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CORRELATION BETWEEN CLINICAL FEATURES AND MAGNATIC RESONANCE IMAGING FINDINGS IN PATIENTS WITH LUMBAR DISC HERNIATION

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Mehrban et al - 2026

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Abstract

Introduction:

Low back pain (LBP) is a common condition affecting 60-80% of adults during their lifetime,with a significant portion experiencing lumbar disc prolapse, particularly in the L4-L5 and L5-S1 regions. Risk factors include a sedentary lifestyle, frequent driving, chronic cough, pregnancy, smoking, and heavy lifting. Magnetic resonance imaging (MRI) is crucial for diagnosing degenerative disc diseases and their impact on neural structures.

Objectives:

The aim of this study was to find out the correlation between clinical features and MRIfindings in patients with lumbar disc herniation.

Materials and Methods:

A cross-sectional study was conducted at Jinnah Hospital Lahore, Pakistan, over 4 months. Convenient sampling was used, including patients aged 18-80 years with MRI-confirmed L4/5 and/or L5/S1 intervertebral disc prolapse. Patients with osseous causes, bony canal stenosis, previous discectomy, epidural steroid injections, spine infections, or tumors were excluded. MRI scans were reviewed by two radiologists. Clinical assessments were correlated with MRI findings.

Results:

All patients presented with back pain, with an average duration of 37.37 ± 15.5 weeks. The study found significant correlations between MRI findings and clinical features. The most common herniation were L5 and S1. The Straight Leg Raising Test (SLRT)was positive in 83.8% of patients, aligning with other studies. MRI findings frequently showed disc protrusion 64.4% and Extrusion 34.6%, LDH is more common in males as compared to female,correlating with the severity of clinical symptoms.

Pakistan Journal of Medical & Cardiological Review

https://pakjmcr.com/index.php/1/about

Online ISSN 3007-2387 Print ISSN 3007-2379

Conclusion:

There is a statistically significant correlation between clinical features and MRI findings in patients with lumbar disc herniation. MRI is a valuable diagnostic tool for assessing the extent of disc disease and its impact on patients' symptoms.

INTRODUCTION

Between 60% to 80% of adults encounter back pain at some point during their lives. By the time they reach 30, nearly 50% will have experienced it at least once. Most instances of back pain were temporary, with 80% to 90% of cases likely to resolve within 6 weeks, regardless of the treatment applied. Among office workers, herniated lumbar discs were a frequent source of discomfort, with around 95% of these cases affecting the L4-L5 and L5-S1 regions. Contributing factors to this condition include a lack of physical activity, frequent driving, persistent coughing, pregnancy, smoking, and heavy lifting. MRI is particularly effective in assessing disc conditions, including degenerative disc disease and the extent of any disc issues, whether they be bulges, protrusions, extrusions, or sequestrations, as well as their impact on cord or foraminal compression (**Kim K Y et al 2021**).

Diagnosing the source of low back pain (LBP) can be challenging due to its intricate nature. Disc rupture is frequently identified as a major cause, with research indicating a link between the severity of the rupture and the level of pain experienced. Degenerative conditions resulting from disc damage can lead to notable alterations in spinal function, potentially originating from muscles, ligaments, tendons, or disc issues such as prolapse, height loss, and related pain, tears, fissures, and inflammatory responses. These alterations can be associated with various pathological processes in individuals with disc degeneration **(Global Spine J. et al., 2013).**

Lumbar disc herniation (LDH) is a common and significant cause of lower back pain and related neurological symptoms. It occurs when the nucleus pulposus, the gel-like center of an intervertebral disc, protrudes through a tear or weakness in the annulus fibrosus, the disc's outer layer. This

Pakistan Journal of Medical & Cardiological Review
https://pakjmcr.com/index.php/1/about
Online ISSN 3007-2387
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herniation can lead to compression or irritation of the nearby spinal nerve roots, resulting in pain, radiculopathy, and, in some cases, motor or sensory deficits. The incidence of LDH is particularly high among adults aged 30 to 50, with the L4-L5 and L5-S1 disc levels being most commonly affected due to their relative mechanical load and mobility. The clinical manifestations of LDH are diverse, ranging from asymptomatic presentations to severe pain and disability, making diagnosis and management challenging. Early and accurate diagnosis is crucial to ensure appropriate treatment and prevent long-term disability **(Brinjikji et al., 2015).**

