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THE CORRELATION BETWEEN STRESS LEVEL AND SITTING DURATION WITH COMPLAINTS OF LOWER BACK PAIN

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ABSTRACT

Background: Low Back Pain (LBP) is the most complained of musculoskeletal problem in the **world**. Medical students are at high risk of experiencing LBP due to several factors such as high stress levels, study hours, and lack of physical activity. Another factor causing LBP is sitting for too long. Medical students usually spend >7 hours studying per day. Poor stress levels and long periods of sitting can cause complaints of low back pain in students. **Aim:** To determine the relationship between stress levels and long periods of sitting with complaints of low back pain in general medical students at Diponegoro University. **Methods:** This research was a cross-sectional study. Stress levels were measured using the Depression Anxiety Stress Scales 42 (DASS 42) and low back pain was measured using the Modified Oswestry Low Back Pain Disability Questionnaire. Spearman's rank correlation was applied for bivariate analysis, with significance set at $p < 0.05$. Statistical analyses were conducted using IBM SPSS Statistics. **Results:** The Spearman correlation test showed significant results ($p < 0.001$) with a moderate degree ($r = 0.471$) between stress levels and complaints of low back pain. The Spearman correlation test showed significant results ($p = 0.027$) with a weak degree ($r = 0.259$) between sitting time and complaints of LBP. **Conclusion:** There is a correlation between stress levels and long periods of sitting with complaints of lower back pain in Medical students at Diponegoro University.

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BACKGROUND

Low Back Pain (LBP) is the most commonly reported musculoskeletal problem worldwide.¹ In 2010, according to the Global Burden of Disease Study, lower back pain ranked among the top ten causes of Disability-Adjusted Life Years (DALYs) in both developed and developing countries.² The prevalence of lower back pain, based on the World Health Organization (WHO), is 2-5% per year in industrialized countries and 64-72% per year in developing countries.³ In Indonesia, the prevalence of lower back pain is estimated to be between 7.6% and 37%.² In Central Java, around 40% of the elderly population is estimated to have experienced lower back pain and sought treatment in hospitals.

Based on previous research, medical students are at high risk of experiencing lower back pain

(NPB) due to factors such as high-stress levels, study hours, and lack of physical activity.⁵ Other studies indicate that psychological factors due to work-related stress in heavy equipment operators also contribute to NPB complaints. It was found that 68.9% of operators experienced high-stress levels, while 31.1% experienced moderate stress levels.⁶ Stress can increase the risk of NPB by causing tension in muscles around the lower back. Additionally, prolonged sitting is another contributing factor. Research shows that sitting for 4-6 hours is a risk factor for lower back pain.⁸ Prolonged sitting can exert pressure on the lumbar vertebrae, leading to lower back pain.

Medical students typically spend more than 7 hours a day studying.⁵ The demanding academic activities and lecture schedules require students to sit for long periods, approximately 6 to 7 hours a day



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during lectures. Prolonged sitting can lead to complaints of lower back pain in students. Therefore, researchers are interested in conducting a study aimed at determining the relationship between stress levels and sitting duration with complaints of lower back pain in General Medicine students at Diponegoro University.

This study differs from previous research in terms of methodology and research subjects. In the previous study, the research subjects were heavy equipment operators and home seamstresses in the Tasikmadu Subdistrict, while the subjects to be used by the researcher were adolescents and young adults aged 19-24 years. The research instruments used in the previous study included the Occupational Stress Inventory (OSI-R), Rapid Upper Limb Assessment (RULA), and Numeric Rating Scale (NRS). In contrast, the researcher's study will use the Depression Anxiety Stress Scales 42 (DASS 42) in the Indonesian version and the Modified Oswestry Low Back Pain Disability Questionnaire in the Indonesian version, which have been tested for their validity and reliability.

METHODS

This study is an analytical observational research with a cross-sectional design, where the research subjects are medical students at Diponegoro University who meet specific inclusion and exclusion criteria. Exclusion criteria include students with a history of spinal trauma such as fractures and dislocations, a history of diseases like scoliosis and osteoporosis, and those engaging in physical activity more than 3 times per week. Inclusion criteria involve General Medicine students at UNDIP aged 19-24 with a Body Mass Index (BMI) less than 25 (Asia Pacific criteria). Sampling is done using consecutive sampling. Based on inclusion criteria, the sample size is fulfilled, amounting to 73 required samples. The independent variables in this study are the stress level and sitting duration of General Medicine students at Diponegoro University. The dependent variable is the complaint of lower back pain among General Medicine students at Diponegoro University. The confounding variable in this study is the gender of the research subjects. The research instruments used in this study are the Depression Anxiety Stress Scales (DASS 42) in Indonesia version and the Modified

Oswestry Low Back Pain Disability Questionnaire in Indonesia version.

