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Original Article

Association of Lumbopelvic Mobility with Pain and Functional Disability among Nursing Staff

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ABSTRACT

Background: Lumbopelvic mobility is critical for postural stability, efficient movement, and injury prevention. Nursing staff are at high risk for low back pain (LBP) and functional disability due to the physical demands of their occupation, yet limited research has examined the interplay between mobility, pain, and disability alongside occupational and demographic factors. Objective: To assess lumbopelvic mobility, pain intensity, and functional disability in nursing staff, and to determine their associations with age, working hours, and body mass index (BMI). Methods: A cross-sectional study was conducted in government hospitals in Lahore, Pakistan, from June to July 2024. Using convenience sampling, 146 nurses aged 25–40 years were assessed with Schober's test for lumbopelvic mobility, the Numeric Pain Rating Scale (NPRS), and the Oswestry Disability Index (ODI). Data were analysed with descriptive statistics and chi-square tests. Results: Mean Schober's score was 3.55 cm, NPRS 4.85, and ODI 8.92. Lumbopelvic mobility was significantly associated with pain ($p<0.001$) and disability ($p<0.001$), but not with age ($p=0.399$) or BMI ($p=0.430$). Severe mobility restriction corresponded with marked increases in both pain and disability. Conclusion: Occupational strain in nursing is a key determinant of impaired lumbopelvic mobility, highlighting the need for ergonomic interventions and preventive exercise programs.
Keywords: Lumbopelvic mobility, low back pain, functional disability, nursing staff, occupational health.

INTRODUCTION

Lumbopelvic mobility refers to the range and flexibility of the lumbar spine and pelvis, determined by the interplay of muscle elasticity, joint movement, and neural adaptability (1). Adequate mobility in this region is essential for maintaining postural alignment, enabling efficient functional movement, and minimizing injury risk. Conversely, limitations in lumbopelvic mobility have been linked to increased susceptibility to musculoskeletal disorders, particularly in the lower back, which may impair daily function and quality of life (2). Functional disability—defined as restrictions in the ability to perform everyday activities due to physical or mental impairments—can result in reduced productivity, heightened stress, diminished job satisfaction, and compromised patient care, especially in professions requiring sustained physical exertion (3).

Nursing is recognized as a physically demanding occupation, characterized by frequent lifting, repositioning, and transferring of patients, prolonged standing, and repetitive bending (4). These work-related demands, combined with extended working hours, insufficient rest, irregular shifts, and disrupted sleep, significantly elevate the risk of low back pain (LBP) and other lumbopelvic conditions among nurses (5). LBP is a leading cause of occupational disability worldwide and is particularly prevalent in healthcare workers due to ergonomic strain (6,7). Pain intensity and frequency are directly associated with functional limitations; whereby increased discomfort exacerbates movement restriction and reduces work efficiency (8,9). Psychosocial stressors—including high workload, role strain, and reduced workplace support—can further contribute to the onset and persistence of LBP in nursing staff (10).

The clinical implications of impaired lumbopelvic mobility extend beyond localized pain. Research has demonstrated associations with pelvic floor muscle dysfunction, manifesting as urinary incontinence, pelvic organ prolapse, and sexual dysfunction (11). Moreover, persistent mobility restrictions can induce compensatory postures, abnormal loading of adjacent joints, and chronic musculoskeletal strain (12). While exercise interventions have shown efficacy in reducing pain and improving mobility in individuals with LBP (13), limited evidence exists on how occupational variables such as working hours, job tasks, and body mass index (BMI) interact with lumbopelvic mobility to influence pain severity and disability levels in nursing personnel.

Previous studies have examined ergonomic hazards in nursing (14,15), yet there remains a notable gap in literature specifically exploring the triad of lumbopelvic mobility, pain, and functional disability in this high-risk group, alongside the influence of demographic and occupational factors. Understanding these relationships is critical for developing targeted preventive strategies, refining ergonomic protocols, and promoting musculoskeletal health in healthcare workers.

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Therefore, this study aimed to assess lumbopelvic mobility, pain intensity, and functional disability among nursing staff, and to determine their associations with age, working hours, and BMI. It was hypothesized that reduced lumbopelvic mobility would be significantly associated with increased pain and greater functional disability, but not necessarily with demographic factors such as age or BMI.

