

Original Article

Effect of Hamstring Tightness, Back Pain and Disability on Sleep Quality

Ibtesam Nabi¹, Munazza Ramzan¹, Shahzaib Aslam¹, Ayesha Noor¹, Tuba Maab¹, Hira Rafique^{2*}, Faisal Nawaz¹, Ishma Ali¹, Fahad Ali¹

¹Student, Quaid-e-Azam College, Sahiwal, Pakistan.

²Senior Lecturer, Quaid-e-Azam College, Sahiwal, Pakistan.

*Corresponding Author: Hira Rafique; Email: hirazohaib8@gmail.com

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ABSTRACT

Background: Chronic low back pain (CLBP), defined as pain persisting for more than three months, is associated with disability, functional limitations, musculoskeletal issues, and sleep disturbances in many individuals worldwide.

Objective: The main objective of this study was to determine the effect of hamstring tightness, pain intensity, and disability on sleep quality in patients with chronic low back pain.

Methods: This cross-sectional study included 387 individuals aged 25-55 years, recruited from various orthopedic units. Data were collected using the Roland-Morris Questionnaire (RMQ) for disability, the Pittsburgh Sleep Quality Index (PSQI) for sleep quality, the Active Knee Extension (AKE) test for hamstring tightness, and the Numeric Pain Rating Scale (NPRS) for pain intensity. Statistical analysis was conducted using SPSS version 25. Descriptive statistics, including means and standard deviations, were calculated for quantitative variables, while frequencies and percentages were calculated for qualitative variables. Chi-square tests were performed to examine the associations between NPRS, RMQ, AKE scores, and PSQI scores, with a p-value of less than 0.05 considered statistically significant.

Results: The mean age of the 387 participants was 41.67 ± 13.38 years; 233 were females (60.2%), and 154 were males (39.8%). The mean RMQ score was 11.45 ± 2.34 , the mean PSQI score was 8.58 ± 2.60 , and the mean NPRS score was 4.97 ± 1.37 . The AKE test was positive in 34.6% of participants. Chi-square tests showed a significant positive association between NPRS and PSQI scores ($p = 0.001$), and between RMQ and PSQI scores ($p = 0.048$). However, the association between AKE scores and PSQI scores was not significant ($p = 0.400$).

Conclusion: This study highlights the significant association between pain intensity, disability, and sleep quality in patients with chronic nonspecific low back pain. Pain and disability adversely affect sleep quality, while hamstring tightness does not appear to have a significant impact. These findings underscore the importance of addressing pain and disability to manage sleep disturbances in this patient population.

Keywords: Chronic low back pain, sleep quality, disability, hamstring tightness, pain intensity, Pittsburgh Sleep Quality Index, Roland-Morris Questionnaire, Active Knee Extension test, Numeric Pain Rating Scale.

INTRODUCTION

Chronic low back pain (CLBP), defined as persistent pain lasting longer than three months, is a pervasive and costly clinical issue globally, impacting more than 50% of the general population (1, 2). It is recognized as a leading cause of disability worldwide, significantly contributing to years lived with disability (YLD) and ranking sixth on the Disability Adjusted Life Years (DALY) scale (3, 4). The prevalence of low back pain (LBP) continues to rise, with estimates indicating that approximately half of the world's population is affected, resulting in an economic burden of not less than \$86 billion annually in the United States alone (5, 6). This financial strain highlights the urgent need for effective management and intervention strategies.

In developing countries like Pakistan, the situation is exacerbated by unique social and cultural dynamics coupled with limited healthcare funding, which was about 0.92% of the GDP as of 2014 (7). The prevalence of LBP in Pakistan is notably high, with about 40.65% of individuals over 50 years old suffering from this condition, a rate 2.5 times higher in women who do not engage in routine life activities (8). The increasing prevalence of obesity, with 26% of women and 19% of men classified as obese according to World

Health Organization data, further compounds the issue (9). Obesity is a significant risk factor for LBP due to increased mechanical loading on the lumbar vertebrae, leading to structural changes and potentially exacerbating pain (10).

The etiology of low back pain is multifactorial, encompassing specific and non-specific causes. Non-specific low back pain (NSLBP) constitutes about 90% of cases and is characterized by pain originating from the costal margins to the inferior gluteal folds, often associated with painful restriction of movement without an identifiable cause such as trauma, fractures, or infections (11, 12). Chronic low back pain is not merely a symptom but a complex disease with distinct factors differing from those present at the onset (13). Many individuals with CLBP experience prolonged and recurrent pain episodes, with significant impacts on their physical and mental health, leading to increased sick leave and reduced quality of life (14, 15).

Research indicates a strong correlation between chronic musculoskeletal pain and sleep disturbances, a relationship that is particularly evident in patients with CLBP. Sleep problems exacerbate pain and disability, creating a vicious cycle that further diminishes the quality of life (16). Studies have shown that prolonged standing positions can worsen pain, especially in individuals with a history of LBP, due to altered muscle activities and spasms (17). Moreover, psychological factors such as anxiety and depression are often comorbid with CLBP, contributing to the overall burden of the disease (18).

