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THE RELATIONSHIP BETWEEN SUBJECTIVE COMPLAINTS OF LOW BACK PAIN AND SLEEP QUALITY

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ABSTRACT

Background: Low back pain is a frequently occurring symptom closely associated with society, both in Indonesia and globally. It can be influenced by both unmodified and modified factors, such as excessive physical activity, obesity, body posture, and psychological factors. Considering these risk factors, it is known that individuals in the productive age range (<45 years) have a significant risk of experiencing low back pain. **Objective:** *This study examines* the correlation between low back pain subjective complaints and sleep quality in students at the Faculty of Medicine Diponegoro University. **Methods:** Analytical observational study with a cross-sectional design. Research subjects are students from the Faculty of Medicine, Diponegoro University, Semarang, which were selected using consecutive sampling. The low back pain subjective complaint is determined using the NRS and sleep quality data are determined by PSQI questionnaire. The relationship between the low back pain subjective complaint and sleep quality is analyzed using the Chi-Square correlation test and Fisher's Exact alternative test. **Results:** From a total of 51 research subjects, the analysis of subjective low back pain complaint scores in relation to sleep quality yielded a p-value of 0.362. Therefore, it can be concluded that there is no significant relationship between subjective low back pain complaint scores and sleep quality. **Conclusion:** There is no relationship between the subjective complaints of low back pain and sleep quality among students at the Faculty of Medicine, Diponegoro University.

INTRODUCTION

Low back pain (LBP) is a commonly occurring symptom closely associated with communities worldwide, including Indonesia. When compared to the global population, the incidence of low back pain is influenced by various factors, including those that cannot be changed and those that can be modified. Unmodifiable factors for low back pain include genetics, gender, and age, while modifiable factors include excessive physical activity, smoking, obesity, body posture, and psychological factors.[1]

Examining the modifiable factors reveals that individuals in the productive age range (<45 years)[2] have a significant risk of experiencing low back pain.[3] This is reinforced by factors such as excessive physical activity, as individuals in their productive years tend to engage in various activity and responsibility that can contribute to ergonomic stress[4], incorrect dietary habits, and even insufficient time for sleep and rest.

Excessive physical activity related to occupational factors is closely linked to issues with sitting position and body posture. Sitting for more than 8 hours with a monotonous pattern and incorrect body posture, such as a bowed head, hunched back, and protruding abdomen, can lead to complaints in the waist and lower back[5]. Psychological factors such as depression, stress, and anxiety also show a significant association with the prevalence of low back pain.[6,7]

Recent evidence from laboratory experiments and clinical studies indicates that sleep disturbances play

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a crucial role as a modulator for pain. Sleep disturbances induced by a reduction in total sleep time result in musculoskeletal pain and decreased tolerance to harmful stimuli. These findings suggest a bidirectional relationship between pain and sleep disturbances, where pain disrupts nighttime sleep or worsens pain the following day.[6]

This study aims to investigate the relationship between subjective complaints of low back pain and sleep quality among medical students at Diponegoro University, who are in their productive age. The research is conducted to establish the connection between subjective complaints of low back pain and sleep quality among medical students at Diponegoro University.

METHODS

The research was conducted from August to October 2023. The research method employed was an analytical observational approach with a cross-sectional design. The study sample comprised 51 students from the Faculty of Medicine at Diponegoro University in Semarang who met the inclusion criteria and did not meet the exclusion criteria. Subject selection was carried out using consecutive sampling.

The inclusion criteria for this study were active students of the Faculty of Medicine at Diponegoro University aged 18 to 24 years, with a BMI <29.9 kg/m2, NRS score ≥1, QBPDS score ≥1, and HDRS score 0–7. Exclusion criteria included students suffering from insomnia, narcolepsy, sleepwalking, other sleep disorders, chronic diseases, and those consuming >1 cup of coffee within 1–3 hours before bedtime. The study also considered environmental factors and nutritional intake as confounding variables.

Collected and validated data were managed using the IBM SPSS Statistics program. Statistical analysis employed bivariate analysis using the Chi-Square correlation test.