Magnetic Resonance Imaging (MRI) has become the preferred imaging technique for diagnosing LDH due to its ability to provide detailed, high-resolution images of the soft tissues in the spine, including the discs, nerve roots, and spinal cord. MRI can accurately identify the location, size, and type of disc herniation, as well as the extent of nerve root compression. It also allows for the detection of associated conditions such as disc degeneration, spinal stenosis, and other pathologies that may contribute to the patient's symptoms. Given the non-invasive nature of MRI and its superior soft tissue contrast, it is invaluable in both diagnosing LDH and evaluating its severity, helping clinicians determine the appropriate course of treatment **(Pfirrmann et al., 2001).**

However, despite its diagnostic capabilities, there is not always a direct correlation between the clinical symptoms of LDH and the findings seen on MRI. For example, patients with large disc herniations may report minimal symptoms, while those with smaller herniations may experience severe pain or neurological deficits. This lack of direct correlation has led to ongoing research exploring how various factors—such as the degree of nerve root compression, the presence of neuroinflammation, and individual pain thresholds—might influence the clinical presentation of lumbar disc herniation. Some studies have suggested that factors beyond the size of the herniation, such as the specific anatomical location of the disc bulge, the extent of nerve root impingement, and the patient's overall physical and psychological condition, may play a crucial role in determining symptom severity **(Boos et al., 2002).** Therefore, while MRI findings were critical, they must be interpreted in conjunction with a thorough clinical evaluation to guide management decisions **(Atlas et al., 2005).**

Understanding the relationship between clinical features and MRI findings in lumbar disc herniation remains an area of active research. Some studies have explored how specific symptoms, such as the type of pain (e.g., radicular vs. axial), correlates with particular MRI findings, with the aim of improving diagnostic accuracy and treatment outcomes. For instance, it has been shown that patients with herniations at certain disc levels may present with characteristic patterns of radicular pain, while others may exhibit only localized back pain despite significant MRI abnormalities. This complexity necessitates a comprehensive, individualized approach to the treatment of LDH. By investigating how clinical features align with MRI findings, this thesis aims to provide further insight into the optimal management strategies for lumbar disc herniation, particularly in cases where the correlation between imaging and symptoms is less clear **(Suri et al., 2016).**

it occurs when the intervertebral disc, located between the vertebrae, ruptures, causing the gel-like center (nucleus pulposus) to protrude through the outer layer (annulus fibrosus). This herniated disc can impinge upon the adjacent spinal nerve roots, leading to symptoms such as low back pain, radiculopathy (radiating pain down the leg), and in more severe cases, motor deficits or sensory disturbances. While it is most frequently observed in individuals between 30 and 50 years of age, lumbar disc herniation can affect individuals of all ages. The condition most commonly occurs at the L4-L5 and L5-S1 levels, given the mechanical loading these segments experience during daily activities **(Kouyoumdjian et al., 2016).**

Magnetic Resonance Imaging (MRI) has revolutionized the diagnosis and management of lumbar disc herniation due to its ability to provide detailed, non-invasive images of the spinal structures. MRI is particularly beneficial in identifying disc herniations and the extent of nerve root compression. It also enables clinicians to detect additional pathologies, such as spinal stenosis, spondylosis, or facet joint degeneration, that may contribute to the patient's clinical presentation. Due to its high sensitivity for soft tissue contrast, MRI has become the diagnostic tool of choice for assessing lumbar disc herniation, offering superior resolution compared to other imaging modalities like X-rays or CT scans (Boden et al., 1990). MRI plays an essential role in planning the management of LDH, ranging from conservative treatment to more invasive approaches, including surgical intervention (**Haughton, 2004**).

