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The Relationship of Academic Stress Levels During Pandemic with Premenstrual Syndrome in Third Grade Senior High School Student

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Abstract

Aims: to determine the correlation between academic stress level with premenstrual syndrome in female adolescent.

Study design: the employed research method was quantitative observational analysis using a cross-sectional design.

Place and Duration of Study: this research was conducted at Senior High School 2 Purworejo, Indonesia, from April to June 2022.

Methodology: this research method utilized quantitative observational analysis with a cross-sectional design. Statistical analysis was performed using the Spearman test with a significance level of $p\text{-value} < 0.05$. A total of 99 students participated in the study.

Results: the result showed that there was a relationship between academic stress levels and premenstrual syndrome ($p\text{-value} < 0.05$) with strong correlation ($r = 0.634$).

Conclusion: there is a clear relationship between academic stress levels with premenstrual syndrome.

Keywords: Pandemic COVID-19; ESSA; SPAF; female student.

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Introduction

Stress can be interpreted as a person's physiological and psychological reaction to threat and need resolution to solve the problem. The stress is a form of cognitive, action, and biological response that can affect a person's health if not immediately treated [1]. The stress caused by problems or challenges with unknown solution and can lead to depression if a person is unable to manage his thoughts [2]. This indicates that stress is a significant issue for individuals.

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Previous research indicated that in 2023, it was found that 2% of the total population with mental disorders in Indonesia fell within the age range of 15 to 24 years [3]. A survey on mental health among teenagers 2022 in Indonesia found that 5.5% of teenagers aged 10-17 years experienced mental disorders. The survey also reported that the national prevalence of depression in Indonesia is 1.4%, categorized by age group characteristics; the highest prevalence of depression is in the 15-24 years group, at 2%. In terms of gender prevalence, the female group had the highest prevalence of depression compared to the male group that was 2.8% compared to 1.1%. Even though the incidence of depression in teenagers in Indonesia is still high, it is known that only 10.4% of young people with depression are recorded as having received treatment either by consulting medical personnel or consulting with teachers [4].

In another research from Riskesdas 2018, it was showed that Purworejo Regency ranks was 27th out of 35 regencies in Central Java for cases of mental emotional disorders, while for its own handling ranks is 11th out of 35 regencies in Central Java [5]. This indicates that the management of emotional mental disorders in Purworejo Regency was suboptimal.

Emotional mental disorders such as stress in adolescents can be caused by various reasons, one of which is the learning school system. The Corona Virus (COVID-19) pandemic has had a major impact including the changes of the learning system by limiting attendance, activities, and interactions between students in the learning implementation. The pandemic, which has been on-going since December 2019, has resulted in various issues, one of which is the mental health of adolescents [6]. Apart of that, academic stress can occur if there are academic demands that are greater than the individual's adaptive abilities, and there is no social support from the environment [7].

Studies conducted in China that investigated the impact of adolescent mental health (18-24 years) during the COVID-19 pandemic, found that the stress rate for adolescents was higher than the national standard, that is 40.33 compared to 29.78 as measured by the Self-Rating Anxiety Scale (SAS) [8]. A study conducted in Indonesia at a high school revealed that 49% of students experienced moderate stress, while 10% faced severe stress as a result of distance learning [9]. Moderate to severe academic stress levels were dominated by students aged 17 years with a prevalence of 67.6% and included in twelfth class children, triggers of stress generally caused by the obligation to take the series of graduation exams and preparation for entering college [10].

The Covid-19 pandemic has significantly affected education. A study conducted in China by the China Care for the Next Generation Working Committee in 2020 found that during the pandemic, over 70% of adolescent students experienced severe academic stress. Some of these students chose to avoid participating in learning during quarantine, viewing it as a burden, and decided to discontinue their schooling [11].

Stress experienced by adolescent girls can lead to neuroendocrine abnormalities and can caused secretion of prostaglandin hormones and trigger Premenstrual Syndrome (PMS). The total incidence of premenstrual syndrome worldwide is estimated at around 47.8% [12]. The incidence of PMS in female adolescents at the high school level is one of the problems of midwifery, especially adolescent reproductive health.