RESULTS

During the research process, a total of 170 respondents filled out the questionnaire, which was then screened based on inclusion and exclusion criteria. Fifty-one students, meeting the specified inclusion and exclusion criteria, were selected for analysis. The characteristics of the research subjects were differentiated based on age, gender, program of study, and body mass index, as presented in the following table:

Table 1. Characteristics of research subjects

Variable	Frequency	Percentage (%)
Gender		
Male	9	17.6
Female	42	82.4
Study Programs		
Medicine	20	39.2
Dentistry	5	9.8
Nursing	10	19.6
Pharmacy	7	13.7
Nutrition	9	17.6
Body Mass Index		
Underweight	6	10
Normal	28	58
Overweight	9	16
Obese	8	16
Age	**Median (min – max)**	21 (18 – 23)

Meanwhile, the correlation test results using the continuity correction test yielded a p-value >0.05 for the carbohydrate intake variable, indicating that there is no significant relationship between carbohydrate intake and sleep quality. On the other hand, the correlation test results using the continuity correction test showed a p-value >0.05 for the environmental variable, indicating that there is also no significant relationship between the environment and sleep quality. This relationship can be observed in the following table:

Table 2. Bi-variate analysis of confounding variables

Variable		Sleep Quality		p
		Good	Poor	
		n (%)	n (%)	
Nutrition Intake	**Yes**	6 (33.33)	12 (66.7)	0.190
	No	6 (18.2)	27 (81.8)	
Environment	**Comfort**	9 (19.6)	37 (80.4)	0.078
	Un-comfort	3 (60.0)	2 (40.0)	

The analysis of the NRS scores, as a measure of subjective low back pain complaints, revealed that most research subjects interpreted their pain as mild. However, when examining the relationship between subjective low back pain complaints and sleep quality

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scores using the Chi-Square correlation test, a p-value of 0.134 was obtained. Since the p-value is >0.05, it can be concluded that there is no significant relationship between subjective low back pain complaints and sleep quality.

Table 3. The relationship between Numeric Rating Scale and Pittsburgh Sleep Quality Index

Pain Intensity	Sleep Quality		p
	Good	Poor	
	n(%)	n(%)	
Mild	9(20)	36(80)	0.134
Severe	3(50)	3(50)	

The analysis of QBPDS scores revealed that the research subjects had scores ranging from the lowest at 1 to the highest at 55, with a mean of 14.4. Meanwhile, when examining the relationship between low back pain disability scores and sleep quality scores using the Mann-Whitney correlation test, a p-value of 0.362 were obtained. Since the p-value is > 0.05, it can be concluded that there is no significant relationship between low back pain disability and sleep quality.

Table 4. The relationships between Quebec Back Pain Disability Scale and Pittsburgh Sleep Quality Index

Sleep Quality	Subjective Complaints Score	
	Median (Min – Max)	p
Good	8 (1 – 40)	0.362
Poor	10 (1 – 55)	

DISCUSSION

In this study, it was found that there is no relationship between nutritional intake and sleep quality. This is because the research only focused on carbohydrate intake without considering other nutrients such as fat, protein, glycemic index, magnesium, fruits, and others.

According to Marrie- Pierre et al, in a narrative review, there are several dietary patterns that can affect an individual's sleep quality. The combination of a high-carbohydrate (HC) diet with a low-fat (LF) diet significantly reduces slow-wave sleep compared to the combination of a low-carbohydrate (LC) diet with a high-fat (HF) diet. Rapid Eye Movement (REM) sleep significantly increases in both diet interventions but is more prominent in the HC/LF diet. Consuming a high glycemic index meal for 4 hours before sleep significantly reduces sleep latency compared to a high glycemic index meal consumed 1 hour before sleep. Consuming 2 kiwi fruits per day 1 hour before sleep for 4 weeks significantly increases sleep duration and efficiency. In addition to kiwi, consuming 8 ounces of sour cherry (Prunus cerasus) juice in the morning and evening for 2 weeks is significantly associated with a decrease in insomnia severity and total wake time in adults with chronic insomnia.[8]

On the other hand, regarding the relationship between the environment and sleep quality, the study results show that there is no significant association between the environment and sleep quality. This contradicts the study conducted by Martha et al. Martha stated that there is a significant relationship between the social environmental and sleep quality, the social environment can affect mood, anxiety, and stress, which can contribute to a state of arousal and potentially impact sleep, specifically to sleep deprivation, insomnia symptoms, and delayed sleep timing.[9]

According to Olga Troynikov et al, the sleep environment, including air temperature and humidity, can influence sleep quality by affecting skin temperature and stability. Moreover, body heat load can be influenced by Body Mass Index (BMI), age, and menstrual cycle. High or hot air temperatures have been found to disturb sleep-wake cycles, reduce total sleep time, decrease REM duration, lower short-wave sleep phases, and increase sleep latency.[5]

After collecting subjective complaints of low back pain based on the Numeric Rating Scale (NRS), it was found that the majority of medical students at Diponegoro University, who had poor sleep quality, interpreted their pain as mild. This result contradicts the theory presented earlier. According to Suwondo, pain that can alter the limbic system of the brain and affect sleep quality is severe pain that is not managed and receives proper therapy for more than 3 consecutive days.[2]