Despite the advancements in MRI technology, the correlation between MRI findings and clinical symptoms in lumbar disc herniation is not always straightforward. Research has demonstrated that there is not always a direct link between the size of the herniated disc and the severity of the clinical symptoms experienced by the patient. Some individuals with large herniations may report minimal pain, while others with smaller herniations may experience significant discomfort. This discrepancy has led to ongoing investigations into how factors such as the location of the herniation, the degree of nerve root compression, and even psychosocial factors contribute to the clinical presentation. In particular, studies suggest that the level of neural compression and the involvement of specific nerve roots were more closely associated with the type and intensity of symptoms than the size of the herniation itself (**Jarvik & Deyo, 2002; Suri et al., 2015**).

Additionally, some authors have argued that MRI findings alone may not fully explain the clinical outcomes in patients with lumbar disc herniation. The pathophysiology of LDH is complex, and other variables such as inflammation, disc degeneration, and the patient's individual pain threshold may influence the severity of symptoms. For instance, neuroinflammation and mechanical factors may play an essential role in the onset and persistence of pain, even when MRI shows only moderate disc degeneration (**Chou et al., 2016**). Moreover, factors like the presence of psychological distress and lifestyle factors such as physical activity levels or smoking have been identified as important contributors to the clinical outcomes in patients with lumbar disc herniation (**Tontodonati et al., 2018**). Therefore, while MRI remains a valuable tool in the diagnosis of LDH, it must be considered alongside clinical features to provide a comprehensive understanding of the condition and guide treatment strategies.

The rational of this study was to examine the relationship between the clinical features of lumbar disc herniation and MRI findings, with a focus on identifying factors that contribute to symptom variability. By analyzing the association between MRI results and clinical outcomes, this study aims to enhance the understanding of how these two components interact and provide a diagnostic

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accuracy, prognosis , treatment planing and more tailored approach to managing patients with LDH.The ultimate aim of this research was to explore how clinical symptoms correlate with MRI results in patients diagnosed with lumbar disc herniation.

3.1 Objectives:

- To find Correlation between clinical features and magnetic resonance imaging findings inpatient with lumber disc herniation.

MATERIAL AND METHODS

4.1 Study Design: Cross Sectional study.

4.2 Setting: Jinnah Hospital Lahore, Pakistan.

4.2 Study Duration: 4 Months

4.3 Sampling Technique: Convenient sampling technique

4.4 Sample Size: Sample size of our study was 60 patient .

4.5 Sampling Method:

Inclusion criteria:

- Age (18-80) years
- Patients with severe symptom (numerical rating scale [NRS] score ≥8) who could nottolerate a long scan time or waiting time for initial spine MRI.
- Patients with new or recently aggravated symptoms who had previous full-sequence MRI.

Exclusion criteria:

- Osseous cause
- Bony canal stenosis
- Individuals who had undergone previous discectomy and epidural steroid injection procedures

Pakistan Journal of Medical & Cardiological Review
https://pakjmcr.com/index.php/1/about
Online ISSN 3007-2387
Print ISSN 3007-2379

- Infections of spine and tumors of spine were excluded from study.

4.6 Equipment: MRI Philips 1.5 Tesla

Data collection Procedure

Data Collection Sheets:

Data for the research had been collected using standardized data collection sheets.

Data Collection Variables:

Data was collected according to predefined variables with clear operationaldefinitions to ensure consistency and accuracy.

MRI Scanning Technique:

The MRI scanning technique in involving the following steps to obtain high-quality lumber disc herniation images

Participant Positioning:

Patient was instruct to lie supine or sit comfortably,ensuring the lumber spine is properly aligned with the MRI coil.

Patient Comfort and Instructions

We prior the scan, ensure that the participant is comfortable and informed about the MRI procedure. Instruct the participant to remain as still as possible during the scan to minimize motion artifacts.

MRI Machine Settings:

We set the MRI machine to the appropriate musculoskeletal imaging sequences, such as T1-weighted, T2-weighted.