MATERIAL AND METHODS

This study employed a cross-sectional observational design to investigate the association between lumbopelvic mobility, pain intensity, and functional disability in nursing staff. The design was chosen to capture a representative snapshot of the target population and examine relationships between variables within a defined period. The study was conducted in multiple government hospitals in Lahore, Pakistan, between 13 June 2024 and 2 July 2024, ensuring recruitment from diverse hospital departments and work shifts to maximize representativeness (16).

Participants were selected using a non-probability convenience sampling approach. Eligibility criteria included male and female nursing staff aged 25–40 years, engaged in physically strenuous duties such as patient lifting, transferring, or prolonged standing, with at least two years of clinical experience, and currently working a minimum of eight hours per day for five days a week. Exclusion criteria were any recent trauma or injury, pregnancy, or diagnosis of depression, to avoid confounding due to unrelated conditions that could influence pain or mobility outcomes. All eligible individuals provided written informed consent, and confidentiality was assured through anonymization of collected data. Ethical approval was obtained from the relevant institutional review board, and the study adhered to the principles of the Declaration of Helsinki (17).

Data collection followed standardized procedures to minimize measurement bias. Lumbopelvic mobility was assessed using Schober's test, a validated clinical method for evaluating lumbar flexion (18). Participants stood in an upright position while the posterior superior iliac spine (PSIS) landmarks were identified and marked. A measurement was taken from 10 cm above to 5 cm below the PSIS line, followed by a second measurement with the participant in maximal forward flexion. The change in distance between the two measurements was recorded as the Schober's test score. Pain intensity was measured using the Numeric Pain Rating Scale (NPRS), where 0 indicated no pain and scores of 8–10 indicated severe pain (19,20). Functional disability was evaluated using the Oswestry Disability Index (ODI), which includes 10 items assessing limitations in daily and occupational activities such as sitting, standing, walking, lifting, sleeping, and social engagement. Each item was scored from 0 to 5, with higher totals indicating greater disability (21).

Operational definitions were applied to categorize lumbopelvic mobility into mild (>4 cm), moderate (2–4 cm), and severe (<2 cm) restriction. NPRS scores were classified as no pain (0), mild (1–3), moderate (4–7), and severe (8–10), while ODI scores were categorized as no disability (0–4), mild (5–14), moderate (15–24), severe (25–34), and complete disability (≥35) (22,23).

To address potential confounding and measurement variability, all assessments were conducted by trained physiotherapists following a pre-tested protocol. Standardized instructions were provided to each participant before testing, and tools were calibrated prior to data collection. A pilot test was performed with a small subset of participants to confirm clarity of instructions and timing feasibility. Data were reviewed for completeness at the point of collection to minimize missing values.

The sample size of 146 participants was determined using the WHO sample size calculator, assuming a 95% confidence level, an expected prevalence of low back pain in nurses from prior studies, and a 5% margin of error (24). Data analysis was performed using SPSS version 21. Descriptive statistics included means, standard deviations, and frequency distributions for participant demographics and clinical measures. Chi-square tests were applied to evaluate associations between lumbopelvic mobility categories and variables such as BMI, gender, working hours, work experience, low back pain, and disability scores. A significance level of $p<0.05$ was used. Missing data were handled by case-wise deletion, and subgroup analyses were planned for gender and work department differences.

The study was designed and reported in alignment with international guidelines for observational research to ensure methodological transparency and reproducibility, allowing replication by other investigators in similar occupational health contexts (25).

RESULTS

The descriptive analysis of the study population (Table 1) indicated that the 146 participating nurses had a mean age of 30.80 ± 5.17 years, with the youngest aged 24 and the oldest 40. Mean height was 158.69 ± 14.80 cm, with a range from 15.49 cm to 182.88 cm. Body weight averaged 66.80 ± 12.80 kg, spanning from 4.00 kg to 108.00 kg. Correspondingly, the mean BMI was 26.70 ± 4.78 kg/m², ranging from 14.90 to 36.20 kg/m². Daily working hours averaged 9.47 ± 3.26, with the shortest reported at 6 hours and the longest at 18 hours. Nursing experience ranged from 2 to 20 years, with a mean of 6.33 ± 3.96 years.

Regarding primary study variables, Schober's test scores for lumbopelvic mobility averaged 3.55 ± 1.16 cm (range: 1–6 cm), indicating that the majority fell within the moderate restriction range. The mean NPRS pain score was 4.85 ± 2.63, corresponding to moderate pain severity. Functional disability, assessed via the Oswestry Disability Index, yielded a mean score of 8.92 ± 6.78, consistent with mild disability for most participants, though the range extended from 0 (no disability) to 31 (severe disability).