Based on previous research, the Covid-19 pandemic had a significant impact on the reproductive health, including the menstrual cycle and premenstrual syndrome which can be triggered by stress. Stress due to the Covid-19 pandemic can disrupt the performance of glucocorticoid hormones and disrupt menstruation, including worsening symptoms of premenstrual syndrome [13]. Apart from that, premenstrual syndrome can also occur due to the effects of progesterone on neuromodulators such as serotonin, opioids, catecholamines, Gamma Aminobutyric Acid, and increased sensitivity to insulin resistance [14].

More than 100 physical and psychological symptoms have been documented for PMS; the most popular of these symptoms include headaches, mood swings, bloating, depression, irritability, abdominal cramps, common pains, breast swelling, and anorexia [15]. Premenstrual syndrome is a significant issue in reproductive health, as previous research has indicated that 20% of teenagers experience premenstrual syndrome with moderate to severe intensity, which can disrupt daily activities [16].

Case Presentation

Research Problem

The menstrual cycle can manifest various symptoms and levels of disturbances, one of which is premenstrual syndrome. Previous research indicates that stress experienced by adolescent girls can trigger premenstrual syndrome. If premenstrual syndrome is not adequately treated and accompanied by proper education, it can lead to more severe symptoms in the form of Premenstrual Dysphoric Disorder (PMDD), characterised by heightened physical and emotional symptoms [12], [15]. Apart from that, premenstrual syndrome can also disrupt daily activities and reduce student productivity in studying.

Research Focus

The stress is an emotional problem that is often experienced by children, especially when studying at school. Severe stress experienced by teenage girls can be caused by neuroendocrine abnormalities in the form of excessive secretion of prostaglandin hormones, thus triggering Premenstrual Syndrome (PMS) [17][18]. The research was conducted by measuring the level of stress experienced by respondents which had an impact on the severity of the premenstrual syndrome they experienced

Research Aim and Research Questions

This research aimed to examine the relationship between academic stress levels during the pandemic and premenstrual syndrome in female adolescents. The hypothesis of this study proposes that there is a correlation between academic stress levels during the pandemic and premenstrual syndrome.

Research Methodology

General Background

This research method employed a quantitative observational analytical approach utilising a cross-sectional design. This research was conducted from April to June 2022 and located in Senior High School 2 Purworejo, Central Java, Indonesia. The data collected were primary data obtained through the use of the Educational Stress Scale for Adolescents (ESSA) and the Shortened Premenstrual Assessment Form (SPAF) questionnaire instruments. Respondents completed the questionnaires consecutively for seven days prior to the onset of their menstrual cycle.

Sample / Participants / Group

The inclusion criteria for this study included female students in the 12th grade science class who agreed to participate in the research, had a regular menstrual cycle, and did not have reproductive disorders such as dysmenorrhea or amenorrhea. The exclusion criteria comprised female students who refused to be research subjects and those who did not exhibit PMS symptoms approximately seven days prior to menstruation. The population for this study consisted of 120 female students in the 12th grade science class at SHS 2 Purworejo. The minimum sample size, calculated using the Slovin formula, indicated that at least 93 respondents were needed. Considering a dropout rate of 10%, the researchers distributed questionnaires to 110 female 12th-grade science students, ultimately resulting in 99 respondents who were analysed in this research. The sample for this study was randomised using the probability sampling method with cluster random sampling.