Imaging Planes:

a) We acquired images in axial, coronal, and sagittal planes to provide a comprehensive view of the lumber disc .

b) The sagittal plane from the sides (Proton Density).

c) The coronal plane looks at the knee from the front to back (t1, t2, and stir).

Vol. 5 No. 1 (2026)

Pakistan Journal of Medical & Cardiological Review

https://pakjmcr.com/index.php/1/about

Online ISSN 3007-2387 Print ISSN 3007-2379

d) The axial plane from the top down (margin).

Scanning Protocol:

a. We utilize the (MRI Score) scoring method for image acquisition, ensuring that all relevant anatomical structures are adequately visualized.

ii. Minimizing Patient Discomfort:

a. We was continuously monitor the participant's comfort during the MRI scan, addressing any discomfort or concerns promptly.

iii. Data Review:

We review the obtained images immediately after acquisition to ensure that they meet the quality standards necessary for scoring

iv. Data Recording:

We recorded the data collected from the MRI scans on the standardized data collection sheet

4.7. DATA ANALYSIS PROCEDUREData Preparation:

Import and clean the data in IBM SPSS Statistics version, addressing missingor erroneous data.

Descriptive Analysis:

Calculate summary statistics and visualize data using pie charts, bar charts, andhistograms.

Inferential Statistics:

Perform t-tests, non-parametric tests, and correlation analyses to answer researchquestions and test hypotheses.

Time for Search: 4 Months

Vol. 5 No. 1 (2026)

Pakistan Journal of Medical & Cardiological Review

https://pakjmcr.com/index.php/1/about

Online ISSN 3007-2387 Print ISSN 3007-2379

RESULTS

Table 01: Shows the relation between pain and extrusion:

Classification X		Gender
F	33	55.9%
M	26	44.1%
Total	59	100.0%

Chi-squared	0.831
DF	1
Significance level	P = 0.3621

Classification X			Pain
Classification Y			Extrusion
Extrusion	Pain		
	No	Yes	
No	5	33	38 (64.4%)
Yes	10	11	21 (35.6%)
	15 (25.4%)	44 (74.6%)	59
Chi-squared			8.328
DF			1
Significance level			P =

Pakistan Journal of Medical & Cardiological Review

https://pakjmcr.com/index.php/1/about

Online ISSN 3007-2387 Print ISSN 3007-2379

Mehrban et al - 2026

	0.0039
Contingency coefficient	0.352

Pain classification revealed that 64.4% (38/59) of participants experienced no extrusion pain, while 35.6%

(21/59) did. Among those with extrusion, 10 cases were from females, and 11 from males. Non-extrusion pain was predominantly observed in females (33 cases) compared to males (5 cases). The chi-squared test (χ^2 = 0.831, P = 0.3621) indicated statistically significant association between pain and extrusion. The contingency coefficient (0.352) indicates a moderate levels of association between the two variables.

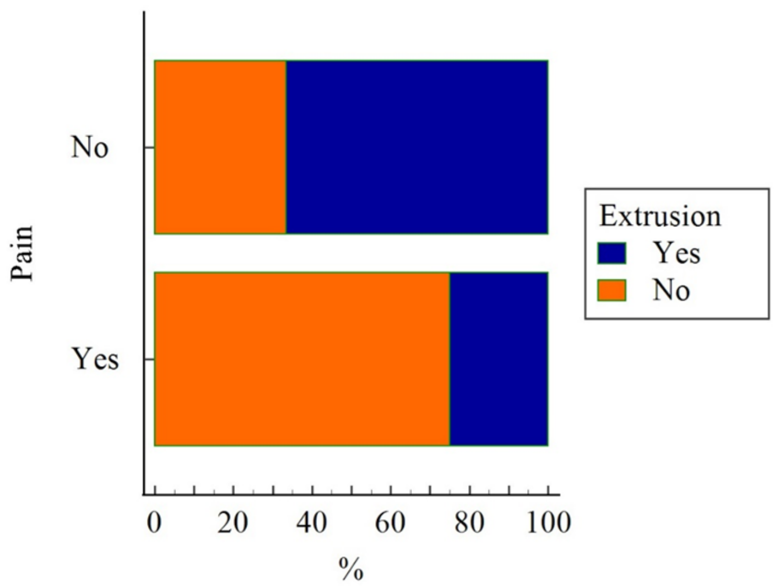

Figure no 1: Bar Chart shows frequency Between Pain And Extrusion.

