

**How to Cite:**

Patel, K., Gupta, A., Barai, D., & Patel, K. (2022). Evaluation of lumbar spine using MRI in patients with chronic low back pain. *International Journal of Health Sciences*, 6(S1), 13994–14000. <https://doi.org/10.53730/ijhs.v6nS1.8479>

## **Evaluation of lumbar spine using MRI in patients with chronic low back pain**

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**Abstract**---Aim: We compared the prevalence of MR imaging features of lumbar spine degeneration in adults and with self-reported low back pain. Evaluating the patient based on the degree of disc bulge correlating findings on MRI study aimed in establishing the role of MRI in prompt diagnosis to assess the degree of disc herniation. Material and Methods : Patients were evaluated each for the following outcomes : degree of disc bulge, disc degeneration, disc extrusion, disc protrusion, annular fissures, Modic changes, central canal stenosis, spondylolisthesis and spondylolysis, RESULTS : 52 self reported cases of low back pain. 40 of them (80%) met the inclusion criteria, 12 patients had a normal MRI, disc bulge (50%), spondylolysis (20%), disc extrusion (5%), MODIC 1 changes (10%), disc protrusion (5%) and disc degeneration (10%) the degree of disc bulge in the upper lumbar levels showed significant radicular symptoms in symptomatic low back pain patients associated with degenerative changes more in older population with a greater pain scale. Conclusion: Using MRI as a tool for diagnosing the cause of chronic low back pain it serves as excellent modality to assess the degree of disc bulge with its symptoms in the symptomatic patients, for evaluating degenerative diseases of spine.

**Keywords**---Lumbar spine, Degenerative disease, disc herniation, MRI, chronic low back pain.

## **Introduction**

Low back pain affects upto two thirds of adults at some point in their lives<sup>1</sup>. Back pain-related disability has significant economic consequences due to consumption of health care resources and loss of economic productivity<sup>2</sup>. The basic purpose of conducting this study is to evaluate the relation between different aspects of lumbar degenerative disc disease and their MRI findings. Antero-posterior (AP) and lateral views of the plain X-ray can be helpful in visualizing gross anatomic changes in the intervertebral disc. It is best visualized on lateral view of X-ray. However, MRI is the standard imaging modality for detecting disc pathology due to its advantage of lack of radiation, multiplanar imaging capability, excellent spinal soft-tissue contrast and precise localization of intervertebral discs changes. Imaging findings<sup>3</sup> such as disc bulge and disc protrusion are often interpreted as causes of back pain, triggering both medical and surgical interventions<sup>4</sup>. Furthermore prior studies have demonstrated that imaging findings of spinal degeneration associated with back pain are present in a large proportion of both symptomatic and asymptomatic individuals, thus limiting the diagnostic value of these findings<sup>5-7</sup> on MRI.

## **Material and Methods**

The study was performed in the department of Radio-diagnosis, Dhiraj Hospital, S.B.K.S. Medical Institute and Research Centre, Pipariya, Vadodara. The study is Observational, Descriptive Hospital Based Study. Only those patients who were willing to participate in study were included. Patients who presented with or without complains low back pain, lower limb radiculopathy were included. The study included 52 patients who opted for MRI Lumbosacral spine at the institute, case-control and cross-sectional studies were included in this analysis. Patient symptomatology was generally determined at the time of the MR imaging findings. Symptomatic individuals with history of chronic low backpain, which included axial back pain and/or sciatica or radiculopathies. The age range for included individuals was 15–50 years. Any studies reporting the prevalence of degenerative. Inclusion criteria, including age cutoffs, were agreed on by the authors by consensus. One reviewer examined abstracts of studies identified from the literature search to determine whether the studies met the inclusion criteria and to exclude any studies that were not relevant to the topic being studied (ie, neck pain, studies correlating CT or radiographs and low back pain, review articles, and so forth). For each study that met inclusion criteria, we used a standard form to abstract imaging technique we look for imaging findings: central spinal canal stenosis, disc degeneration, annular fissure (including high-intensity zones), high-intensity zones (a subgroup of annular fissures defined as “annular fissures witha focal area of increasedT2 signal), disc bulge, disc protrusion, disc extrusion, Modic changes, spondylolisthesis, and spondylolysis. Patients were examined and the disc bulge was the criteria to differentiate mild moderate severe radicular pain , patients were categorized on pain scale and were correlated with