Instrument and Procedures

The independent variable in this study was the level of academic stress and the dependent variable in this study was the premenstrual syndrome. The external variables analysed were the body mass index, sleep patterns, physical activity and caffeine intake. The instruments used during the research were informed consent, biodata form, a screening form, and questionnaire. Stress academic variable measured by Educational Stress Scale for Adolescents (ESSA) developed by Sun et al in 2011 [19] and translated by Sihotang, Adi Ignatius in 2021 [20]. Premenstrual syndrome measured by Shortened Premenstrual Assessment Form (SPAF) developed by Allen et al [21] and translated by PINLABS FIB UNAIR Surabaya [22]. During the research, the researchers adhered to ethical principles and prioritised the rights and freedoms of the participants by distributing informed consent forms, ensuring anonymity, maintaining confidentiality, and upholding fairness. Before doing the research, respondents had received an explanation about the research and filled out an informed consent form respondent. Respondents were asked to fill out a questionnaire for 7 days before the start of their menstrual cycle. During the research, all respondents received online consultation facilities regarding PMS conditions experienced for 24 hours by chat *WhatsApp*. As a reward, respondents who return the complete questionnaire will receive educational posters as a prize. This research was ethically tested by the Health Research Ethics Committee Faculty of Medicine; Universitas Sebelas Maret Surakarta with the number of certificate is No.69/UN27.06.11/KEP/EC/202.

Data Analysis

The data analysis in this study used univariate analysis in order to determine the frequency distribution of each variable, and bivariate analysis to determine the relationship between academic stress and premenstrual syndrome. Statistical analysis of the data used the Spearman test with a significance level ($p\text{-value} \leq 0.05$). Data analysis was performed using Statistical Package for Social Science (SPSS) software version 25.

Univariate Analysis

Table 1. Frequency distribution of characteristics respondent.

Variable	Frequency (f)	Percentage (%)
Body Mass Index (BMI)		
Underweight (<18.5)	39	39.4
Ideal (18.5-24.99)	53	53.5
Overweight (≥25)	7	7.1
Sleep Pattern		
Haggard (<7hour/day)	72	72.7
Enough sleep (7-8 hour/day)	27	27.3
Physical Activity		
Yes (2-3x/week)	12	12.1
Sometimes (1x/week)	69	69.7
No	18	18.2
Caffeine consumption		
Yes (everyday)	16	16.2
Sometimes (2-3x/week)	46	46.5
No (max 1x/week)	37	37.3
Academic Stress Scale		
Mild	0	0
Moderate	81	81.8
Severe	18	18.2
Premenstrual syndrome		
Mild	72	0
Moderate	27	81.8
Severe	0	18.2

Based on the research data tabulation, it can be seen that the average BMI of respondents is 19.93 kg/m² (ideal) with the lowest BMI of 14.53 kg/m² and the highest BMI of 33.29 kg/m². The majority of respondents have an ideal BMI, poor sleep patterns, and physical activity with intensity once a week, and consume caffeine 2-3 times a week. It can be seen that the respondents do not have good lifestyle.

In this study, academic stress was assessed using the ESSA questionnaire. As shown in Table 1, the majority of respondents reported experiencing moderate academic stress (81.8%). The highest total score in the ESSA questionnaire was for the statement, "students feel sad when they cannot achieve their expectations," while the lowest score was related to the statement, "my parents force me to study optimally." Analysing the tabulated responses revealed that most stressors stemmed from discrepancies between personal expectations and reality.

The level of premenstrual syndrome in this study was measured by the SPAF questionnaire. Based on the research data, it can be seen that the majority of female students have low levels of premenstrual syndrome. Based on the respondent's answers, it can be seen that the most common symptom experienced during premenstrual syndrome by respondents is irritability or temper, while the least common symptom is swelling of the legs. Based on these answers, it can be seen that the majority of symptoms experienced by respondents during premenstrual syndrome were emotional symptoms.

Bivariate Analysis

Table 2. Correlation between variable

Academic stress scale	Premenstrual Syndrome						Total		p-value	r
	Mild		Moderate		Severe		N	%		
	N	%	N	%	N	%	N	%		
Mild	0	0	0	0	0	0	0	0		
Moderate	69	85.2	12	14.8	0	0	81	100	0.000 ^a	0.634 ^b
Severe	2	11.1	16	88.9	0	0	18	100		
Total	71	71.7	28	28.3	0	0	99	100		

^ap-value ≤ 0.05

= significant

^b(r) 0.60-0.799

= strong correlation

Based on the bivariate analysis, it showed that the majority of respondents experienced moderate levels of academic stress with mild premenstrual syndrome, totalling 69 female students (85.2%). Meanwhile, those who experienced moderate academic stress with moderate premenstrual syndrome totalled 12 female students (14.8%). Among respondents with high levels of academic stress, 2 female students (11.1%) experienced mild premenstrual syndrome, and 16 female students (88.9%) experienced moderate premenstrual syndrome. This indicates that there is an effect of the severity of PMS on the level of academic stress experienced by the respondents.