Vol. 5 No. 1 (2026)

Pakistan Journal of Medical & Cardiological Review

https://pakjmcr.com/index.php/1/about

Online ISSN 3007-2387 Print ISSN 3007-2379

Table 2 Shows the relation between pain and Mid-Endplate Irregulaties

Classification X	Pain		
Classification Y	"mid endplate irregularities Yes/No"		
mid_endplate_irregularities_Yes_No	Pain		
	No	Yes	
No	15	25	40 (67.8%)
Yes	0	19	19 (32.2%)
	15 (25.4%)	44 (74.6%)	59

Chi-squared	9.392
DF	1
Significance level	P = 0.0022
Contingency coefficient	0.371

Mid-endplate irregularities were present in 32.2% (19/59) of patients, and all of them experienced pain. Patients without mid-endplate irregularities (67.8%, 40/59) included 15 cases with no pain and 25 with pain. The chi-squared test (χ^2 = 9.392, P = 0.0022) indicated a statistically significant association between mid-endplate irregularities and pain. A contingency coefficient of 0.352 suggests a moderate association strength. Overall, pain was reported by 74.6% of participants, with a stronger link to the presence of mid-endplate irregularities.

Vol. 5 No. 1 (2026)

Pakistan Journal of Medical & Cardiological Review

https://pakjmcr.com/index.php/1/about

Mehrban et al - 2026

Online ISSN 3007-2387

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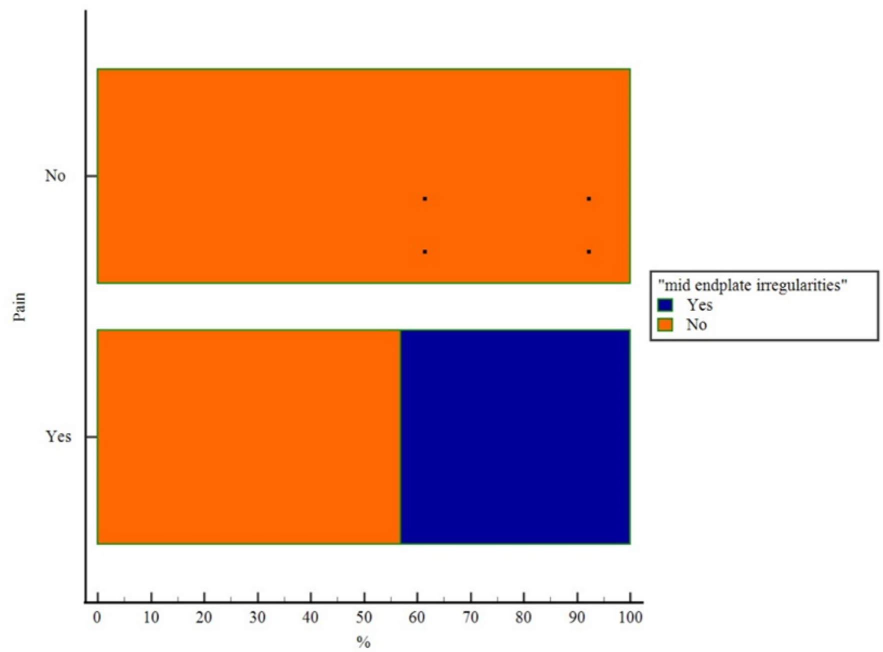

Figure 2: Show frequency between mid-endplate irregularities and pain.

