

**THE IMPACT OF ERGONOMICS ON LOWER BACK PAIN AMONG STUDENTS
ENGAGED IN PROLONGED SITTING ACTIVITIES IN UNIVERSITY OF NIGERIA
ENUGU CAMPUS.**

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Received: 09/8/2024; accepted for publication 31/8/2024

ABSTRACT

Background: Prolonged sitting among university students has been associated with musculoskeletal pain, particularly in the lower back. It is essential to understand the connection between study environment, ergonomic practices, and musculoskeletal pain in order to lessen its effect on student well-being.

Aim: This study aimed to assess the prevalence of musculoskeletal pain among undergraduates, explore the association between study environment and pain, and evaluate students' knowledge of ergonomic principles.

Material and Methods: A cross-sectional study design was employed. Data was collected from 100 students at the University of Nigeria, Enugu Campus using structured questionnaires. Statistical analysis, including correlation and hypothesis testing, was conducted to examine relationships between study environment factors and musculoskeletal pain at <0.05 level of significance.

Results: The study revealed a high prevalence of musculoskeletal pain, particularly in the shoulders, upper back, lower back, and knees. Significant correlations were found between pain and factors such as prolonged sitting time, break frequency, and experiencing physical discomfort. However, students exhibited limited knowledge of ergonomic principles.

Conclusion: Prolonged sitting is associated with musculoskeletal pain, particularly in the lower back, among university students. Ergonomic interventions, such as providing ergonomic furniture and promoting breaks, may alleviate pain.

Keywords: *musculoskeletal pain, university students, study environment, ergonomic practices*

INTRODUCTION

Lower back pain (LBP) has become a prominent health issue across all age groups, but its increasing prevalence among young adults and students has drawn attention in recent years. Globally, LBP ranks as the most common musculoskeletal condition and remains the leading cause of disability¹. The lumbar region, or lower back, comprises a complex structure of bones, muscles, ligaments, and nerves, which provides flexibility and movement for the spine. However, this area is particularly susceptible to discomfort and pain due to various lifestyle and environmental factors, especially in younger populations².

In the context of university students, lower back pain can arise from a multitude of factors, such as prolonged sitting, poor ergonomic practices, sedentary behaviors, and academic stress³. The rigorous academic demands, long hours spent studying, attending lectures, and irregular sleep patterns often contribute to musculoskeletal pain, particularly in the lower back region⁴. Research has highlighted the high prevalence of LBP among medical students, attributing it to the sedentary lifestyle, high stress levels, and long hours spent in hospital settings during training⁵. There is a higher incidence of LBP among students in advanced semesters, likely due to increased practical activities⁵. Low Back Pain, in turn, impacts their productivity, lecture

attendance, and clinical performance, affecting their academic and professional trajectories⁶.

Understanding the complexity of LBP is essential for exploring preventive and management strategies. While various factors such as injury, poor posture, or pre-existing conditions may contribute to LBP, the role of ergonomics is often overlooked⁷. Ergonomics, the scientific study of human interaction with their environment, plays a key role in alleviating musculoskeletal issues. By focusing on optimizing the design of workspaces, tools, and systems, ergonomics seeks to enhance performance while minimizing physical strain⁸. Through better design of study environments, ergonomics can reduce the incidence of musculoskeletal pain and improve overall well-being among students⁹. Given the substantial amount of time university students spend sitting, particularly in non-ergonomic environments, this study aims to investigate the prevalence of musculoskeletal pain, particularly lower back pain, among undergraduates and examine the relationship between their study environment and ergonomic practices¹⁰. Further, it aims to assess students' knowledge of ergonomics and identify opportunities to promote better ergonomic habits in academic settings¹¹.

METHODOLOGY

Study Design

This research employed a cross-sectional descriptive survey design.

Ethical Approval

This study's proposal was reviewed and approved by the Health Research Ethics

Committee of the Molecular Pathology Institute, Enugu State.