Table 2 shows that the relationship between academic stress level variables and premenstrual syndrome after being analysed obtains a probability value (p-value = 0.000) and a correlation coefficient value (r = 0.634). The probability value showed that was a relationship between the academic stress variable and the premenstrual

syndrome variable in respondents. The correlation strength was found to be 0.634, indicating a strong correlation between the two research variables. The positive correlation coefficient (r) suggests that the level of academic stress is directly proportional to the incidence of premenstrual syndrome.

Discussion

During the research, questionnaires were distributed to 110 female students who met the inclusion and exclusion criteria; however, only 99 respondents participated in the study until completion. Eleven respondents did not fully complete the questionnaire, rendering them ineligible for inclusion in the data analysis. In this study, the majority of female students experienced moderate levels of academic stress and the majority experienced mild premenstrual syndrome. Based on the cross-tabulation analysis between the level of academic stress and premenstrual syndrome, it can be observed that a higher level of academic stress is associated with an increased level of premenstrual syndrome. This is consistent with previous research which stated that there was a relationship between stress levels and premenstrual syndrome in Islamic Vocational School students in Malang Regency (p -value = 0.0001, r = 0.681)[17]. In addition, previous research also stated that there was a relationship between stress levels and premenstrual syndrome with a moderate level of correlation in SHS 2 Tilatang Kamang students [2].

The stress experienced by a woman can cause stimulation of the pituitary gland and produce Adrenocorticotrophic Hormone (ACTH) whose function will increase cortisol and adrenaline levels in the body. Increased cortisol will affect increase in estrogenic and prostaglandins in the body, it can makes an imbalance of ovarian hormones in women which causes symptoms of premenstrual syndrome such as increased heart rate, feeling tired easily, easily experiencing headaches, stomach cramps, and pain and tension in the breasts [23]. When the body gets a stressor, the body will also get a decrease in serotonin hormone which causes premenstrual syndrome symptoms such as easily feeling excessive anxiety, mood swings, and often feeling afraid to face the reality [24]. If someone can't manage stress, the body's metabolism will change and have an impact on health, therefore it is important to be able to identify the causes of stress in each individual and not worse with the psychological condition [1].

Based on the research data, it can be seen that the most common cause of academic stress experienced by respondents based on the ESSA questionnaire is the factor of female students who feel sad if they cannot achieve their expectations. If this cannot be controlled by the body, it can affect a person's psychological health. Several previous studies have indicated that various factors, including stress, anxiety, and depression, can exacerbate premenstrual syndrome. Psychological disorders, particularly academic stress, can worsen premenstrual syndrome in women [24].

The incidence of premenstrual syndrome in women is also influenced and worsened by other external factors such as body mass index (BMI), sleep patterns, physical activity, and caffeine consumption [24]. In this study, the majority of respondents had an ideal BMI of 53.9% (53 female students), the majority had poor sleep patterns with a prevalence of 72.7% (73 female students), the majority did physical activity with an intensity of once a week by 69.7% (69 female students), and the majority consumed caffeine 2-3 times a week with a prevalence of 46.5% (46 female students).

Sleep patterns are the factors analysed in this study. Based on the theory, the category of sufficient sleep is with a duration of 7-8 hours per day [25]. The majority of respondents' sleep quality based on data analysis experienced poor sleep quality (72.7%). Previous research has concluded that efficiency, duration, and quality of sleep can influence the occurrence of premenstrual syndrome [26]. The quality of a person's sleep can affect the body's hormone production, if the quality of sleep is good then the body can restore energy and the body will relax because protein synthesis in the body are going well [25]. A person with poor or bad sleep patterns will tend to experience premenstrual syndrome, because the body will be decreased response to the hormone melatonin during the luteal phase, this can cause emotional changes during the luteal phase of menstruation [26]. Therefore, if women get better quality of sleep, it will decrease potential for premenstrual syndrome in women.