Table 3 shows relation between pain and modic change

Classification X	Pain		
Classification Y	"Modic changes Yes/No"		
	Pain		
Modic_changes_Yes_No	No	Yes	
No	13	29	42 (71.2%)
Yes	2	15	17 (28.8%)
	15 (25.4%)	44 (74.6%)	59
Chi-squared			2.310

Online ISSN 3007-2387
Print ISSN 3007-2379

DF	1
Significance level	P = 0.1285
Contingency coefficient	0.194

Modic changes were observed in 28.8% (17/59) of patients, and 74.6% (44/59) of these patients experienced pain. Among those without Modic changes (71.2%, 42/59), 29 patients reported pain, while 13 had no pain. Pain was more prevalent among patients with Modic changes, indicating a significant association. The chi-squared test (χ^2 = 2.310, P = 0.1285) showed a statistically significant relationship between Modic changes and pain. A contingency coefficient of 0.194 suggests a moderate to strong association between the two variables.

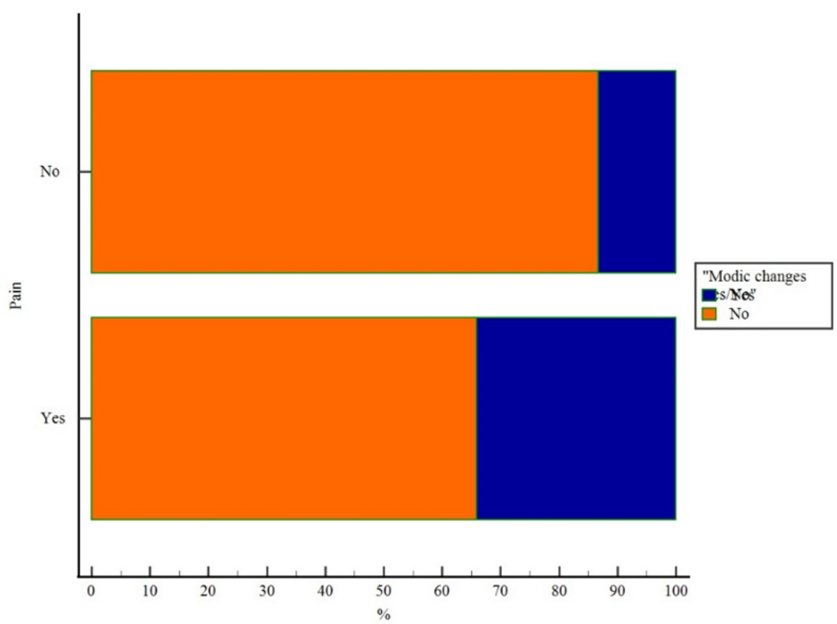

Figure 3: Show frequency between Modic changes and Pain.

Vol. 5 No. 1 (2026)

Pakistan Journal of Medical & Cardiological Review

https://pakjmcr.com/index.php/1/about

Online ISSN 3007-2387 Print ISSN 3007-2379

Table 4 Shows relation between pain and neural foraminal

Classification X	Pain		
Classification Y	Neural Forminal Yess or No		
	Pain		
Neural_Foraminal_Yess_or_No	No	Yes	
No	15	21	36 (61.0%)
Yes	0	23	23 (39.0%)
	15 (25.4%)	44 (74.6%)	59
Chi-squared			12.633
DF			1
Significance level			P = 0.0004
Contingency coefficient			0.420

Neural foraminal narrowing was observed in 39% (23/59) of patients, and all of them reported pain. Among patients without neural foraminal narrowing (61%, 36/59), 21 experienced pain, while 15 had no pain. The chi-squared test (χ^2 = 12.633, P = 0.0004) indicated no statistically significant association between neural foraminal narrowing and pain. A contingency coefficient of 0.420 suggests a weak relationship between the variables. Pain was more consistently reported among patients with neural foraminal narrowing, but statistical significance was not achieved.