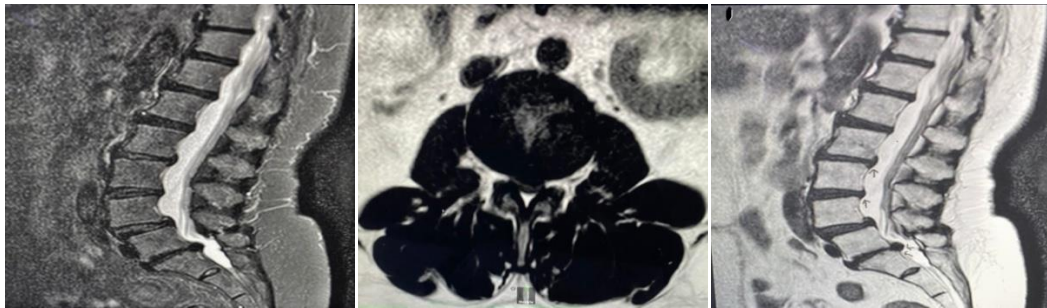
degree of disc bulge age factor was also considered and conclusions were drawn based on findings of chronic low back pain and radicular pain.

## Results

Search yielded 52 unique studies. 40 (79%) met the inclusion criteria out of which 28 (70%) were male, 14 (30%) female (Imaging findings revealed a higher prevalence in symptomatic individuals 50 years of age or younger included disc bulge (50%), spondylolysis(20%) , disc extrusion (5%) , Modic 1 changes(10%), disc protrusion(5%) and disc degeneration(10%). Imaging findings were not associated with low back pain included 10 studies evaluated using Modic change(30%), central canal stenosis(25%), high-intensity zone, annular fissures, and spondylolisthesis.

Table-1: Radiological findings according to gender distribution.

<b>Diagnosis</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>
Normal study	7	3	10
Abnormal imaging findings	28	14	42
Total	35	17	52



(Axial, Saggital T2/STIR images show focal disc protrusion at the level of L2-L3 vertebral disc space indenting anterior thecal sac compressing bilateral lateral recess and abutting the spinal cord causing mild narrowing of spinal canal)

Degenerative spine Findings by Symptomatic Status in Individuals 50 years of age and younger In order of decreasing OR, imaging findings with a higher prevalence in individuals with low back pain 50 years of age or younger compared with asymptomatic individuals 50 years of age or younger included disc bulge , disc extrusion, Modic 1 changes , disc protrusion and disc degeneration. Imaging findings not associated with low back pain included any Modic change, central canal stenosis, high intensity zone, annular fissures (including patients with and without high-intensity zones), and spondylolisthesis.

FINDINGS	Number of studies	Percentage
Disc bulge	32	80%
Disc protrusion/extrusion	18	45%
Modic 1 changes	25	62.5%
Spondylolysis	28	70%
Spondylolisthesis	20	50%
Central spinal canal stenosis	5	12.5%
High intensity zones	8	20%

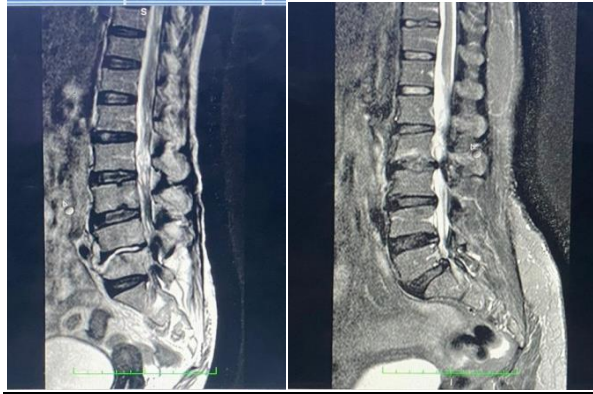
Spectrum of findings on MRI including the degree of disc bulge and degenerative changes of symptomatic patients (n=40)

Herniation was identified in 60% ( $n = 52$ ) of patients at the initial examination. The prevalence of herniations in patients with LBP (57%) ( $n = 28$ ) and those with radiculopathy (65%) ( $n = 32$ ) were similar although patients with radiculopathy were more likely to have stenosis and nerve root compression. There was no relationship between herniation type, size, and behavior over time with outcome.