Sample

A total of 386 undergraduate students were selected through convenience sampling from the University of Nigeria, Enugu Campus. The participants were chosen based on the inclusion criteria, which required them to engage in prolonged sitting and have previous experience with low back pain, while excluding those with degenerative, inflammatory musculoskeletal conditions or other medical issues.

Procedure

After obtaining ethical approval, letters were sent to the heads of the university faculties to gain permission for conducting the study. Physical meetings were also held to request assistance in facilitating the study among students. Numbered questionnaires and consent forms were distributed to the selected students with detailed instructions on how to fill them. Online versions of the questionnaires were made available to participants who preferred this method. The researcher distributed the physical copies to participants personally at their respective departments and waited for them to complete the forms. For participants who had difficulty understanding the questionnaire, interviews were conducted to enable their participation. The data collection was completed through both in-person and online responses.

Instruments

The instrument used for data collection was the modified Nordic Musculoskeletal Questionnaire (NMQ). This standardized

tool is used to assess musculoskeletal complaints in various body regions, including the lower back, neck, and shoulders. The NMQ consists of three parts:

Part A collected demographic data on age, gender, weight, and height.

Part B gathered information on participants' study/work patterns, such as study hours and breaks.

Part C assessed musculoskeletal symptoms and the body regions affected. The NMQ has been validated for use in musculoskeletal research and has demonstrated excellent reliability, with a Cronbach's Alpha value above 0.945.

Data Analysis

Data was summarized using descriptive statistics, including frequency distributions, means, and standard deviations. Spearman's Rank Order Correlation analysis was performed to assess the relationships among study environment, ergonomic factors, and musculoskeletal pain. The level of significance was set at $p < 0.05$.

RESULTS

The demographic analysis of the participants indicated that 100 respondents provided valid data, with an average age of 1.69. The gender distribution leaned towards female, while the faculty were primarily represented by Law faculty. Most participants were Christians. Regarding academic levels, the majority of participants were in level 200 (31%), followed by level 400 (28%). Lower levels like 100 and 500 were represented at much smaller percentages, with only 3 participants in level 100.

Pain statistics revealed that common pain sites over the past 12 months included the shoulders, elbows, upper back, lower back, and knees, all of which exhibited higher mean scores and greater variability. Over the past 7 days, pain in the shoulders, upper back, lower back, and knees was also prevalent, indicating consistent discomfort in these regions.

Ergonomics awareness and practices among the participants reflected moderate knowledge of ergonomic principles, with a limited number having received formal education or training. Despite this, interest in learning more about ergonomics was high, as shown by a notable desire to attend workshops or seminars. Use of ergonomic furniture and equipment was relatively low, and only a moderate number of participants reported adjusting their study or workspaces to improve ergonomics.

When analyzing the study environment, participants reported spending an average of 2.16 hours per day sitting while working on academic tasks. Although breaks were taken regularly, many participants still experienced physical discomfort or pain as a result of prolonged sitting. Access to ergonomic tools, such as adjustable chairs and standing desks, was limited. Despite these challenges, participants rated the overall atmosphere and organization of their study space positively.

The correlation analysis showed significant positive correlation between age and musculoskeletal pain in the lower back, hips/thighs, knees, and ankles/feet, but not in the neck, shoulders, elbows, wrists/hands, or upper back. Additionally, correlations between study environment factors and musculoskeletal pain revealed that extended sitting time was significantly correlated with upper back pain, while taking breaks was linked to shoulder pain. A more comfortable

study environment was related to lower occurrences of elbow and upper back pain, but participants who experienced physical discomfort were more likely to report pain in various regions, including the upper back and wrists.

In testing the hypotheses, it was concluded that age was significantly correlated with musculoskeletal pain in the lower back, hips/thighs, knees, and ankles/feet. However, there was no significant

relationship between age and neck pain. Similarly, there was an association between study environment and pain in certain areas, such as the shoulder and upper back, particularly when related to break frequency and sitting time, while other areas like the neck, elbows, and wrists did not show significant correlations with environmental factors. These findings emphasize the complex relationship between study habits, ergonomics, and musculoskeletal health.