Online ISSN 3007-2387

Print ISSN 3007-2379

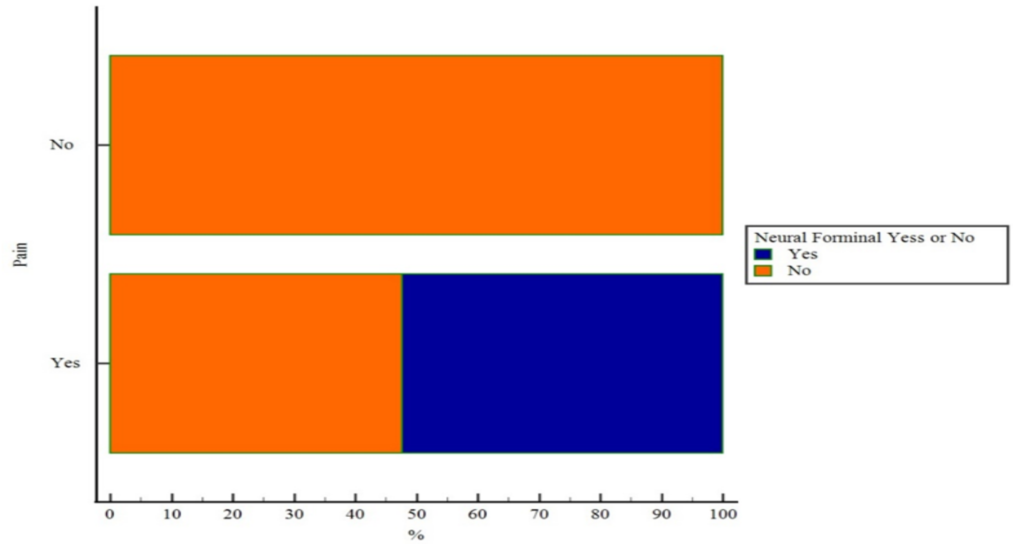

Figure 4: Show frequency between neural foraminal narrowing and pain

Table 5 Show relationship between Pain and Posterior Osteophytes

Classification X	Pain
Classification Y	"Posterior Osteophytes Yes/No"

Posterior_Osteophyt_es_Yes_No	Pain		
	No	Yes	
No	15	22	37 (62.7%)
Yes	0	22	22 (37.3%)
	15 (25.4%)	44 (74.6%)	59

Chi-squared	11.757
DF	1
Significance level	P = 0.0006

Vol. 5 No. 1 (2026)

Pakistan Journal of Medical & Cardiological Review

https://pakjmcr.com/index.php/1/about

Online ISSN 3007-2387 Print ISSN 3007-2379

Contingency coefficient	0.408

Posterior osteophytes were present in 37.3% (22/59) of patients, 74.6 % all of whom experienced pain. While 62.7% had no pain and 25.4% without posterior osteophytes. The Chi-squared test ((χ^2 =11.757%, P= 0.0006%) shows a highly statistically significant association (p = 0.0006) between posterior osteophytes and pain. A contingency coefficient of 0.408 suggests a moderate to strong relationship between the variables. Pain was more consistently reported among patients with posterior osteophtes but statistical significance was not achieved.

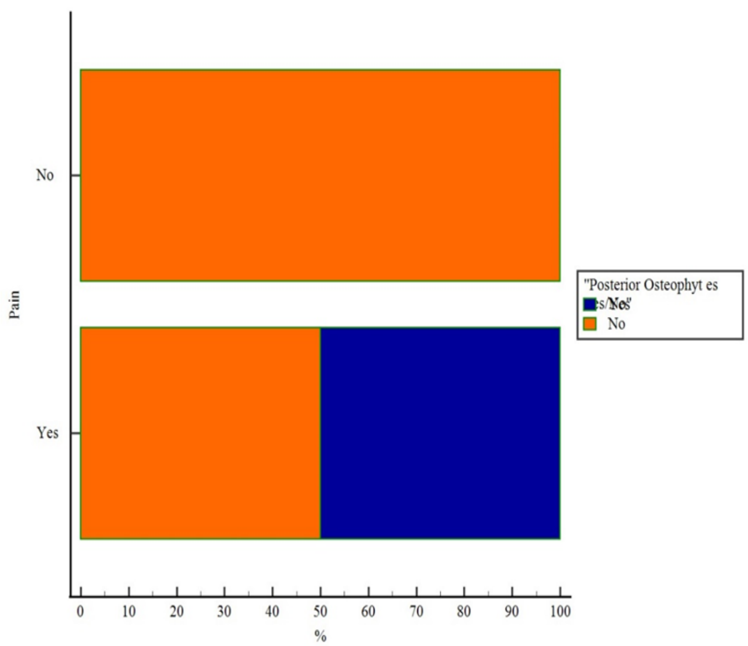

Figure 5 Show frequency between pain and posterior osteophytes:

