

Magnetic Resonance Imaging Findings in Low Back Pain Due To Lumbar Degenerative Disease and Correlation with Modified Oswestry Disability Index

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ABSTRACT

BACKGROUND- Low back pain (LBP) is one of the most common musculoskeletal disorders worldwide and a leading cause of disability. Magnetic Resonance Imaging (MRI) is considered the gold standard for evaluating degenerative changes such as disc bulge, disc herniation, annular fissure, Modic changes, facet arthropathy, ligamentum flavum hypertrophy, and spinal canal stenosis. However, the correlation between radiological findings and functional disability remains controversial. The Modified Oswestry Disability Index (MODI) is a validated tool used to assess disability in patients with LBP.

MATERIAL AND METHOD- A hospital-based cross-sectional observational study was conducted in the Department of Radio-diagnosis at T.S. Misra Medical College & Hospital, Lucknow, over 18 months (March 2023–August 2024). Fifty patients with low back pain who met inclusion criteria underwent MRI of the lumbosacral spine using a 1.5 Tesla machine. Degenerative changes were assessed and graded using standardized criteria. Disability was evaluated using the MODI questionnaire.

RESULT- The mean age was 46.9 ± 10.2 years, with male predominance (58%). L4–L5 was the most commonly affected level (58%). Majority of patients had Grade IV disc degeneration (40%). Disc bulge (64%) and disc herniation (42%) were common findings. MODI scores increased significantly with higher Pfirrmann grades ($p < 0.001$). Significant associations were observed between MODI scores and disc herniation, annulus tear, endplate changes, facet arthropathy, ligamentum flavum hypertrophy, spinal canal stenosis, and neural foraminal stenosis ($p < 0.05$).

CONCLUSION- MRI findings in lumbar degenerative disease show a significant correlation with functional disability as assessed by MODI. Increasing severity of degenerative changes is associated with higher disability scores. Combined clinical and radiological evaluation improves assessment and management of patients with low back pain.

Keywords: Low Back Pain; Lumbar Degenerative Disease; Modified Oswestry Disability Index; Disc Degeneration.

Introduction

Degenerative disc disease is a major contributor to chronic low back pain (LBP), affecting a significant proportion of the global population. Mechanical stress, particularly repetitive flexion, rotation, and axial loading, plays a crucial role in the pathogenesis of disc disease. Lumbar disc pathology, including prolapse and herniation, is a common cause of radicular pain, accounting for nearly 90% of sciatica cases, most often at the L5–S1 level¹. While magnetic resonance imaging (MRI) is the gold standard for evaluating spinal degenerative changes due to its superior soft tissue resolution and multiplanar capability, its clinical interpretation remains challenging². MRI often reveals abnormalities that may not correlate with patient symptoms, potentially leading to overdiagnosis and unnecessary interventions.

The Modified Oswestry Disability Index (MODI) is a widely used, validated tool for assessing functional disability in patients with LBP. It provides a patient-centered measure of the impact of spinal disorders on daily activities and quality of life. However, the relationship between MRI findings and functional disability remains controversial, with studies reporting inconsistent correlations. Correlating MRI findings with MODI scores can enhance diagnostic precision, guide individualized treatment planning, and improve prognostic assessment³.

Furthermore, most available literature originates from Western populations, with limited data from the Indian subcontinent, where lifestyle factors such as frequent bending, squatting, and floor sitting may influence spinal degeneration patterns. Therefore, this study aims to evaluate the correlation between MRI findings and MODI scores in patients with lumbar degenerative disease, to better understand the clinical relevance of radiological changes and to aid in more informed diagnostic and therapeutic decision-making.

MATERIAL AND METHOD

A hospital-based cross-sectional observational study was conducted in the Department of Radio-diagnosis at T.S. Misra Medical College & Hospital, Lucknow, over 18 months (March 2023–August 2024). Fifty patients with low back pain who met inclusion criteria underwent MRI of the lumbosacral spine using a 1.5 Tesla machine. Degenerative changes were assessed and graded using standardized criteria. Disability was evaluated using the MODI questionnaire. Statistical analysis was performed using SPSS version 27. Pearson's correlation coefficient, Chi-square test, t-test, and ANOVA were applied. A p-value.