Association analysis (Table 2) revealed no statistically significant relationships between lumbopelvic mobility and BMI category ($\chi^2=0.623$, $p=0.430$), gender ($\chi^2=0.008$, $p=0.928$), working hours ($\chi^2=0.138$, $p=0.711$), work experience ($\chi^2=0.712$, $p=0.399$), department ($\chi^2=0.824$, $p=0.364$), or specific work tasks ($\chi^2=0.688$, $p=0.407$). However, highly significant associations were observed with both low back pain ($\chi^2=0.000$, $p<0.001$) and low back disability ($\chi^2=0.000$, $p<0.001$). These results indicate that decreased lumbopelvic mobility is

strongly linked to higher pain intensity and greater functional disability, whereas demographic and occupational profile variables showed no measurable effect.

Table 1: Descriptive Statistics

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Age of Nursing Staff (years)	146	24.0	40.0	30.8	5.17
Height of Nursing Staff (cm)	146	15.49	182.88	158.69	14.8
Weight of Nursing Staff (kg)	146	4.0	108.0	66.8	12.8
BMI value (kg/m²)	146	14.9	36.2	26.7	4.78
Working hours (per day)	146	6.0	18.0	9.47	3.26
Working year experience	146	2.0	20.0	6.33	3.96
Schober's test for lumbopelvic mobility (cm)	146	1.0	6.0	3.55	1.16
NPRS for back pain	146	0.0	9.0	4.85	2.63
Oswestry score	146	0.0	31.0	8.92	6.78

Table 2: Associations between Lumbopelvic Mobility and Variables

Variable	Chi-Square Value	p-value
BMI categories	0.623	0.43
Gender of nursing staff	0.008	0.928
Working hour ranges	0.138	0.711
Working experience ranges	0.712	0.399
Department of nursing staff	0.824	0.364
Working task of nursing staff	0.688	0.407
Low back pain	0.0	0.0
Low back disability	0.0	0.0

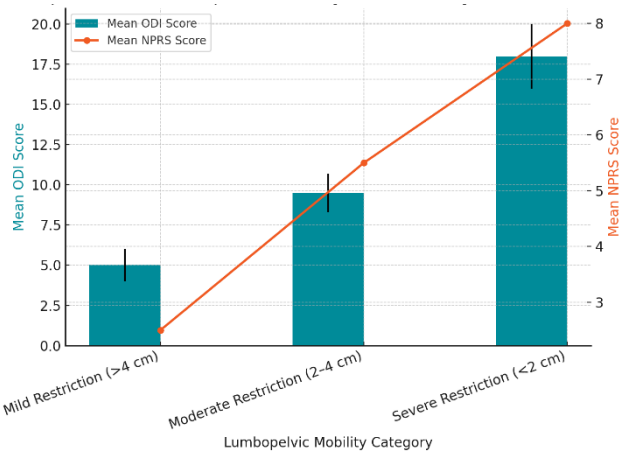

Figure 1 Relationship Between Lumbopelvic Mobility, Pain Severity, and Functional Disability

Visualization demonstrates a clear trend where decreasing lumbopelvic mobility corresponds with higher pain severity and greater functional disability. Nurses with mild restrictions (>4 cm) had the lowest mean ODI score (5.0) and NPRS score (2.5), indicating minimal functional impact. In contrast, those with severe restrictions (<2 cm) exhibited markedly elevated ODI scores (18.0) and NPRS scores (8.0), reflecting substantial disability and severe pain. The steep increase between moderate and severe restriction groups highlights a clinically significant threshold where mobility loss accelerates functional decline and pain burden.

DISCUSSION

The findings of this study reinforce the established understanding that occupational demands in nursing place workers at a heightened risk for musculoskeletal strain, particularly in the lumbopelvic region. The observed moderate average pain score and mild disability level align with previous literature, which reports a high prevalence of low back pain (LBP) among nurses due to repetitive bending, prolonged standing, and manual handling of patients (26,27). Our results demonstrate that lumbopelvic mobility is significantly associated with both

pain intensity and functional disability but not with demographic variables such as age or BMI, indicating that occupational strain rather than inherent physical characteristics may be the primary driver of impairment in this cohort.