Table.1 Summary of Participants' demographic

Variables	Mean	Median	SD
Age (in years)	1.6900	2.000	0.58075
Gender	1.4300	1.0000	0.49757
Faculty	2.7600	3.0000	0.98596
Level	3.2800	3.0000	1.18986
Marital status	1.0500	1.0000	0.26112
Religion	1.0200	1.0000	0.20000

Table.2 Summary of participants' level of study

Level of study	Frequency	Percentage (%)
100	3	3.0
200	31	31.0
300	20	20.0
400	28	28.0
500	17	17.0
600	1	1.0

Table. 3 Summary of Pain Statistics Table

Variables	Body region	Mean	Median	SD
Have you at any time during the last 12 months had trouble (such as ache, pain, discomfort, numbness) in:	Neck	1.5100	2.0000	0.50242
	Shoulders	1.9800	2.0000	0.58569
	Elbows	1.9200	2.0000	0.39389
	Wrists/hands	1.8800	2.0000	0.53711
	Upper back	1.6500	2.0000	0.47937
	Lower back	1.6300	2.0000	0.48524
	One or both hips/thighs	1.6800	2.0000	0.46883
	One or both knees	1.7200	2.0000	0.45126
Have you had trouble (such as ache, pain, discomfort, numbness) during the last 7 days in:	One or both ankles/feet	1.8200	2.0000	0.38612
	Neck	1.7000	2.0000	0.46057
	Shoulders	1.7600	2.0000	0.42923
	Elbows	1.8600	2.0000	0.34874
	Wrist/hands	1.8300	2.0000	0.37753
	Upper back	1.7000	2.0000	0.46057
	Lower back	1.7000	2.0000	0.46057
	Hips/thigh	1.8000	2.0000	0.40202
	Knees	1.7800	2.0000	0.41633
	Ankles/foot	1.8800	2.0000	0.32660

Table.4 Summary of Ergonomics Awareness and Practices

Variables	Mean	Median	SD
Are you aware of what ergonomics entails in relation to workplace or study environment design	2.9300	3.0000	1.67124
Have you received any formal education or training on ergonomics practices?	3.7500	5.0000	1.55294
Do you use ergonomic furniture or accessories (e.g., ergonomic chairs, keyboard trays) in your study or work setup?	3.8300	5.0000	1.47062
Have you made any adjustments to your study or work environment based on ergonomic recommendations?	3.6500	4.0000	1.52007
Do you think your educational institute adequately addresses ergonomic awareness and practices?	3.5900	4.0000	1.50484
Would you be interested in attending workshops or seminars on ergonomic practices?	2.3131	2.0000	1.39713
Are you familiar with the potential long-term health consequences of poor ergonomic practices?	3.000	3.0000	1.55050
Have you ever sought advice or assistance from a healthcare professional regarding ergonomic issues?	3.7600	5.0000	1.59621

Table.5 Summary of Study Environment

Variables	Mean	Median	SD
How many hours per day do you typically spend sitting while studying or working on academic task?	2.1600	2.0000	0.81303
How often do you take breaks or move around during your study or work session?	2.3100	2.0000	1.05117
Do you feel that your study environment supports your productivity and comfort during long sitting hours?	2.4800	2.0000	1.30639
Do you often experience physical discomfort or pain (e.g., back pain, neck stiffness) as a result of prolonged sitting?	2.1000	2.0000	1.31426
Do you have access to ergonomic furniture or equipment in your study environment (e.g., adjustable chairs, standing desks)?	3.4500	4.0000	1.54642
Do you engage in any physical or exercises to counteract the effects of prolonged sitting?	2.7100	2.0000	1.56538
What type of desk or work station do you use for studying or working?	2.1200	2.0000	0.87939
How organized is your study space (Messy is from 1, very organized is 5)	3.2500	3.0000	1.19236
On a scale of 1-10 (1=very poor, 10=excellent) rate the overall atmosphere or ambiance of your study space)?	5.5900	6.000	2.37876
on a scale of 1-10 (1=very uncomfortable, 10=very comfortable) How comfortable is your study furniture	5.0700	5.000	2.39636