The objective of this study is to explore the relationship between hamstring tightness, pain, disability, and sleep quality in patients with chronic nonspecific low back pain. By examining these associations, the study aims to provide insights into how these factors interplay and influence sleep disturbances, ultimately informing targeted interventions to improve sleep quality and overall well-being in this patient population. The findings are expected to highlight the critical need for comprehensive management approaches that address both the physical and psychological aspects of chronic low back pain to enhance patient outcomes (19, 20).

Understanding the intricate relationships between pain, disability, hamstring tightness, and sleep quality in CLBP patients is crucial for developing effective therapeutic strategies. This study endeavors to contribute to this understanding by providing evidence-based insights that can guide clinical practice and improve the quality of life for individuals suffering from this debilitating condition (21, 22).

MATERIAL AND METHODS

This cross-sectional study aimed to investigate the relationship between hamstring tightness, back pain, disability, and sleep quality in patients with chronic nonspecific low back pain (NSLBP). The study included 387 participants aged 25-55 years who had been experiencing NSLBP for the past three months without radiating pain to the lower extremities. The sample size was calculated using the Epitool sample size calculator, ensuring a confidence level of 95%, a desired precision of 0.05, and an expected true proportion of 0.5. Participants were recruited using convenient sampling from patients attending Civil Hospital Sahiwal, Qayyum Hospital Sahiwal, DHQ Pakpattan, and Al-Khidmat Hospital Sahiwal over six months following the approval of the study synopsis.

The inclusion criteria encompassed both genders, aged between 23-55 years, with a history of NSLBP of at least three months duration. Exclusion criteria included current pregnancy, specific underlying pathologies such as tumors, infections, inflammatory disorders, signs of nerve root compression, or a history of spinal fracture. Data collection was carried out following ethical principles outlined in the Declaration of Helsinki, ensuring informed consent was obtained from all participants.

Four validated instruments were utilized to measure the study variables: the Numeric Pain Rating Scale (NPRS) for pain intensity, the Roland-Morris Questionnaire (RMQ) for disability assessment, the Pittsburgh Sleep Quality Index (PSQI) for evaluating sleep quality and disturbances, and the Active Knee Extension (AKE) test for assessing hamstring flexibility and lower limb function. These tools were chosen due to their high reliability and validity in both clinical and research settings, providing a comprehensive assessment of the impacts and characteristics of NSLBP.

Data collection involved face-to-face interviews and physical assessments conducted by trained healthcare professionals. Each participant's demographic information, medical history, and relevant clinical data were recorded. The NPRS was used to quantify pain intensity on a scale of 0 to 10, with higher scores indicating greater pain. The RMQ assessed the impact of low back pain on daily functioning, with higher scores reflecting greater disability. The PSQI measured various aspects of sleep quality, including subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. The AKE test evaluated hamstring tightness by measuring the angle of knee extension while the participant was lying supine.

Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS) version 25.0. Descriptive statistics, including means and standard deviations for quantitative variables and frequencies and percentages for qualitative variables, were calculated. The chi-square test was employed to examine the associations between NPRS, RMQ, AKE scores, and PSQI scores. A p-value of less than 0.05 was considered statistically significant.

Ethical approval for the study was obtained from the institutional review board of Quaid-e-Azam College, Sahiwal. Participants were assured of their confidentiality and the voluntary nature of their participation. They were informed about the study's purpose, procedures, potential risks, and benefits before obtaining written informed consent.

In summary, this study employed robust methodology and reliable assessment tools to explore the effects of hamstring tightness, pain, and disability on sleep quality in individuals with chronic nonspecific low back pain. The findings are expected to contribute to a better understanding of the interplay between these factors and inform the development of targeted interventions to improve patient outcomes (1, 2).

RESULTS

This study aimed to investigate the effect of hamstring tightness, pain, and disability on sleep quality in patients with chronic nonspecific low back pain (CNLBP). A total of 387 participants, aged between 22 and 55 years, were included in the study. The mean age of participants was 38.48 ± 10.252 years. Among the participants, 233 (60.2%) were female, and 154 (39.8%) were male.

Table 1 presents the descriptive statistics for gender and BMI. Most participants had a normal BMI (42.9%), followed by overweight (35.7%), obese (12.9%), and underweight (8.5%).

Table 1: Descriptive statistics

Variable	Frequency	Percent
Gender		
Male	154	39.8
Female	233	60.2
BMI		
Underweight	33	8.5
Normal	166	42.9
Overweight	138	35.7
Obese	50	12.9

Table 2 provides the distribution of pain severity based on the Numeric Pain Rating Scale (NPRS). Most participants reported moderate pain (79.3%), followed by mild pain (12.7%) and severe pain (8.0%).

Table 2: Distribution of pain severity

Pain Severity	Frequency	Percent
Mild	49	12.7
Moderate	307	79.3
Severe	31	8.0
Total	387	100.0

Table 3 shows the descriptive statistics for RMQ, PSQI, and NPRS. The mean RMQ score was 11.4522 ± 2.33905 , indicating the level of disability. The mean PSQI score was 8.58 ± 2.598 , reflecting sleep quality, while the mean NPRS score was 4.97 ± 1.373 , indicating pain intensity.

