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Burden and Severity Profile of Low Back Pain and Functional Disability Among University Students with Prolonged Sitting: A Cross-Sectional Study

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ABSTRACT

Background: *Low back pain (LBP) is increasingly reported among university students and may result in functional limitation. Prolonged sitting is common in academic settings, yet symptom severity profiles among prolonged sitters are underreported in local student cohorts. Objective: To determine the burden and severity distribution of low back pain intensity and functional disability among university students with prolonged sitting, and to explore whether sitting duration is associated with pain or disability severity. Methods: A cross-sectional observational study was conducted at the University of Management and Technology, Lahore, using convenience sampling. A total of 120 students aged 20–30 years with acute or chronic LBP were assessed using the Numeric Pain Rating Scale (NPRS) and Oswestry Disability Index (ODI). Sitting duration was categorized as 5–6, 7–8, and 8–9 hours/day. Data were summarized using frequencies and percentages, and Pearson correlation was used to explore associations between sitting duration and NPRS and ODI outcomes. Results: Participants were predominantly female (85.8%) and aged 20–25 years (98.3%). Moderate-to-severe pain (NPRS 4–10) was reported by 81.6% of students, and 46.7% demonstrated ODI ≥21%. Sitting duration showed negligible correlations with NPRS ($r = 0.014$, $p = 0.881$) and ODI ($r = -0.012$, $p = 0.900$). Conclusion: University students with prolonged sitting demonstrated high pain and disability burden, but sitting duration alone was not associated with symptom severity, indicating the likely influence of multifactorial determinants beyond sitting time alone.*

Keywords

low back pain, prolonged sitting, Oswestry Disability Index, Numeric Pain Rating Scale, university students, disability

INTRODUCTION

Low back pain (LBP) is widely recognized as one of the leading contributors to disability and activity limitation globally, with significant personal and societal costs attributable to reduced productivity, healthcare utilization, and impaired quality of life (1,2). Although LBP is traditionally emphasized in older adults and occupational settings, a growing body of evidence indicates that young adults, particularly university students, experience a substantial burden of LBP due to increasingly sedentary learning environments, prolonged screen exposure, and extended sitting during study and lectures (2–4). In student populations, LBP is clinically important because it may interfere with academic performance, reduce participation in physical activity, increase absenteeism, and contribute to psychological distress, creating a cycle of pain, inactivity, and reduced wellbeing (5–7). Importantly, most LBP in young adults is nonspecific, where no definitive structural cause is identified, and symptoms are shaped by biomechanical, behavioral, and psychosocial factors, including sedentary behavior and ergonomics (2,8).

Sedentary behavior, operationalized by sitting time and screen-based tasks, has been repeatedly associated with musculoskeletal symptoms; however, evidence remains heterogeneous due to variation in exposure definitions, population characteristics, and outcome measurement strategies (9,10). Some studies among healthcare and physiotherapy students report high prevalence of LBP with consequences for function and attendance, whereas other studies demonstrate weak or non-significant associations between sitting posture or sitting exposure and pain outcomes (5,6,11). This inconsistency suggests that, while prolonged sitting may be a relevant context in which LBP occurs, the clinical burden of LBP among students may not be adequately characterized by association analysis alone. Instead, a detailed severity profile—covering pain intensity and functional disability—may offer more actionable insight for university health promotion strategies, ergonomic interventions, and early rehabilitation planning. Standardized Patient-Reported Outcome Measures (PROMs), such as the Numeric Pain Rating Scale (NPRS) for pain intensity and the Oswestry Disability Index (ODI) for functional disability, provide clinically interpretable, validated tools to quantify symptom severity and its functional impact (12).

Despite rising concern regarding sedentary academic environments, local evidence in Pakistani university settings quantifying the distribution of LBP severity and disability burden using standardized PROMs remains limited, particularly in general student cohorts. Such evidence is necessary to support prevention programs aimed at reducing disability and improving student quality of life. Therefore, this study aimed to determine the frequency and severity distribution of low back pain intensity and functional disability among university students reporting prolonged daily sitting, and to explore whether sitting duration demonstrated any measurable relationship with pain intensity or disability severity (9,12).