The Depression Anxiety Stress Scales 42 (DASS 42) is a valid questionnaire developed by Lovibond and Lovibond in 1995 to assess the level of stress. Internationally, this scale has been widely used, and there is already a questionnaire available in the Indonesian language. The questionnaire was previously employed by Hakim to measure anxiety levels in medical students. The DASS-42 consists of 42 questions aimed at measuring emotional status, including depression, anxiety, and stress. In this study, the researcher selected only 14 questions to measure the stress level. The stress scale is evaluated based on questions numbered 1, 6, 8, 11, 12, 14, 18, 22, 27, 29, 32, 33, 35, 39. Each question has 4 scores: 0 = never, 1 = sometimes, 2 = often, 3 = always. The final DASS scale is divided into 5 categories: normal = 0-14, mild stress = 15-18, moderate stress = 19-25, severe stress = 26-33, and extremely severe stress = 34-42. The measurement tool used in this study is a standardized instrument, eliminating the need for validity and reliability testing. The questionnaire has been declared valid and reliable with a Cronbach's Alpha coefficient of 0.880, and 14 questions are deemed valid, representing stress indicators.

The Oswestry Low Back Pain Disability Questionnaire is a measurement tool designed to assess the perceived disability of an individual with lower back pain (NPB) in performing daily activities.¹³ The ODI (Oswestry Disability Index) was initially developed by Fairbanks and colleagues in 1980. One advantage of this questionnaire is its question model, which has a standard of certainty in qualitatively measurable answers that align with the patient's perception.¹⁴ This questionnaire was previously used by Alfaridah to measure disabilities resulting from lower back pain in heavy equipment operators.⁶ There are ten questions related to lower back pain in this questionnaire. The assessment scores in this questionnaire vary from 0 (no disability) to 5 (most severe disability). All items in the modified ODI questionnaire in Indonesia version are considered valid. The reliability test results of the modified ODI questionnaire in Indonesia version using Cronbach's Alpha yielded satisfactory results ($r > 0.89$).¹⁴



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In conducting this research, various steps were followed, such as obtaining Ethical Clearance, followed by the distribution and completion of questionnaires through Google Form, which had been previously approved in the consent form. Data from the completed Google Form were recorded. The collected data were then examined for completeness and accuracy. The gathered data were tabulated, coded, and entered into the SPSS computer program. Subsequently, statistical analysis and hypothesis testing were performed. To test the hypothesis regarding the relationship between the level of stress and the duration of sitting with lower back pain complaints, a correlation test was conducted. The research variables involve data with ordinal and ratio scales, so non-parametric tests were employed.

For testing the hypothesis regarding the correlation between the level of stress and lower back pain, as both stress level and lower back pain are ordinal scale data, a non-parametric correlation test, specifically the Rank Spearman test, was conducted. Similarly, for testing the hypothesis regarding the relationship between the duration of sitting and lower back pain, since the duration of sitting is ratio scale data and lower back pain is ordinal scale data, a non-parametric correlation test, specifically the Rank Spearman test, was applied. In the final stage, a discussion was conducted regarding the obtained research results.

RESULTS

Data collection was carried out on 90 General Medicine students at Diponegoro University. However, 17 respondents did not meet the research criteria: 5 had a history of scoliosis or osteoporosis, 5 engaged in physical activity more than 3 times per week, and 7 had a Body Mass Index (BMI) of ≥ 25 kg/m². Therefore, the number of samples analyzed was 73 respondents. Variables investigated in this study include the level of stress, sitting duration, and lower back pain complaints (LBP). Analysis was conducted using Univariate and Bivariate methods.

The sample in this study consists of 73 students with an age range of approximately 19-24 years, where 46.6% are 21 years old, and the majority have a normal Body Mass Index (BMI). General characteristics can be seen in Table 1.

Table 1. General Characteristics of the Research Sample

Variable	Frequency	Percentage (%)
Age		
19 years	8	11
20 years	26	35,6
21 years	34	46,6
22 years	4	5,5
23 years	1	1,4
Gender		
Male	19	26
Female	54	74
Body Mass Index		
Underweight	11	15,1
Normal	32	43,8
Overweight	30	41,1

Based on Table 2, it is known that there are no respondents who have a very severe level of stress or Low Back Pain (LBP).

Table 2. Characteristics of Test Variables

Variable	Frequency	Percentage (%)
Sitting Duration		
<2 hours	8	11
2-4 hours	20	27,4
>4 hours	45	61,6
Stress Level		
Normal	16	21,9
Light	33	45,2
Currently	17	23,3
Heavy	7	9,6
Low Back Pain		
Minimal Disability	36	49,3
Moderate Disability	34	46,6
Severe Disability	3	4,1

In order to find the relationship between stress levels, the Depression Anxiety Stress Scale 42 (DASS 42) questionnaire in Indonesian version was used.