This study also analysed other factors that cause premenstrual syndrome that is physical activity. The ideal frequency of physical activity per week in 2-3 times, if it is less than the ideal frequency it will reduce one's physical fitness [27]. Based on the analysis of the respondent's data, it can be seen that the majority of female students still do physical activity once a week (69.7%). Someone who regularly does physical activity will produce more endorphins, increase oxygen levels in the blood and muscles, improve blood circulation, reduce cortisol, and be able to improve psychological conditions [28], [29]. Apart from that, doing physical activity can also increase serotonin levels in the body that has function to affect a woman's emotions [24]. Therefore, women who regularly carry out physical activities will have a lower risk of experiencing PMS.

Another factor analysed in this study was the consumption of caffeine in the form of tea or coffee. Tea contains tannin compounds and coffee contains caffeine compounds, both of which trigger disruption of hormone production in the body if consumed in excess of more than 250 mg per day [24]. The International Food Information Council Foundation (IFICF) states that 250 mg of caffeine is equivalent to consumption tea/coffee as much as 600 ml (2.5 glasses of star fruit) per day, the tannin content in one glass of tea is ± 50 mg and the caffeine content in a glass

of coffee is ± 150 mg [30]. Based on the analysis of respondent data it can be seen that the majority of female students still consume caffeine with intensity 2-3 times a week. Caffeine consumption that exceeds from the body's tolerance limit can interfere with the performance of the hypothalamus in the brain, where the hypothalamus is a regulator of hormone production in the body, it can makes hormonal imbalances in the body and exacerbate symptoms of premenstrual syndrome [24]. High caffeine consumption can cause hypoestrogenism and hyperexcretion of progesterone, resulting in disruption of the luteal phase of the menstrual cycle, this condition can affect the occurrence of PMS [31]. It can be concluded that a woman's daily caffeine consumption habits are likely to increase her chances of experiencing premenstrual syndrome.

The body mass index is a factor analysed in this study. The analysis of this study showed that the majority of respondents had an ideal BMI. The body mass index can affect the severity of PMS symptoms because it will reduce estradiol secretion in women with adiposity, compared to women with ideal body weight [32]. Based on the theory, women who have a body mass index above ideal (overweight) will be more likely to experience PMS because they have excess fat reserves under the skin. Excess fat in the body can stimulate the body to produce more estrogen and cause hyper estrogen, and can make an imbalance of ovarian hormones in the body and can exacerbate premenstrual syndrome [33].

Another theory also states that the body mass index in less (underweight), indicates a person with lack of nutrition which can cause the body to experience metabolic disorders. Nutrition in less or limited quantities will affect the performance of the body's organs so that a person's physique will feel tired easily and allow for reproductive function disorders in the form of abdominal pain during the menstrual cycle. Fulfilment of balanced nutrition during the menstrual phase is very necessary, especially during the luteal phase, during which phase the reproductive organs must maintain the corpus luteum and require more nutritional intake [34]. Malnutrition related to a decrease in gonadotropin hormones to secrete Luteinizing Hormone (LH) and Follicle Stimulating Hormone (FSH). In this condition, estrogen will decrease, which will have an impact on menstruation. A decrease in LH resulting from low nutritional status can lead to a shortened luteal phase. Malnutrition is a significant factor associated with disruptions in the hypothalamus, pituitary gland, and ovaries [35]. Based on this theory it can be seen that BMI is less, ideal, or excess still has the potential to experience premenstrual syndrome.

Apart from being influenced by nutritional factors, premenstrual syndrome experienced by women is a consequence caused by a person's inability to manage stress, so that the body experiences hypersensitivity to changes in sex hormone levels. Based on this research, adolescent girls should strive to minimize academic stress, maintain healthy sleep patterns, engage in regular physical activity, pay attention to their dietary intake, and achieve and sustain an ideal body weight. By adopting a healthy lifestyle, they can reduce PMS symptoms each month and help prevent PMDD.

