution recurrent incidence of stomatitis aphthous**

| No. | Recurrent stomatitis aptosa | N   | Percentage (%) |
|-----|-----------------------------|-----|----------------|
| 1   | Not                         | 13  | 36.1           |
| 2   | Yes                         | 23  | 63.9           |
|     | Total                       | 36  | 100            |

Table 3 shows that 23 respondents (63.9\%) experienced recurrent aphthous stomatitis and 13 respondents (36.1\%) did not experience recurrent aphthous stomatitis.

**Table 4: Results of the chi-square analysis of academic stress on recurrent incidence of stomatitis aphthous**

| Level of academic stress | Recurrent aphthous stomatitis | Total | OR (95% CI) | p-value |
|--------------------------|--------------------------------|-------|-------------|---------|
|                          | Not | Yes | N   | % | N   | % | (95% CI) |         |
| Low                      | 9   | 52.9 | 8   | 47.1 | 17  | 100 | 4.219 (0.982-18.11) | 0.047   |
| High                     | 4   | 21.1 | 15  | 78.9 | 19  | 100 |               |         |
| Total                    | 13  | 36.1 | 23  | 63.9 | 36  | 100 |               |         |

Table 4 the results of the chi-square analysis of academic stress on the incidence of recurrent aphthous stomatitis shows that the p-value is 0.047 (p <0.05), which means that there is a significant relationship between academic stress and the incidence of recurrent aphthous stomatitis.
**DISCUSSION**

Stress is a condition caused by a mismatch between something that is desired or expected with the expectations generated by the environment and the individual's own ability to fulfill his/her wishes which is considered to have the potential to harm, threaten and disturb the calm that the person cannot control. Symptoms or signs that someone experiences when they experience stress include: symptoms of stress related to physical stress symptoms related to emotional or mental symptoms of stress related to work. Even people experiencing stress will tend to show decreased concentration ability, deteriorating health, depression and sleep disorders and cause oral health problems, one of which is recurrent aphthous stomatitis.\(^{1,9}\)

The results showed that academic stress on the incidence of recurrent aphthous stomatitis showed that the p-value was 0.047 (p <0.05), meaning that there was a significant relationship between academic stress and the incidence of recurrent aphthous stomatitis. The results also showed the OR value of 4.219, meaning that people experiencing stress have a 4-5 times chance of recurrent aphthous stomatitis compared to people who do not experience stress. This is in line with previous research by Tangkilisan which shows that 59.7% of students with SAR experience have high levels of stress. Research by Wowor et al. proved that there was a significant relationship between stress and recurrent aphthous stomatitis in PSPDG students. Research by Junhar et al. shows that there is a relationship between stress and recurrent aphthous stomatitis in prisoners.\(^{8,13,14}\)

Stress is one of the predisposing factors for recurrent aphthous stomatitis. The response to stress causes suppression of IgA, IgG, and neutrophil functions. The decrease of IgA function in stress will facilitate the attachment of microorganisms to the mucosa so that microorganisms can easily invade the tissue and cause infection. Decreased IgG function facilitates pathological conditions because the decreased function of phagocytosis, toxins and viruses cannot be neutralized. The decrease in neutrophils will cause the phagocytosis function to decrease, resulting in a decrease in killing microorganisms. If that happens, the microorganisms that can cause SAR can develop rapidly.\(^{16,17}\)

The stress response causes the hypothalamus to release CRH and then release ACTH, ACTH stimulates the adrenal cortex to produce cortisol. Glucocorticoids including cortisol suppress immune functions such as IgA function. The function of IgA is to bind viruses and bacteria to prevent these microorganisms from adhering to the mucosal surface. IgA activates complement via an alternative pathway so that microorganisms are easily phagocytosed. The decrease in the function of IgA in stress will facilitate the attachment of microorganisms to the mucosa so that microorganisms are easy to invade the mucosa, microorganisms are also difficult in phagocytes causing easy infection.\(^{18,19}\)

IgG is the main immunoglobulin formed on the stimulation of antigens. IgG diffuses easily into the extravascular tissue and performs antibody activity in the tissue. IgG coats microorganisms so that the particles are more easily phagocytosed, besides that IgG is also able to neutralize toxins and viruses. IgG can attach to Fc receptors on the surface of target cells and allow the ADCC process to occur. The decrease in IgG function in stress will facilitate the occurrence of pathological conditions, because the decrease in phagocytosis, toxins and viruses cannot be neutralized. Neutrophils react quickly to stimuli, can move to the area of inflammation because they are stimulated by chemotactic factors, including released by complement and activated lymphocytes. Like macrophages, the main function of neutrophils is to provide a non-specific immune response by carrying out phagocytosis and killing and getting rid of microorganisms. This function is supported and enhanced by complement or antibody. Neutrophils also have granules that contain destructive enzymes and various proteins that damage microorganisms under stress conditions, the function of Neutrophils has decreased, decreased phagocytosis, decreased in killing microorganisms.\(^{20–22}\)

The response to stress releases glucocorticoids including cortisol, glucocorticoids including cortisol effects on the immune system, namely immunosuppression and anti-inflammatory effects. This effect involves more cellular immune response, anti-inflammatory effect, which is to suppress the accumulation of leukocyte cells in the inflamed area. Cortisol suppresses SigA, IgG and neutrophil cells, making infection easy. The large number of IL-1 mediators and metalloproteinase matrices causes RAS disease, so RAS is not only due to microorganisms, stress factors can also cause RAS.\(^{16,21}\)

**CONCLUSION**

Based on the results of the study, it can be concluded that there is a significant relationship between academic stress and the incidence of recurrent aphthous stomatitis in grade 3 students who are working on final scientific papers.

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**CONFLICT OF INTEREST**

The authors declare that they have no conflict interests.

**ETHICAL CLEARANCE**

All participants were signed the informed consent prior to the data collection.

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