Meanwhile, data on disability due to Low Back Pain (LBP) from the Quebec Back Pain Disability Scale (QBPDS) questionnaire revealed the top five complaints experienced by medical students at Diponegoro University related to low back pain, resulting in poor sleep quality. The top five complaints leading to poor sleep quality are as follows:

1. Sitting in a chair for several hours

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2. Walking several miles
3. Sleeping through the night
4. Lifting and carrying a heavy suitcase
5. Carrying two bags of groceries

The order of the Pittsburgh Sleep Quality Index (PSQI) components most affected by subjective complaints of low back pain includes:

1. Subjective sleep quality
2. Daytime dysfunction
3. Sleep duration
4. Sleep disturbances
5. Sleep latency
6. Sleep efficiency

However, the results indicate that there is no significant relationship between subjective complaints of low back pain and sleep quality in medical students at Diponegoro University. This contradicts the study conducted by Alhamam et al. Alhamam stated that there is a significant relationship between QBPDS and PSQI components, including prolonged sleep latency, increased total wake time after sleep onset, and decreased sleep efficiency. Alhamam also concluded that the relationship between low back pain and sleep quality is influenced by multiple socio demographic characteristics such as gender, residential area, high work frequency, and previous history of low back pain.[5]

The lack of a significant relationship between subjective complaints of low back pain and sleep quality may be due to various factors such as subjective interpretation by subjects in translating questionnaire content, activities before sleep, sleep positions, and physical activities performed.

The data obtained show that most research subjects interpret their pain as mild. Severe pain, which is not managed and receives proper therapy for more than 3 consecutive days, is considered to be the type of pain that can alter the limbic system of the brain and affect sleep quality. In this study, the research questionnaire assessed the subjective complaints of low back pain experienced by individuals on the day of questionnaire completion without inquiring about the duration of pain or the interventions undertaken by the research subjects.

According to Ilya Krisnana et al, the use of electronic devices before bedtime is related to an individual's sleep quality. Using devices shortly before sleep can disrupt melatonin production through digital screen exposure. Reduced melatonin production results in increased wakefulness, leading to increased sleep latency and reduced total sleep time. This can happen because electromagnetic waves from devices can disturb the REM sleep cycle and inhibit blood flow to muscles.[10]

According to Yuan Zhang et al, sleep position can affect an individual's sleep quality. A flexed lumbar position reduces spinal compression, thus reducing the occurrence of low back pain that can worsen sleep quality. In his research, Yuan also stated the sleep positions that result in the best sleep quality: lying on the right side, lying on the left side, and supine. Good sleep quality is also characterized by a low frequency of position changes. On the contrary, research subjects with a high frequency of position changes indicate poor sleep quality.[11]

According to Duncan et al, insufficient physical activity and a high sitting frequency are associated with poorer sleep quality.[12] According to Monica Sejbuk et al, longer daily physical activities such as walking, swimming, cycling, and the like are associated with better sleep quality, while shorter or light daily physical activities such as a sedentary lifestyle do not contribute to improved sleep quality.[13] In this study, there were no questions about daily activities and the duration of sitting each day that could affect the sleep quality of the research subjects. This is a limitation of the study that could impact the research results.

The data from this study show that there are research subjects with low QBPDS scores but poor sleep quality, high QBPDS scores with good sleep quality, low QBPDS scores with good sleep quality, and high QBPDS scores with poor sleep quality. The research results, when seen from the NRS, also produce similar findings. This indicates that the subjectivity of the study is very high, thus influencing the final research results.

CONCLUSION

Based on the results of the research and discussions conducted, it can be concluded that there is no relationship between subjective complaints of low back pain and sleep quality among medical students at Diponegoro University. This suggests that factors other than subjective complaints of low back pain may be influential in the manifestation of sleep quality among the student population studied.

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ETHICAL APPROVAL

The research was conducted after obtaining ethical clearance no.143/EC/KEPK/FK-UNDIP/VIII/2023 from the Health Research Ethics Commission (KEPK) of the Faculty of Medicine at Diponegoro University.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHOR CONTRIBUTIONS

Conceptualization, Dinanti Bintang Shahrani; methodology, Dinanti Bintang Shahrani, Tanti Ajoe Kesoema, Erna Setiawati; data analysis, Dinanti Bintang Shahrani; data collection, Dinanti Bintang Shahrani; source of funds, Dinanti Bintang Shahrani; wrote the original draft, Dinanti Bintang Shahrani; review and edit, Dinanti Bintang Shahrani, Tanti Ajoe Kesoema, Erna Setiawati, Rahmi Isma Asmara Putri; supervision, Dinanti Bintang Shahrani, Tanti Ajoe Kesoema, Erna Setiawati, Rahmi Isma Asmara Putri.

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