RESULT

Demographic and general profile

Among 50 patients with low back pain due to lumbar degenerative disease, the majority of participants were in the 41–60-year age group, comprising 22 patients (44.0%) followed by 15 patients (30.0%) over 60 years and 13 patients (26.0%) aged 40 years or younger. The mean age of the cohort was 46.9 ± 10.2 years.

Table 1 - Age Distribution of Patients

Age in years	No. of cases (n=50)	Percentage
≤40	13	26.0
41-60	22	44.0
>60	15	30.0
Mean age in years	46.9 ± 10.2	

In our study, the majority of participants were male, accounting for 29 patients (58.0%), while 21 patients (42.0%) were female.

Figure 1: Distribution of Patients Based on Gender

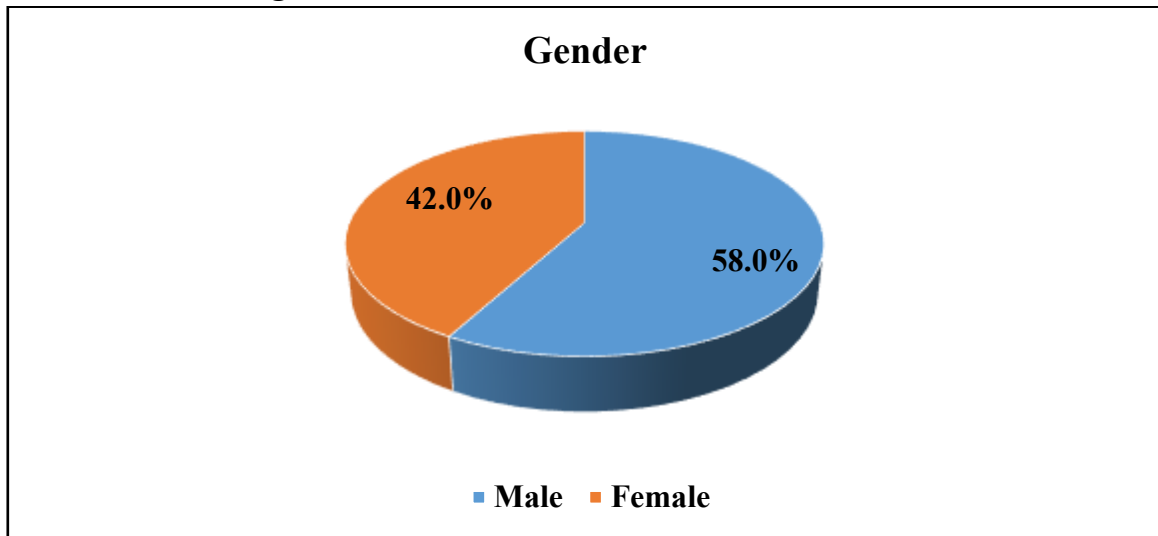


Figure 2: Distribution According to Spinal Level

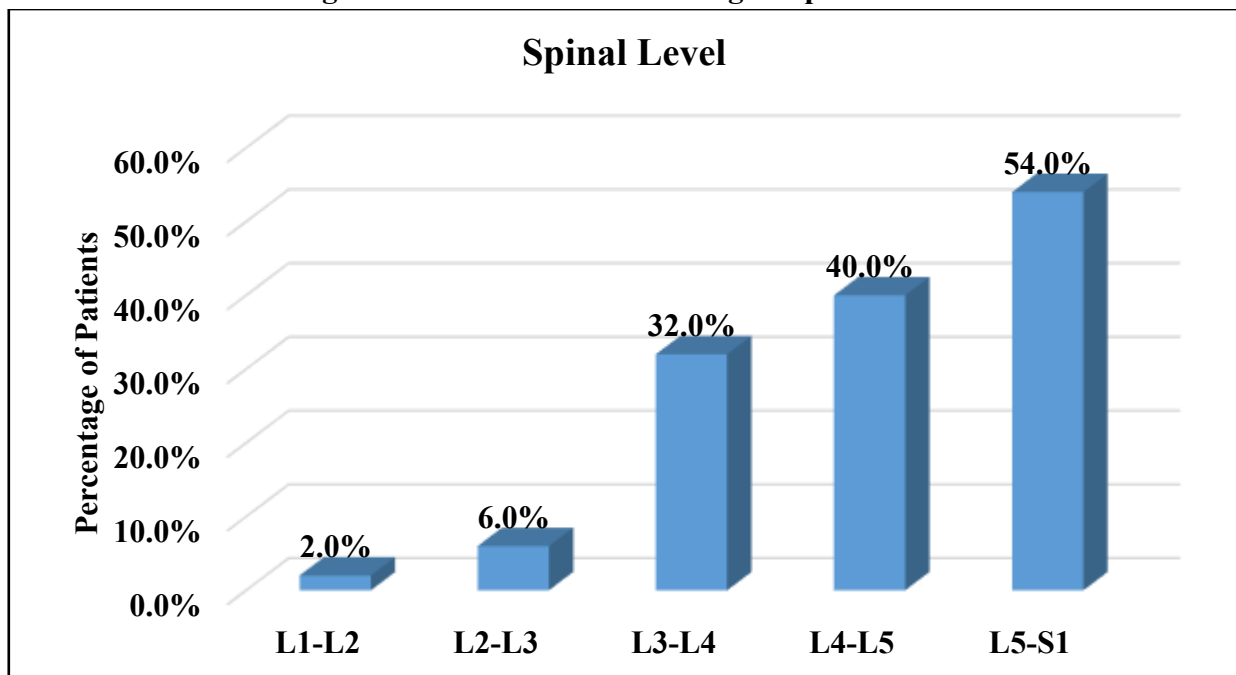


Table 2: Distribution of the studied group based on Severity of Disc Degeneration (Pfirschmann Grade)

Grade	No. of cases (n=50)	percentage
I	0	0.0
II	6	12.0
III	13	26.0
IV	20	40.0
V	11	22.0

In our study, the distribution of the Modified Oswestry Disability Index (MODI) scores showed that the majority of patients had mild to moderate disability. the majority fell into the categories of moderate (34%) and severe disability (32%), together accounting for two-thirds of the cohort. A smaller proportion had minimal disability (18%), while 12% were classified as crippled and 4% as bed-bound, reflecting significant functional impairment in these groups.