Table 3. The Relationship between Stress Level and Long Sitting with Lower Back Pain

Variable	Low Back Pain	
	p	R (rho)
Stress Level	<0,001	0,417
Sitting Duration	<0,027	0,259

Based on the results of the bivariate analysis with the Spearman test, a p-value of <0.001 ($p < 0.05$) was obtained, indicating a significant relationship between stress levels and Low Back Pain (LBP) complaints. Both variables produced an r-value (Spearman correlation coefficient) of 0.417, indicating a moderate correlation strength with a positive direction, meaning



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that as stress levels increase, lower back pain complaints also increase.

This test also aimed to determine the relationship between sitting duration and lower back pain complaints (LBP) based on the Modified Oswestry Low Back Pain Disability Questionnaire in the Indonesian version. Based on the results of bivariate analysis with the Spearman test, a p-value of 0.027 ($p < 0.05$) was obtained, indicating a significant relationship between sitting duration and LBP complaints. Both variables produced an r-value (Spearman correlation coefficient) of 0.259, indicating a weak correlation strength with a positive direction, meaning that the longer the sitting duration, the higher the lower back pain complaints.

Tabel 4. Relationship between Gender and Low Back Pain

Variable	Low Back Pain			p value
	Minimal Disability	Moderate Disability	Severe Disability	
Male	6(8,2)	12(16,4)	1(1,4)	0,082
Female	30 (41,1)	22(30,1)	2(2,7)	

The confounding variable used in this study is gender. Since the gender variable is nominal, the Spearman test cannot be applied, as done with the previous variables. Therefore, the researcher used the Mann-Whitney test. Based on the Mann-Whitney test results, a p-value of 0.082 ($p > 0.05$) was obtained, indicating that the two variables are not significantly related. The Mann-Whitney test cannot measure the strength of the relationship between variables as the Spearman test can.

DISCUSSION

This study shows a significant correlation of a moderate degree between the level of stress and complaints of lower back pain in General Medicine students at Diponegoro University. This result aligns with the hypothesis of the study. Arumsari's research explains that psychological stress can lead to physical tension and cause pain in the head, upper shoulders, and lower back. The study found a significant relationship between stress and lower back pain with a significance value of 0.004, indicating that respondents experienced moderate to high stress. The higher the level of stress, the higher the complaints of lower back pain.¹⁵ Additionally, Emel et al.'s research also explains a significant relationship between work-

related stress and lower back pain. When exposed to stress, the anterior pituitary gland secretes the neurotransmitter Pituitary Adenylate Activating Polypeptide (PACAP). PACAP regulates corticotropin-releasing hormone and the autonomic nervous system, leading to increased paraspinal muscle activity and reflex spasms, resulting in pain.¹⁰

This study reveals a significant correlation of weak degree between sitting duration and complaints of lower back pain, consistent with the study's hypothesis. Sumekar and Natalia's research explains that prolonged sitting affects lower back pain complaints, showing a significant relationship between sitting duration and lower back pain with a significance value of 0.006. Respondents who sat for a long time (>4 hours) had a higher risk of experiencing lower back pain.¹⁶ Siagian et al.'s study also explain a significant relationship between sitting duration and lower back pain in students at Stikes Hang Tuah Tanjungpinang.⁷ This is consistent with the theoretical foundation that prolonged sitting for more than 2 hours a day can increase the risk of lower back pain.⁹ Prolonged sitting can cause tension in the back muscles and ligaments, particularly the posterior longitudinal ligament, leading to pain. Static muscle contraction over a long period increases pressure and reduces blood flow, resulting in reduced energy exchange and the accumulation of metabolic by-products, causing muscle fatigue and pain.

This study indicates a non-significant correlation between gender and complaints of lower back pain, consistent with some previous studies. Wulandari et al.'s research explains that there is no significant relationship between gender and lower back pain with a significance value of 0.076.¹⁷ Siagian et al.'s study also states that there is no relationship between gender and the occurrence of lower back pain.⁷ However, some studies suggest that women experience lower back pain more frequently than men due to physiological differences, with women having lower muscle strength than men. This is because men engage in physical activities more often, resulting in stronger muscles.⁷

The limitation of the conducted study is the uneven distribution of gender and other factors that may influence the research results.



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CONCLUSION

Based on the conducted research, it is found that there is a moderate correlation between the level of stress and lower back pain and weak correlation between sitting duration, and lower back pain complaints among General Medicine students at Diponegoro University. For further research development, additional studies can be conducted by analyzing other variables.

ETHICAL APPROVAL

Ethical clearance has been issued with No. 208/EC/KEPK/FK-UNDIP/V/2023. Participants' consent to participate in the study was obtained in the form of informed consent documents.

CONFLICT OF INTEREST

No potential conflicts of interest are reported by the author.

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AUTHOR CONTRIBUTIONS

Conceptualization, Dean; methodology, Dean, Rahmi, Erna; data analysis, Dean; data collection, Dean; source of funds, Dean; wrote the original draft, Dean; review and edit, Dean, Rahmi, Erna; supervision, Dean, Rahmi, Erna.

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