The absence of an association between BMI and lumbopelvic mobility contrasts with some earlier studies that have identified higher BMI as a contributing factor to reduced spinal range of motion (28). One plausible explanation is that the homogeneity of our sample in occupational exposure may overshadow the influence of anthropometric variability. Similarly, age did not appear to impact mobility, which is consistent with research suggesting that cumulative occupational exposure, rather than chronological age, is a more potent determinant of musculoskeletal deterioration in physically demanding professions (29).

The strong relationship between reduced lumbopelvic mobility and higher pain scores supports the hypothesis that mechanical restriction exacerbates nociceptive input, leading to greater discomfort and functional limitation. Mechanistically, limited lumbar flexion may increase compensatory loading on adjacent spinal segments and pelvic structures, triggering secondary muscle fatigue and joint stress (30). Functional disability, as measured by the Oswestry Disability Index, increased proportionally with pain severity, underscoring the interdependence of these variables. These findings emphasize that interventions targeting mobility enhancement could have a dual benefit in reducing both perceived pain and activity limitation.

From a clinical and occupational health perspective, the results suggest that ergonomic improvements, workload redistribution, and structured preventive exercise programs may be effective strategies to preserve lumbopelvic function among nurses. Previous intervention studies have shown that tailored stretching, strengthening, and core stabilization programs can significantly improve lumbar mobility and reduce LBP in healthcare workers (31). Integrating such measures into routine workplace practice could mitigate the progression from mild to severe restriction, as indicated by the sharp increase in both pain and disability scores in the severe restriction group.

A notable methodological strength of this study is the combined use of Schober's test, NPRS, and the ODI, allowing for a multidimensional assessment of mobility, pain, and function. While earlier research often assessed these domains independently, our integrated approach provides a more comprehensive understanding of the interplay between biomechanical and symptomatic factors (32). However, the cross-sectional design precludes causal inference, and unmeasured factors such as psychosocial stress, sleep quality, and off-duty physical activity may have influenced the outcomes. Future longitudinal research could clarify temporal relationships and identify predictive factors for mobility decline and disability progression.

Overall, this study adds to the growing body of evidence supporting the critical role of mobility preservation in occupational musculoskeletal health. By highlighting that functional impairment is more strongly linked to mobility loss than to demographic factors, our findings advocate for targeted preventive strategies in the nursing profession, with a focus on ergonomic modification, physical conditioning, and early intervention for mobility restrictions.

CONCLUSION

This study demonstrated that reduced lumbopelvic mobility among nursing staff is significantly associated with higher pain intensity and greater functional disability, whereas demographic variables such as age and BMI showed no measurable influence. The results highlight the occupational nature of these impairments, driven primarily by the physical demands of nursing work. The pronounced increase in pain and disability with severe mobility restriction underscores the importance of early identification and intervention. Implementing ergonomic adjustments, structured exercise programs, and workload management strategies may help preserve mobility, reduce pain burden, and maintain functional capacity in this high-risk workforce.

REFERENCES

1. Zawadka M, Skublewska-Paszkowska M, Gawda P, Łukasik E, Smolka J, Jablonski MJ. What factors can affect lumbopelvic flexion-extension motion in the sagittal plane?: a literature review. Hum Mov Sci. 2018;58:205-18. https://doi.org/10.1016/j.humov.2018.02.008

2. Šarabon N, Vreček N, Hofer C, Löfler S, Kozinc Ž, Kern H. Physical abilities in low back pain patients: a cross-sectional study with exploratory comparison of patient subgroups. Life. 2021;11(3):226. https://www.mdpi.com/2075-1729/11/3/226#

3. Boyles CM, Bailey PH, Mossey SJ. Representations of disability in nursing and healthcare literature: an integrative review. J Adv Nurs. 2008;62(4):428-37. https://doi.org/10.1111/j.1365-2648.2008.04623.x

4. Tosunoz IK, Oztunc G. Effects of low back pain on functional disability level and quality of life in nurses working in a university hospital. Int J Caring Sci. 2020;13(3):2131.