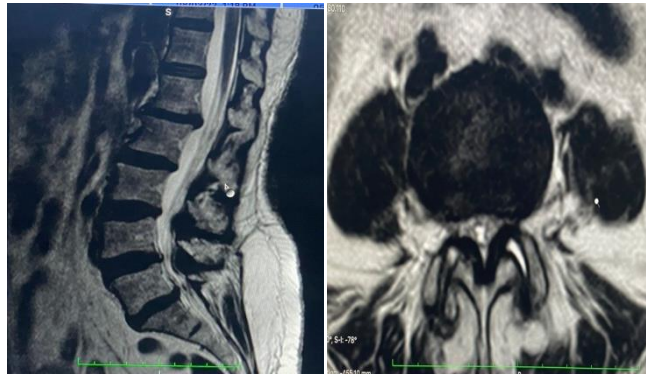
S.No	Age group	Radicular symptoms	Pain scale	Degree of disc protrusion
1	15-25Y	30%	2-3	Mild
2	25-30Y	28%	2-3	Moderate
3	30-35Y	42%	3-4	Moderate
4	35-40Y	50%	3-4	mild
5	40-45Y	45%	4-6	Moderate
6	45-50Y	60%	4-6	moderate

Categorization of patients on basis of age and pain scale with degree of disc bulge and based on bilateral or unilateral lower limb radicular pain (n=40)

Findings suggest that the association between disc bulge and low back pain may be more significant in older adults and adults in whom the prevalence of chronic low back pain is associated with degenerative changes often have bilateral radicular presentation in contrast to association between disc bulges and low back pain was lower in middle age population with less degenerative changes the study group recorded a lower pain scale.



Sagittal T2 weighted images showing multiple degenerative changes schmorl's node noted at multiple lumbar levels with straightening of lumbar spine with diffuse posterior disc bulge and altered signal intensity in multiple lumbar body levels



Axial T2/STIR hyperintense signal noted with diffuse posterior disc bulge at multiple lumbar vertebral body levels indenting anterior thecal sac with compression of lateral recess and compression traversing nerve roots

### **Discussion**

Degeneration is the most common spinal ailment manifested in the society presenting with low back pain, the study included 52 patients, degenerative spine findings have a higher prevalence in individuals 50 years of age or younger with self-reported low back pain. There were overlapping symptoms noted the patients presented<sup>8</sup>.

The timely diagnosis of degenerative spine in symptomatic individuals included Disc findings, including disc bulge (50%) the degree of disc bulge was assessed and the symptoms were compared on the basis of pain scale and to the radicular symptoms in patients of various age groups compared , only 30% of the patients had mild posterior disc bulge in the age group of 15-25 years but only non specific chronic low back pain as the patients of older age were evaluated on the listed parameters the patient with older age group 45-50 years had most of the radicular symptoms with severe disc protrusions and a pain scale of 7-9 with

severe disc protrusion, out of all the patients examined these patients 30% had mild posterior disc bulge had low back pain, radicular symptoms with diffuse posterior disc bulge, disc degeneration (34%), and disc extrusion (45%) and protrusions (40%), had significant associations with low back pain. Type 1 Modic changes (62.5%) and spondylolysis (70%) also demonstrated a significant association with low back pain. While these findings do not prove that disc- and endplate-related imaging and spondylolysis are pain generators<sup>9</sup>, they do suggest that evidence of these findings could be explored as candidates for biomarkers of low back pain. Our findings corroborate those of other studies examining the association between disc imaging findings and low back pain<sup>10</sup>.