Table 3: Distribution of Modified Oswestry Disability Index (MODI)

Modified Oswestry Disability Index	No. of cases (n=50)	Percentage
Minimal Disability	0.0%-20.0%	9
Moderate Disability	21.0%-40.0%	17
Severe Disability	41% – 60%	16
Crippling	61% – 80%	6
Bed-bound	81% – 100%	2

Table 4: Association between Severity of Degeneration and MODI

Pfirschmann grade Grade	No. of cases (n=50)	Mean MODI ± SD	p-value*
I	0 (0.0)	-	<0.001
II	6 (12.0)	22.8 ± 6.7	
III	13 (26.0)	28.9 ± 8.5	
IV	20 (40.0)	36.7 ± 10.9	
V	11 (22.0)	44.2 ± 12.4	

*ANOVA test

Table 5: Mean MODI Scores by MRI Features

MRI Features		MODI Mean ± SD	p-value
Disc bulge	Present	34.2 ± 11.8	0.034*
	Absent	27.1 ± 9.6	
Disc herniation	Present	42.1 ± 12.5	<0.001*
	None	26.8 ± 8.7	
Annulus tear/fissure	Present	39.4 ± 12.1	0.006*
	Absent	29.6 ± 10.4	
Degenerative endplate changes	None	28.1 ± 9.8	0.002*
	Type I/II/Mixed	37.9 ± 11.7	
Facet arthropathy	Mild	26.9 ± 8.5	0.003#

	Moderate	33.7 ± 10.4	
	Severe	41.5 ± 12.8	
Ligamentum flavum hypertrophy	Present	38.2 ± 11.9	0.005*
	Absent	29.1 ± 9.7	
Spinal canal stenosis	Mild	27.4 ± 9.2	<0.001#
	Moderate	34.6 ± 10.5	
	Severe	44.3 ± 12.7	
Neural foramen stenosis	Mild	28.7 ± 9.4	0.002#
	Moderate	34.1 ± 10.8	
	Severe	43.6 ± 12.2	

