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The effect of sitting duration, physical activity, and stress level on the incidence of low back pain among students of the faculty of medicine pelita harapan university year 2020-2022

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ABSTRACT

Introduction: Low back pain (LBP) is a common musculoskeletal complaint affecting all age groups, leading to disability and decreased productivity. Various factors, including sitting duration, physical activity, and stress levels, can influence LBP incidence. This study examines these factors among medical students at Pelita Harapan University.
Methods: A cross-sectional study design with a comparative analytic study type was used. The Nordic Musculoskeletal Questionnaire, Global Physical Activity Questionnaire, and Perceived Stress Scale were administered to assess LBP, sitting duration, physical activity, and stress levels. Data were analyzed using SPSS 26 and the Chi-square method.
Results: Relationship was found between sitting duration and LBP (P = 0.01). However, no significant relationship was found between physical activity and LBP (P = 0.19) or stress levels and LBP (P = 0.91).
Conclusion: Sitting duration significantly affects LBP incidence among medical students, while physical activity and stress levels do not. The implications of this study highlights the need for interventions aimed at reducing sedentary behaviour among students. Educational programs that promote ergonomic practices during study sessions and encourage taking breaks to stand or walk during extended study periods could be beneficial in preventing LBP.

INTRODUCTION

Low back pain (LBP) is a prevalent musculoskeletal issue and one of the leading causes of disability, affecting people of all ages and backgrounds. [1] It is characterized by discomfort or pain in the lower back area, which can range from mild to severe and may be acute or chronic in nature. According to the Global Burden of Disease Study, LBP is a major contributor to years lived with disability worldwide, impacting individuals' quality of life, productivity, and overall well- being. [2-4] In Indonesia, the prevalence of LBP is increasing, with various studies indicating that lifestyle factors such as prolonged sitting, physical inactivity, and high-stress levels contribute to the high incidence of this condition. Specifically, medical students are a unique population who may be at increased risk for LBP due to their demanding academic schedules, long hours of sitting during lectures and study sessions, and high levels of academic stress. Despite the recognition of these risk factors, there is a paucity of research focusing on LBP among medical students in Indonesia. [5-8]

Previous studies have shown mixed results regarding the relationship between physical activity and LBP. Some research suggests that regular physical activity can help prevent and alleviate LBP by strengthening the muscles that support the spine and improving overall physical fitness. [9] However, other studies have found no significant association between physical activity levels and LBP, indicating that more research is needed to clarify this relationship.

Similarly, the role of stress in the development and exacerbation of LBP is well- documented. High-stress levels can lead to muscle tension, poor posture, and other physiological changes that

contribute to back pain. However, the specific impact of stress on LBP among medical students has not been thoroughly investigated. [8]

This study aims to address these gaps in the literature by examining the prevalence of LBP and its association with sitting duration, physical activity levels, and stress among students at the Faculty of Medicine, Pelita Harapan University. Understanding these relationships is crucial for developing effective interventions to reduce the burden of LBP in this population and improve their overall health and academic performance.

RESEARCH METHODS

This study utilized a cross-sectional design with an unpaired categorical comparative analytic type. The Nordic Musculoskeletal Questionnaire assessed LBP, the Global Physical Activity Questionnaire evaluated sitting duration and physical activity, and the Perceived Stress Scale measured stress levels. Data were analyzed using SPSS 26 and the Chi-square method.

Study Design, Participants, and Procedure

This cross-sectional study was conducted between February and March 2023 to investigate the effect of sitting duration, physical activity, and stress levels on the incidence of low back pain (LBP) among medical students at Pelita Harapan University. The study was approved by the research ethics committee of Pelita Harapan University (No: 068/K-LKJ/ETIK/I/2023). The participants were preclinical medical students from the year 2020-2022 of the Faculty of Medicine, Pelita Harapan University. The inclusion criteria for participants were students from the Faculty of Medicine, Pelita Harapan University, enrolled in the 2020- 2022 cohorts and students who agreed to participate by providing informed consent. Exclusion criteria in this study were students with a history of chronic low back pain, students with conditions that could precipitate low back pain (e.g., hernia nucleus pulposus, ankylosing spondylitis, spinal stenosis), and students with a history of back injury or surgery.

Participants were recruited via online platforms, including Google forms, Line, and WhatsApp. They were provided with an information sheet, a research criteria questionnaire, an informed consent form, and three validated questionnaires: the Nordic Musculoskeletal Questionnaire, the Global Physical Activity Questionnaire, and the Perceived Stress Scale. Participants who consented proceeded to fill out the questionnaires.

Data Collection

Sampling in this study used non-probability convenience sampling technique. The sample size was calculated using the formula for calculating the sample size of an unpaired comparative categorical analytical research. Total number of samples required for this study were minimum 168 students.

Statistical Analysis

Data were tabulated using Microsoft Excel 2019 and analyzed with the Statistical Package for the Social Sciences (SPSS) version 26. Descriptive statistics summarized the data, presenting numerical variables as means with categorical variables as counts and percentages.

A chi-square test was used to determine the relationship between categorical variables, with a significance level set at $p<0.05$. The chi-square test assessed the association between sitting duration, physical activity, stress levels, and the incidence of LBP. Odds Ratios (OR) were calculated to estimate the strength of associations between risk factors and outcomes.

RESULTS AND DISCUSSION

Among 193 respondents, 132 (68.4%) reported experiencing LBP, while 61 (31.6%) did not. Most respondents (85.5%) had a sitting duration of ≥5 hours, and 63.2% had medium to high physical activity levels according to WHO standards. Stress levels were moderate to high in 74.1% of respondents. Chi- square analysis revealed a significant relationship between sitting duration and LBP ($P = 0.01$), but no significant relationships for physical activity ($P = 0.19$) or stress levels ($P = 0.91$).