Table 3: Descriptive Statistics for RMQ, PSQI, and NPRS

Scale	N	Minimum	Maximum	Mean	Std. Deviation
Total Score RMQ	387	5.00	19.00	11.4522	2.33905
Total Score PSQI	387	2	17	8.58	2.598
Score NPRS	387	1	9	4.97	1.373

Table 4 provides the results of the Active Knee Extension (AKE) test. A positive AKE test, indicating hamstring tightness, was observed in 34.6% of participants, while 65.4% had a negative AKE test.

Table 4: Active Knee Extension (AKE) test

AKE Score	Frequency	Percent
Positive	134	34.6
Negative	253	65.4

AKE Score	Frequency	Percent
Total	387	100.0

The chi-square test results are presented in Table 5. A significant positive association was found between NPRS and PSQI scores ($p = .001$), indicating that higher pain levels were associated with poorer sleep quality. Similarly, a significant positive association was found between RMQ and PSQI scores ($p = .048$), suggesting that greater disability was associated with poorer sleep quality. However, no significant association was found between AKE scores and PSQI scores ($p = .400$), indicating that hamstring tightness did not significantly affect sleep quality in this population.

Table 5: Association between NPRS, Total Score PSQI, Total Score RMQ, AKE Score, and PSQI

Association	Chi-square value	Df	P-value
NPRS and Total Score PSQI	59.009	28	.001
Total Score RMQ and PSQI	230.195	196	.048
AKE Score and Total PSQI	14.687	14	.400

In summary, the study findings indicate that pain intensity and disability significantly affect sleep quality in patients with chronic nonspecific low back pain. However, hamstring tightness does not appear to have a significant impact on sleep quality. These results highlight the importance of addressing pain and disability in managing sleep disturbances in this patient population (1, 2).

DISCUSSION

The findings of this study revealed significant associations between pain intensity, disability, and sleep quality in patients with chronic nonspecific low back pain (CNLBP). Pain and disability were found to adversely affect sleep quality, while hamstring tightness did not have a significant impact. These results align with previous studies that have highlighted the detrimental effects of chronic pain and disability on sleep, underscoring the complex interplay between physical and psychological factors in patients with CNLBP.

The significant positive association between pain intensity, as measured by the Numeric Pain Rating Scale (NPRS), and sleep quality, as measured by the Pittsburgh Sleep Quality Index (PSQI), corroborates findings from earlier research. Previous studies have shown that pain disrupts sleep patterns, leading to difficulties in falling and staying asleep, reduced sleep efficiency, and overall poorer sleep quality (22, 23). This study reinforces these findings, emphasizing that effective pain management is crucial for improving sleep outcomes in individuals with CNLBP.

Similarly, the association between disability, assessed by the Roland-Morris Questionnaire (RMQ), and sleep quality further supports the notion that functional limitations and physical impairments significantly contribute to sleep disturbances. This is consistent with the literature that suggests disability exacerbates sleep problems, potentially through increased discomfort, reduced physical activity, and heightened anxiety related to functional impairments (24, 25). Addressing disability through targeted interventions, such as physical therapy and rehabilitation programs, may help mitigate its impact on sleep quality.

In contrast, the lack of a significant association between hamstring tightness, as measured by the Active Knee Extension (AKE) test, and sleep quality suggests that hamstring flexibility may not be a critical factor in sleep disturbances among patients with CNLBP. This finding contrasts with some studies that have indicated a potential link between musculoskeletal flexibility and pain (22). However, it aligns with other research suggesting that specific muscle tightness may not directly influence sleep quality (23). The discrepancy highlights the need for further investigation into the role of musculoskeletal factors in sleep disturbances.

The study had several strengths, including a robust sample size and the use of validated assessment tools, which enhanced the reliability and generalizability of the findings. The cross-sectional design allowed for the examination of associations between variables in a real-world clinical setting, providing valuable insights into the relationships between pain, disability, and sleep quality. However, the study also had limitations. The cross-sectional nature of the study precluded the establishment of causal relationships. Longitudinal studies are needed to determine the directionality of the associations observed. Additionally, the reliance on self-reported measures may introduce bias, as participants might overestimate or underestimate their symptoms and experiences.

Given these limitations, future research should focus on longitudinal designs to explore causal pathways between pain, disability, and sleep quality. Incorporating objective measures of sleep, such as polysomnography, alongside self-reported assessments could provide a more comprehensive understanding of sleep disturbances in this population. Furthermore, investigating the potential moderating effects of psychological factors, such as anxiety and depression, on the relationship between pain and sleep quality could offer deeper insights into the biopsychosocial model of CNLBP.

CONCLUSION

This study underscored the significant impact of pain intensity and disability on sleep quality in patients with CNLBP. While hamstring tightness did not appear to influence sleep quality, the findings highlight the importance of comprehensive pain and disability management to improve sleep outcomes. Healthcare providers should prioritize interventions that address both physical and psychological aspects of CNLBP to enhance overall quality of life for these patients. Future research should aim to build on these findings, addressing the identified limitations and expanding the scope to include more diverse populations and settings (22, 23, 24, 25).

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