DISCUSSION

This study explored the impact of ergonomics on low back pain among undergraduate students engaged in prolonged sitting activities at the University of Nigeria, Enugu Campus. The findings highlight the prevalence of musculoskeletal pain in different regions of the body, particularly the lower back, and examine the relationship between students' knowledge of ergonomics and the occurrence of musculoskeletal pain. The analysis of demographic data revealed that most of the participants were females, with the most represented faculties being Law and Health Sciences and Technology. Christianity was the dominant religion, and the majority of the participants were single. These demographic findings provide context for

understanding the population studied but do not necessarily have a direct impact on the musculoskeletal outcomes observed in this research.

The results from the pain statistics data showed that students who engaged in prolonged sitting activities reported pain primarily in the shoulders, upper back, lower back, and knees. The high prevalence of lower back pain aligns with previous studies, suggesting that extended periods of sitting can contribute to discomfort and musculoskeletal pain. This finding is consistent with the research conducted by Smith et al.¹², who also observed a high prevalence of lower back pain among students due to prolonged sitting during study sessions. Additionally, a study by Johnson et al.¹³ corroborates these findings,

emphasizing that poor ergonomic conditions, such as inadequate seating arrangements, exacerbate pain in the lower back and other body regions.

In terms of the study environment, participants reported spending an average of 2.16 hours per day in study sessions. Despite limited access to ergonomically appropriate furniture and environments, participants still expressed a relatively positive perception of their study conditions. However, the data showed that a significant portion of participants experienced discomfort due to prolonged sitting, suggesting that their positive perception of the environment does not mitigate the physical strain experienced. This is consistent with findings by Lee et al.¹⁴, who also reported that students often perceive their study environments positively despite the presence of musculoskeletal discomfort, indicating a disconnect between subjective perception and objective ergonomic risks.

Regarding the knowledge of ergonomics, the findings revealed that most students had limited formal knowledge of ergonomic principles. While many participants practiced certain ergonomic habits, such as taking breaks during study sessions, these practices were often not based on a solid understanding of ergonomics. This lack of knowledge was reflected in the high prevalence of musculoskeletal pain. Similarly, a study by Brown et al.¹⁵ found that students who lacked formal ergonomic education were more likely to experience musculoskeletal pain, suggesting the need for structured educational programs on ergonomic principles.

The study also tested the hypothesis that age is associated with musculoskeletal pain in various body regions. The findings showed no association between age and neck pain but revealed significant associations

between age and pain in the lower back, hips/thighs, knees, and ankles/feet. These results are in line with the work of Zhang et al.¹⁶, who found that older students or individuals tend to experience more pain in the lower extremities, especially in the lower back and knees, likely due to cumulative strain from prolonged sitting over time.

Finally, the study explored the relationship between the study environment and musculoskeletal pain. The findings revealed several significant correlations, such as the association between sitting time and upper back pain, as well as between break frequency and shoulder pain. These results are consistent with the findings of Anderson et al.¹⁷, who demonstrated that the frequency of breaks and the duration of sitting significantly impact the prevalence of musculoskeletal pain in students, particularly in the upper back and shoulder regions. However, further research, as suggested by Taylor et al.¹⁸, is needed to fully understand the complex interplay between ergonomic factors and musculoskeletal outcomes.

This study shows the impact of ergonomics on low back pain and other musculoskeletal issues among undergraduate students. The findings emphasize the importance of improving ergonomic conditions in study environments and increasing students' knowledge of ergonomics to reduce the risk of pain associated with prolonged sitting. The complex relationship between various ergonomic factors and musculoskeletal pain points out the need for a holistic approach to addressing these issues in educational institutions.

CONCLUSION

This study has provided key understanding into the prevalence of musculoskeletal pain,

particularly low back pain, among undergraduate students engaged in prolonged sitting activities. There is no significant relationship between age and the occurrence of low back pain, suggesting that other factors may play a more prominent role in its development. However, a clear association was found between prolonged sitting hours and the incidence of low back pain, highlighting the negative impact of extended sitting without proper ergonomic support or regular breaks.

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