Conclusions and Implications

According to the research data, it is evident that the majority of respondents have not adopted a healthy lifestyle, most reported moderate levels of academic stress, and the majority experienced low levels of premenstrual syndrome. There is a significant relationship between academic stress levels and premenstrual syndrome among female students in the twelfth-grade science class at SHS 2 Purworejo, with a strong identified correlation.

Based on the results of this study, some suggestions can be given to female students: First, for school institutions to be able to create pleasant learning conditions for female students to reduce stress. Second, for female students it is recommended to implement a healthy lifestyle and always think positively. Third, health workers should utilize various media to provide counselling on adolescent reproductive health.

Limitation

This study has several limitations. Firstly, it focuses on data from a specific time frame due to the use of a cross-sectional method. Secondly, the research only analysed one menstrual cycle for each respondent, whereas the influence between variables may require examination over a longer duration. Lastly, there is potential for bias in how respondents completed the questionnaire, as it was not directly supervised by the researcher.

Suggestions for Future Research

Based on the limitations of this study, the researcher provides several suggestions for further research: First, it is expected that future researchers can conduct research with a longer duration by considering the number of longer menstrual cycle durations to measure the strength of the correlation between variables. Second, further researchers can consider and analyse various external variables that may affect the correlation results to reduce bias in the study. Third, further researchers can closely monitor respondents during the questionnaire filling to reduce bias in the study, for example by taking research samples from female students who live in dormitories. Fourth, future researchers should consider selecting the most appropriate timing for their studies to more accurately assess

academic stress, such as during exam periods, daily tests, or when preparing for the next level of educational selection. Fifth, subsequent researchers could conduct a deeper examination of the respondents' characteristics to better understand the correlation between the variables in the study.

Declarations

Author Contributions

Conceptualisation, Dewi Ayuningrum Puji Lestari, Noviyati Rahardjo Putri, and Niken Bayu Argaheni; methodology, Dewi Ayuningrum Puji Lestari, Noviyati Rahardjo Putri, and Niken Bayu Argaheni; software, Dewi Ayuningrum Puji Lestari; validation, Revi Gama Hatta Novika, Atriany Nilam Sari, Noviyati Rahardjo Putri, and Niken Bayu Argaheni; formal analysis, Dewi Ayuningrum Puji Lestari, Noviyati Rahardjo Putri, and Niken Bayu Argaheni; investigation, Dewi Ayuningrum Puji Lestari; resources, Dewi Ayuningrum Puji Lestari, Noviyati Rahardjo Putri, and Niken Bayu Argaheni; data curation, Dewi Ayuningrum Puji Lestari.; writing—original draft preparation, Dewi Ayuningrum Puji Lestari.; writing—review and editing, Dewi Ayuningrum Puji Lestari, Noviyati Rahardjo Putri, Niken Bayu Argaheni, Revi Gama Hatta Novika, and Atriany Nilam Sari; visualization, Dewi Ayuningrum Puji Lestari, Noviyati Rahardjo Putri, and Niken Bayu Argaheni; supervision, Noviyati Rahardjo Putri, and Niken Bayu Argaheni; project administration, Dewi Ayuningrum Puji Lestari; funding acquisition, Dewi ayuningrum Puji Lestari. All authors have read and agreed to the published version of the manuscript.

Data Availability Statement

Data sharing not applicable

No new data were created or analysed in this study. Data sharing is not applicable to this article.

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Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki and approved by Health Research Ethics Committee Medical Faculty Sebelas Maret University with certificate No.69/UN27.06.11/KEP/EC/202 and approved on June 2nd, 2022, for studies involving human.

Informed Consent Statement

Informed consent was obtained from all respondents in the research.

Conflicts of Interest

The author declares that there is no conflict of interests regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and falsification, double publication and submission, and redundancies have been completely observed by the authors.

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