MATERIALS AND METHODS

A cross-sectional observational study was conducted among university students at the University of Management and Technology (UMT), Lahore, Pakistan. Participants were recruited through a convenience sampling approach. Students were informed about the study aims and procedures, and written informed consent was obtained prior to participation. Eligible participants included male and female university students aged 20–30 years who reported low back pain (acute or chronic) and reported prolonged daily sitting within the study's sitting-time categories. Exclusion criteria

included lumbar or lower limb neurological deficits, recent surgical history, pregnancy, history of fracture, vertebral deformity, or any condition likely to substantially influence pain reporting or functional capacity.

The sample size was determined using RaoSoft sample size estimation, yielding a target sample of 120 participants, which was achieved. Data were collected using a structured questionnaire capturing demographics (gender, age group, BMI category), pain duration (acute vs chronic), daily sitting duration (5–6, 7–8, 8–9 hours/day), and outcomes assessed by validated PROMs. Pain intensity was assessed using the Numeric Pain Rating Scale (NPRS), an 11-point scale (0–10), and reported in categories as mild (1–3), moderate (4–6), and severe (7–10) for descriptive interpretation (12). Functional disability was assessed using the Oswestry Disability Index (ODI), a validated measure of LBP-related disability across 10 activity domains, reported as a percentage score and categorized as minimal (0–20%), moderate (21–40%), severe (41–60%), and crippled (61–80%) disability (12).

Data were entered and analyzed using SPSS version 24. Descriptive statistics were presented as frequencies and percentages. Pearson correlation was used as an exploratory analysis to assess the relationship between daily sitting duration and (i) pain intensity and (ii) functional disability, with statistical significance set at $p < 0.05$. Ethical approval was obtained from the university research ethics committee prior to data collection, confidentiality was ensured through anonymized data handling, and participation was voluntary with the right to withdraw at any stage.

RESULTS

A total of 120 students participated. Females constituted the majority (103/120; 85.8%), while males accounted for 17/120 (14.2%). Most participants belonged to the 20–25-year age group (118/120; 98.3%), with only 2/120 (1.7%) aged 26–30 years. With respect to BMI, 62.5% (75/120) had normal BMI, 25.0% (30/120) were underweight, 8.3% (10/120) were overweight, and 4.2% (5/120) were obese. Pain duration was classified as acute in 55.8% (67/120) and chronic in 44.2% (53/120).

Table 1. Demographic and Clinical Characteristics of Participants (N = 120)

Variable	Category	n	%
Gender	Male	17	14.2
	Female	103	85.8
Age group (years)	20–25	118	98.3
	26–30	2	1.7
BMI category	Underweight	30	25.0
	Normal	75	62.5
	Overweight	10	8.3
	Obese	5	4.2
Pain duration	Acute	67	55.8
	Chronic	53	44.2

Table 2. Distribution of Prolonged Sitting Exposure, Pain Severity, and Disability Severity (N = 120)

Domain	Category	n	%
Daily sitting duration	5–6 hours/day	24	20.0
	7–8 hours/day	45	37.5
	8–9 hours/day	51	42.5
NPRS pain severity	Mild (1–3)	22	18.3
	Moderate (4–6)	49	40.8
	Severe (7–10)	49	40.8
ODI disability severity	Minimal (0–20%)	64	53.3
	Moderate (21–40%)	44	36.7
	Severe (41–60%)	10	8.3
	Crippled (61–80%)	2	1.7

Daily sitting exposure was high within the cohort: 80.0% (96/120) reported sitting 7–9 hours/day, and the most common sitting category was 8–9 hours/day (51/120; 42.5%). Pain severity distribution indicated a substantial burden of clinically relevant symptoms, as 81.6% (98/120) reported moderate-to-severe pain on NPRS (scores 4–10). Mild pain was reported by 18.3% (22/120), while both moderate and severe pain were each reported by 40.8% (49/120) of participants. Functional disability assessed by ODI showed that although 53.3% (64/120) were classified as minimal disability, nearly half of the participants (46.7% (56/120)) had disability levels ≥21%, including 36.7% (44/120) with moderate disability, 8.3% (10/120) with severe disability, and 1.7% (2/120) with crippled disability. Thus, the cohort exhibited high pain severity despite a disability distribution that was predominantly minimal-to-moderate.