*sample 't' test; #ANOVA test

DISCUSSION

Our findings were comparable to the findings of **Eswara S et al⁴** who reported that they included a total of 90 patients with LBP, with a mean age of 47±13.75 years, with equal sex preponderance {45 (50%) male and 45 (50%) female}. There were 24 (26.7%) patients with minimal disability, 51 (56.7%) with moderate disability, 9 (10%) with severe disability and 6 (6.6%) patients with crippled disability. In the **Wani SK and Deshpande N⁵** study, we have randomly selected 64 participants having low back pain (LBP) with MRI scan of lumbar spine of both genders 50 (Males-37.5% & Females -62.5%) with a mean age and SD of 48.59 ± 13.32 years, respectively. **Yu LP et al⁶** evaluated 108 surgical patients with lumbar degenerative disease and found that Grade IV and V degeneration were the most frequent MRI findings, correlating with higher pain scores and disability indices. Similarly, **Yuvabalakumaran T et al⁷** observed that patients 51 with chronic low back pain commonly demonstrated Grade III–IV degeneration. In another study, Han Y et al¹⁰³ employed quantitative MRI biomarkers and confirmed that progressive Pfirrmann grades correlated with worsening clinical symptoms, reinforcing the predictive value of MRI grading in functional disability assessment.

Sharma A et al⁸ identifies 51 patients with severe findings, including severe spinal canal stenosis, facet joint arthropathy, and neural foraminal stenosis, primarily in the 30-50 range of Modified Oswestry Score, with 40 patients exhibiting Grade 3 severe spinal canal stenosis, and a maximum of 127 having a score between 10-20. According to **Agarwal A et al⁹** in total, 8.24% of the patients had minimal disability in the MODI; 37.65%, moderate disability; 32.94%, severe disability; 20%.

CONCLUSION

The present study demonstrates a significant correlation between MRI features of lumbar degenerative disease and functional disability measured by the Modified Oswestry Disability Index. Advanced disc degeneration (Grades IV–V), annular tears, endplate changes, severe facet arthropathy, ligamentum flavum hypertrophy, and spinal canal/foraminal stenosis were all associated with higher MODI scores, indicating greater disability. These findings are consistent with previous studies, reinforcing the clinical utility of MRI not only for structural assessment but also as a predictor of functional impairment. In conclusion, MRI serves as a valuable tool in the evaluation of lumbar degenerative disease, and its integration with disability indices such as MODI can guide individualized management strategies, prognostication, and timely intervention. Future longitudinal studies with larger cohorts and inclusion of

psychosocial variables are warranted to further validate these associations and refine patient care pathways.

REFERENCES

- 1 Das G, Ray S, Ishwarari S, Roy M, Ghosh P. Ozone nucleolysis for management of pain and disability in prolapsed lumbar intervertebral disc: A prospective Cohort study. *Interventional Neuroradiology*. 2009; 15:330-4.
- 2 Modic MT, Ross JS. Lumbar degenerative disk disease. *Radiology*. 2007;245(1):43–61
- 3 Sharma A, Ahmad K, Shukla VP, Goel A, Singh SK. MRI Findings in Low Backache Due to Lumbar Degenerative Disease and Its Correlation with Modified Oswestry Disability Index. *Int J Sci Res*. 2025;14(7):1761–8.
- 4 Eswara S, Kalenahalli KV, Yerram S, Itagi RM, Jose J. Correlation of Magnetic Resonance Imaging findings with Clinical Grading in Lumbar Disc Degeneration: A Cross-sectional Study. *Journal of Clinical and Diagnostic Research*. 2023;17(5): TC29-TC35.
- 5 Wani SK, Deshpande N, Student PG. Correlation of pain and disability with MRI findings in patients with lumbar discogenic back pain. *Int J Physiother Res*. 2014;2:418- 23
- 6 Yu LP, Qian WW, Yin GY, Zheng Y, Chen AM. MRI assessment of lumbar disc degeneration with the Pfirrmann grading system and its clinical correlation in patients with low back pain. *Eur Spine J*. 2010;19(9):1499–1505.
- 7 Yuvabalakumaran T, Kaliya-Perumal AK, Shetty AP, Rajasekaran S. Correlation of MRI findings and paraspinal muscle changes with Oswestry Disability Index in chronic low back pain. *Asian Spine J*. 2020;14(6):789–797
- 8 Sharma A, Ahmad K, Shukla VP, Goel A, Singh SK. MRI Findings in Low Backache Due to Lumbar Degenerative Disease and Its Correlation with Modified Oswestry Disability Index. *Int J Sci Res*. 2025;14(7):1761–8.
- 9 Agarwal A, Kohli N, Pandey P, Khare R, Bhatt D and Ali A. Clinico-Radiological Correlation of Degenerative Lumbar, Spine on Magnetic Resonance Imaging with Modified, Oswestry Disability Index. *European Journal of Cardiovascular Medicine (EJCM)*. 2024;14(6):544-56