## Conclusion

The study demonstrates that MR imaging is a useful modality and essential to assess the health of the lumbar spine with evidence of disc bulge, disc degeneration, degree of disc extrusions and protrusions and its assessment for radicular pain in patients based on the pain scale, Modic 1 changes, and spondylolysis, disc protrusions which had significant associations with low back pain in adult patients 50 years of age or younger. The degree of disc bulge and its foraminal extension is marked in the patients presenting with chronic low back pain with acute exacerbation of pain in both young and old age.

The association between these degenerative findings and pain should not be interpreted as causation. These imaging findings may be considered as candidate biomarkers for low back pain (younger than 50 years of age). The role of these findings in determining treatment strategies or prognosis of low back pain. Using MRI as a tool for diagnosing the cause of chronic low back pain it serves as an excellent modality to assess the degree of disc bulge with its symptoms in the symptomatic patients and for evaluating degenerative diseases of the spine. It serves as a reliable modality to diagnose the degree of degeneration and disc bulge in a symptomatic individual and its prompt further management and to assess the severity and selective management to alleviate symptoms in a symptomatic individual.

## References

1. Jarvik JG, Deyo RA. Diagnostic evaluation of low back pain with emphasis on imaging. *Ann Intern Med* 2002;137:586–97 CrossRef Medline
2. Deyo RA, Cherkin D, Conrad D, et al. Cost, controversy, crisis: low back pain and the health of the public. *Annu Rev Public Health* 1991; 12:141–56 CrossRef Medline
3. Li AL, Yen D. Effect of increased MRI and CT scan utilization on clinical decision-making in patients referred to a surgical clinic for back pain. *Can J Surg* 2011;54:128–32 CrossRef Medline.
4. Andersson GB. Epidemiological features of chronic low-back pain. *Lancet*. 1999;354(9178):581–585. doi: 10.1016/S0140-6736(99)01312-4. [[PubMed](#)] [[CrossRef](#)] [[Google Scholar](#)]
5. Martin BI, Deyo RA, Mirza SK, et al. Expenditures and health status among adults with back and neck problems. *JAMA*. 2008;299(6):656. doi: 10.1001/jama.299.6.656. [[PubMed](#)] [[CrossRef](#)] [[Google Scholar](#)]

6. Kadow T, Sowa G, Vo N, Kang JD. Molecular basis of intervertebral disc degeneration and herniations: what are the important translational questions? *Clin Orthop Relat Res.* 2015;473(6):1903–1912. doi: 10.1007/s11999-014-3774-8. [[PMC free article](#)] [[PubMed](#)] [[CrossRef](#)] [[Google Scholar](#)]
7. Kepler CK, Ponnappan RK, Tannoury CA, Risbud MV, Anderson DG. The molecular basis of intervertebral disc degeneration. *Spine J.* 2013;13(3):318–330. doi: 10.1016/j.spinee.2012.12.003. [[PubMed](#)] [[CrossRef](#)] [[Google Scholar](#)]
8. Pfirrmann CW, Metzdorf A, Zanetti M, Hodler J, Boos N. (2001) Magnetic resonance grade of lumbar intervertebral disc degeneration. *Spine* 26: 1873–1878.
9. Thompson JP, Pearce RH, Schechter MT, Adams ME, Tsang IK, et al.(1990) Preliminary evaluation of a scheme for grading the gross morphology of the human intervertebral disc. *Spine* 15: 411–415.
10. Griffith JF, Wang YX, Antonio GE, Choi KC, Yu A, et al. (2007) Modified Pfirrmann grading system for lumbar intervertebral disc degeneration. *Spine* 32: 708–712.
11. Rinarta, K., Suryasa, W., & Kartika, L. G. S. (2018). Comparative Analysis of String Similarity on Dynamic Query Suggestions. In *2018 Electrical Power, Electronics, Communications, Controls and Informatics Seminar (EECCIS)* (pp. 399-404). IEEE.