Table 3. Exploratory Association Between Sitting Duration and Symptom Burden (Pearson Correlation, N = 120)

Exposure	Outcome	Pearson r	p-value (2-tailed)
Sitting duration	NPRS pain severity	0.014	0.881
Sitting duration	ODI disability severity	−0.012	0.900

In exploratory analyses, sitting duration demonstrated a negligible correlation with NPRS pain severity ($r = 0.014$) and was not statistically significant ($p = 0.881$). Similarly, sitting duration had an almost zero correlation with ODI disability severity ($r = −0.012$) and was not statistically significant ($p = 0.900$). These results suggest that within this sample—where prolonged sitting exposure was common—the burden of pain and disability was high, but sitting duration alone did not show a measurable linear association with pain intensity or disability severity.

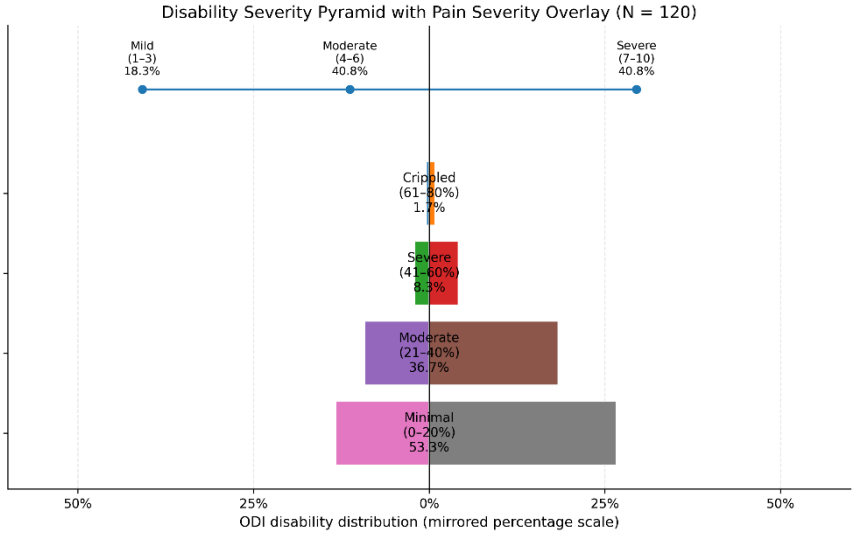

Figure 1 Disability Severity Pyramid with Pain Severity Overlay (N = 120)

The disability severity pyramid demonstrates that most students were classified as minimal disability (53.3%), followed by moderate disability (36.7%), while smaller proportions reported severe disability (8.3%) and crippled disability (1.7%), indicating that 10.0% of participants experienced severe-to-crippling functional limitation. In contrast, the pain severity overlay shows a pronounced shift toward higher symptom intensity, with 81.6% of students reporting moderate-to-severe pain on the NPRS, distributed equally as moderate (40.8%) and severe (40.8%), while only 18.3% reported mild pain. Collectively, the figure highlights an important clinical pattern in this cohort: high pain intensity is common even when disability remains predominantly minimal-to-moderate, suggesting that functional limitation does not necessarily mirror pain severity in prolonged-sitting university students and reinforcing the need for multidimensional assessment and intervention.

DISCUSSION

This cross-sectional study characterized the burden and severity distribution of low back pain intensity and functional disability among university students reporting prolonged daily sitting at a large private university in Lahore. The findings demonstrated a substantial symptom burden: 81.6% of participants reported moderate-to-severe pain on the NPRS and 46.7% reported at least moderate disability (ODI ≥21%). Although the majority were classified as minimal disability (53.3%), the proportion with severe-to-crippled disability (10.0%) indicates a clinically relevant subgroup at risk of meaningful functional limitation. These results reinforce that LBP in university populations is not merely episodic discomfort but frequently manifests with symptom severity sufficient to affect daily activities and functioning (1,2,8).