The principal findings of this study reveal a significant correlation between sitting duration and LBP incidence, aligning with previous research. However, physical activity and stress levels did not

significantly affect LBP, suggesting that other factors may be more influential. This study's strengths include a comprehensive assessment approach, incorporating self-reported questionnaires to gather detailed data on sitting duration, physical activity, stress levels, and LBP prevalence. Moreover, this study focusses on a relevant population, where preclinical medical students is particularly relevant due to their unique lifestyle, which involves prolonged sitting and high stress, providing valuable insights into a vulnerable population. On the other hand, limitations on this study lies on the cross-sectional design of the study which limits the ability to establish causality between the identified factors and lower back pain. In addition, the reliance on self-reported data for physical activity and stress levels may introduce bias, as participants might underreport or overreport their behaviors which may affect the result of the study.

Compared to previous studies that have explored similar themes, this research provides a more comprehensive analysis by simultaneously considering multiple factors—sitting duration, physical activity, and stress. While other studies have often focused on one or two of these variables in isolation, this study's multifactorial approach offers a broader perspective on the issue. Nonetheless, some studies have utilized longitudinal designs, which allow for a better understanding of how these factors interact over time. The cross-sectional nature of this study may limit the generalizability of the findings, as it captures a single point in time rather than changes over a longer period.

In relation to other studies, this research aligns with previous findings indicating a correlation between sitting duration and LBP incidence. However, findings of this study revealed no significant correlation between physical activity and stress levels with the incidence of lower back pain (LBP) among medical students at Pelita Harapan University. This contrasts with several existing studies that have documented a clear relationship between these factors and LBP. Several potential explanations might account for this discrepancy. First, the measurement methods for physical activity and stress levels could vary significantly between studies which may cause different results. Moreover, the specific characteristics of the study population might influence the findings. This study focused on preclinical medical students who may have unique stressors and activity patterns compared to other populations. The academic environment, characterized by prolonged sitting and intense mental work, might overshadow the effects of physical activity and stress on LBP, making it difficult to detect a significant correlation.

In relation to other studies, this research aligns with previous findings indicating high LBP prevalence among medical students and the general student population. Prolonged sitting and low physical activity levels as significant risk factors for LBP are consistent with other research, but the pronounced association between high stress levels and LBP in this study is particularly notable. This suggests a potentially greater impact of stress on LBP among medical students due to their unique academic demands and future career pressures. These findings underscore the need for targeted interventions, such as educational programs on ergonomics, regular physical activity promotion, and stress management workshops to reduce LBP incidence in this population.

The implications of this study are significant for both academic institutions and health practitioners. It highlights the need for interventions aimed at reducing

Sedentary behavior among students. Educational programs that promote ergonomic practices during study sessions and encourage taking breaks to stand or walk during extended study periods could be beneficial in preventing LBP. Moreover, these findings emphasize the importance of a holistic approach to understanding and managing LBP. By recognizing that physical activity and stress are not the sole contributors to LBP in all populations, healthcare providers and educators can develop more comprehensive strategies that consider a wider range of factors. This approach can lead to more effective prevention and treatment plans, ultimately improving the quality of life for medical students and potentially reducing the long-term burden of LBP as they progress in their careers.

Despite the insights gained from this study, several questions remain unanswered. Future research could explore the long-term effects of lifestyle modifications on lower back pain incidence among students. Additionally, qualitative studies could provide deeper insights into the personal experiences of students regarding pain management and the effectiveness of various interventions.

Investigating the role of other potential confounding factors, such as sleep quality and academic workload, could also enhance the understanding of this issue.

CONCLUSION

In conclusion, this study found a high prevalence of low back pain (LBP) among preclinical medical students at Pelita Harapan University, identifying prolonged sitting as a significant contributing factor, while physical activity and stress levels do not. The implication of this findings suggests that interventions aimed at reducing sitting time could be essential in preventing LBP among students. Educational institutions should consider implementing programs that encourage breaks for standing or walking during long study sessions. Future research should focus on longitudinal studies to establish causal relationships. A longitudinal approach could provide deeper insights into the dynamics of sitting behavior, physical activity, and stress over time. By addressing these areas, we can better understand and mitigate the risk of lower back pain in the student population, ultimately enhancing their academic performance and quality of life.

What is already known on this topic

1. LBP is a common musculoskeletal issue affecting various age groups.
2. Sitting duration, physical activity, and stress levels are potential factors influencing LBP incidence.

What this study adds

1. Demonstrates a significant relationship between sitting duration and LBP among medical students.
2. Highlights the need for further research on physical activity and stress levels as LBP factors.

Competing interests

The authors declare no competing interest.

Authors' contributions

Author and co-author work equally in the process of writing

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Tables

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Table 1: Analysis of Sitting Duration and LBP

Sitting Duration	Low Back Pain		Total	P value	OR (95% CI)
	No	Yes			
Low (< 5 hours)	17	11	28	0.01	4.25
High (≥ 5 hours)	44	121	165		
Total	61	132	193		

Table 2: Analysis of Physical Activity and LBP

Physical Activity	Low Back Pain		Total	P value	OR (95% CI)
	No	Yes			
Low (< 600 MET min/ week)	27	44	71	0.19	1.58
Moderate - High (≥ 600 MET min/ week)	34	88	122		
Total	61	132	193		

Table 3: Analysis of Stress Levels and LBP

Stress Levels	Low Back Pain		Total	P value	OR (95% CI)
	No	Yes			
Low (< 14)	15	30	45	0.91	1.10
Moderate – High (≥ 14)	46	102	148		
Total	61	132	193		