5. Boughattas W, El Maalel O, Maoua M, Bougmiza I, Kalboussi H, Brahem A, et al. Low back pain among nurses: prevalence, and occupational risk factors. Occup Dis Environ Med. 2017;5(1):26-37. https://doi.org/10.4236/odem.2017.51003

6. Lewis R, Gómez Álvarez CB, Rayman M, Lanham-New S, Woolf A, Mobasheri A. Strategies for optimising musculoskeletal health in the 21st century. BMC Musculoskelet Disord. 2019;20:164. https://doi.org/10.1186/s12891-019-2510-7

7. Chaudhari AJ, Raynor WY, Gholamrezanezhad A, Werner TJ, Rajapakse CS, Alavi A. Total-body PET imaging of musculoskeletal disorders. PET Clin. 2021;16(1):99-112. https://doi.org/10.1016/j.cpet.2020.09.012

8. Peeling JL, Muzio MR. Functional neurologic disorder. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023.

9. Sikiru L, Hanifa S. Prevalence and risk factors of low back pain among nurses in a typical Nigerian hospital. Afr Health Sci. 2010;10(1):26-30. https://pubmed.ncbi.nlm.nih.gov/20811521/

10. Hayden JA, Ellis J, Ogilvie R, Malmivaara A, van Tulder MW. Exercise therapy for chronic low back pain. Cochrane Database Syst Rev. 2021;(9). https://doi.org/10.1002/14651858.CD009790.pub2

11. Jokhio AH, Rizvi RM, MacArthur C. Prevalence of pelvic organ prolapse in women, associated factors and impact on quality of life in rural Pakistan: population-based study. BMC Womens Health. 2020;20:49. https://doi.org/10.1186/s12905-020-00934-6

12. Delitto A, George SZ, Van Dillen L, Whitman JM, Sowa G, Shekelle P, et al. Low back pain: clinical practice guidelines linked to the international classification of functioning, disability, and health from the orthopaedic section of the American Physical Therapy Association. J Orthop Sports Phys Ther. 2012;42(4):A1-A57.

13. Njaka S, Yusoff DM, Anua SM, Kueh YC, Edeogu CO. Musculoskeletal disorders (MSDs) and their associated factors among quarry workers in Nigeria: a cross-sectional study. Heliyon. 2021;7(2):e06130. https://doi.org/10.1016/j.heliyon.2021.e06130

14. Rasheed H, Rashid J, Javeed RS. Frequency of low back pain among nurses working in Jinnah Hospital Lahore. Int J Endorsing Health Sci Res. 2017;5(3):44-51.

15. Tousignant M, Poulin L, Marchand S, Viau A, Place C. The modified–modified Schober test for range of motion assessment of lumbar flexion in patients with low back pain: a study of criterion validity, intra- and inter-rater reliability and minimum metrically detectable change. Disabil Rehabil. 2005;27(10):553-9. https://doi.org/10.1080/09638280400018411

16. Hershkovich O, Grevitt MP, Lotan R. Schober test and its modifications revisited—what are we actually measuring? Computerized tomography-based analysis. J Clin Med. 2022;11(23):6895. https://doi.org/10.3390/jcm11236895

17. Michener LA, Snyder AR, Leggin BG. Responsiveness of the numeric pain rating scale in patients with shoulder pain and the effect of surgical status. J Sport Rehabil. 2011;20(1):115-28. https://doi.org/10.1123/jsr.20.1.115

18. Feng Y, Liu C, Tao S, Wang C, Zhang H, Liu X, et al. Developing and validating the nurse-patient relationship scale (NPRS) in China. J Adv Nurs. 2024;23(1):255.

19. Fairbank JC, Pynsent PB. The Oswestry disability index. Spine. 2000;25(22):2940-53. https://journals.lww.com/spinejournal/toc/2000/11150

20. Flaubert JL, Le Menestrel S, Williams DR, Wakefield MK, National Academies of Sciences, Engineering, and Medicine. Supporting the health and professional well-being of nurses. In: The future of nursing 2020–2030: charting a path to achieve health equity. Washington (DC): National Academies Press (US); 2021.

21. Melnyk BM, Orsolini L, Tan A, Arslanian-Engoren C, Melkus GDE, Dunbar-Jacob J, et al. A national study links nurses' physical and mental health to medical errors and perceived worksite wellness. J Occup Environ Med. 2018;60(2):126-31. https://journals.lww.com/joem/toc/2018/02000

22. George SZ, Fritz JM, Silfies SP, Schneider MJ, Beneciuk JM, Lentz TA, et al. Interventions for the management of acute and chronic low back pain: revision 2021: clinical practice guidelines linked to the international classification of functioning, disability and health from the Academy of Orthopaedic Physical Therapy of the American Physical Therapy Association. J Orthop Sports Phys Ther. 2021;51(11):CPG1-CPG60. https://www.jospt.org/doi/10.2519/jospt.2021.0304

23. [WHO Sample Size Calculator]. World Health Organization. Available from: https://www.who.int/tools/sample-size-calculator