A key interpretive point is that, despite high pain and disability prevalence, daily sitting duration did not demonstrate a measurable linear relationship with NPRS or ODI outcomes in this sample (r values near zero; $p > 0.05$). This finding underscores the importance of avoiding oversimplified explanations of student LBP that rely on total sitting hours alone. The lack of association may reflect the multifactorial nature of nonspecific LBP, where symptom expression is influenced by multiple interacting domains including physical activity levels, muscular endurance, ergonomic setup, psychosocial stress, sleep quality, and pain sensitization mechanisms rather than exposure duration alone (2,4,9). Moreover, the range of sitting exposure was relatively restricted, with 80% of students reporting sitting 7–9 hours/day, which limits variability and can attenuate association estimates due to range restriction. In such contexts, differences in sitting patterns—such as sustained uninterrupted sitting, frequency of micro-breaks, or postural variability—may exert greater influence than total sitting time but were not captured within the available dataset (9,10).

The symptom pattern observed in this cohort is consistent with prior research indicating that students, particularly healthcare or medically oriented cohorts, experience high LBP prevalence and report meaningful functional effects. Regional studies among physiotherapy and healthcare students have reported high LBP frequencies with consequences including reduced leisure activity, absenteeism, and impaired daily task performance (5,6,11). Similarly, international reports show that LBP is common among medical and health sciences students, with potential contributions from prolonged academic sitting, stress, irregular sleep, and reduced physical activity (12,13). While some studies have reported significant associations between prolonged sitting and LBP, systematic review evidence emphasizes heterogeneity and suggests that sedentary behavior is associated with increased LBP risk at the population level, but the strength and consistency of associations vary based on measurement methods and confounding adjustment (9). In other words, prolonged sitting may represent a contextual exposure for student LBP, but not necessarily a direct linear predictor of pain intensity or disability severity when examined in isolation.

From a practical perspective, the high burden of moderate-to-severe pain in this cohort indicates a need for university-centered prevention and management strategies regardless of whether a statistically significant sitting–outcome association is observed. Multi-component interventions—including ergonomic education, structured active breaks, progressive strengthening of trunk musculature, and promotion of physical activity—have shown promise in reducing musculoskeletal strain and discomfort in prolonged-sitting populations and may be adapted for university environments (10,14). The present findings support a shift toward integrated student health approaches that address multiple determinants of LBP rather than focusing solely on reducing sitting time. Additionally, because the sample was predominantly female (85.8%), future studies should explore sex-stratified symptom profiles and potential gender-specific risk patterns, particularly in relation to pain perception, physical activity behaviors, and psychosocial stressors (2,9,11).

Several limitations should be considered when interpreting these findings. The cross-sectional design precludes inference regarding temporality or causation. The study relied on convenience sampling from a single university, limiting generalizability to broader student populations. Sitting exposure was self-reported and categorized, which may introduce misclassification bias. Potential confounding variables such as physical activity

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level, ergonomic conditions, mental stress, sleep duration, smoking, and prior injury were not measured or adjusted for, which may partly explain the absence of association between sitting duration and outcomes. Future longitudinal research incorporating objective sedentary behavior measurement (e.g., accelerometry), detailed ergonomic assessment, and multivariable modeling is recommended to clarify determinants of student LBP severity and disability and to identify modifiable targets for prevention (9,10,15).

CONCLUSION

Among university students reporting prolonged daily sitting, low back pain burden was substantial, with most participants experiencing moderate-to-severe pain and nearly half demonstrating at least moderate functional disability; however, sitting duration within the observed range was not significantly associated with pain intensity or disability severity, suggesting that student low back pain is likely influenced by multifactorial determinants beyond total sitting time alone and warrants comprehensive prevention and management strategies.

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