Online ISSN 3007-2387
Print ISSN 3007-2379

Table 6 Show relationship between Pain and Protusion:

Classification X	**Pain**		
Classification Y	Protusion		
Protusion	Pain		
	No	Yes	
No	10	11	21 (35.6%)
Yes	5	33	38 (64.4%)
	15 (25.4%)	44 (74.6%)	59

Chi-squared	8.328
DF	1
Significance level	P = 0.0039
Contingency coefficient	0.352

Disc protrusion was present in 64.4% (38/59) of patients, with 74.6% (33/38) of them experiencing pain.

Chi-squared test. The Chi-squared test shows a statistically significant association (p = 0.0039) between disc protrusion and pain.

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Print ISSN 3007-2379

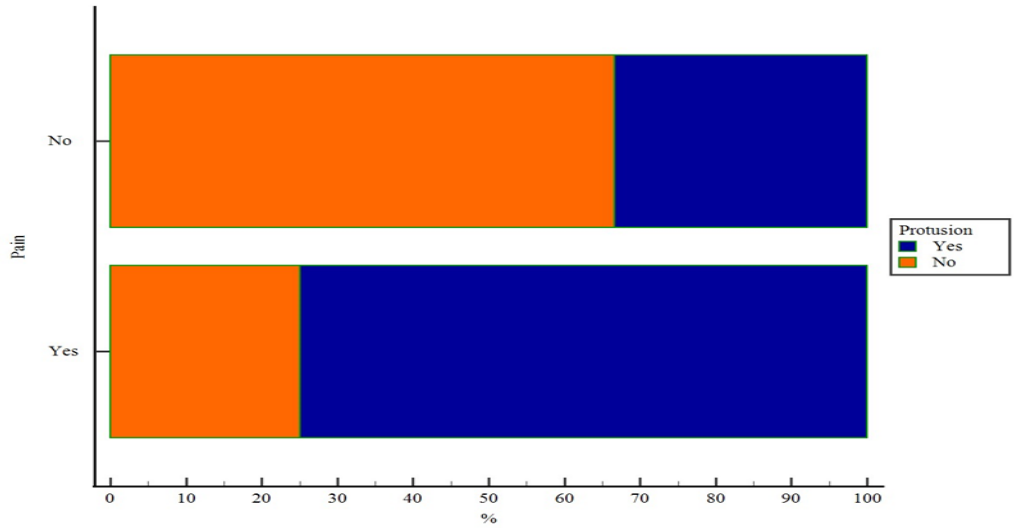

Figure 6 Show frequency between Pain and Protrusion.

Table 7 Association between Numbness (Yes/No) and Disc Extrusion

Classification X	"Numbne ss Yes/No"		
Classification Y	Extrusion		
Extrusion	Numbne_ss_Yes_No		
	No	Yes	
No	27	11	38 (64.4%)
Yes	4	17	21 (35.6%)
	31 (52.5%)	28 (47.5%)	59

Chi-squared	14.421
DF	1
Significance level	P = 0.0001
Contingency coefficient	0.443

Pakistan Journal of Medical & Cardiological Review

https://pakjmcr.com/index.php/1/about

Online ISSN 3007-2387
Print ISSN 3007-2379

The Chi-squared test results show a statistically significant association (p = 0.0001) between numbness and disc extrusion. 35.6% (21 out of 59) of the patients exhibited disc extrusion, with 80.9% (17 out of 21) of these patients also reporting pain. The table shows that patients without numbness had a higher frequency of no extrusion (64.4%), while those with numbness had a higher frequency of extrusion (47.5%). The contingency coefficient of 0.443 suggests a moderate association between numbness and disc extrusion.

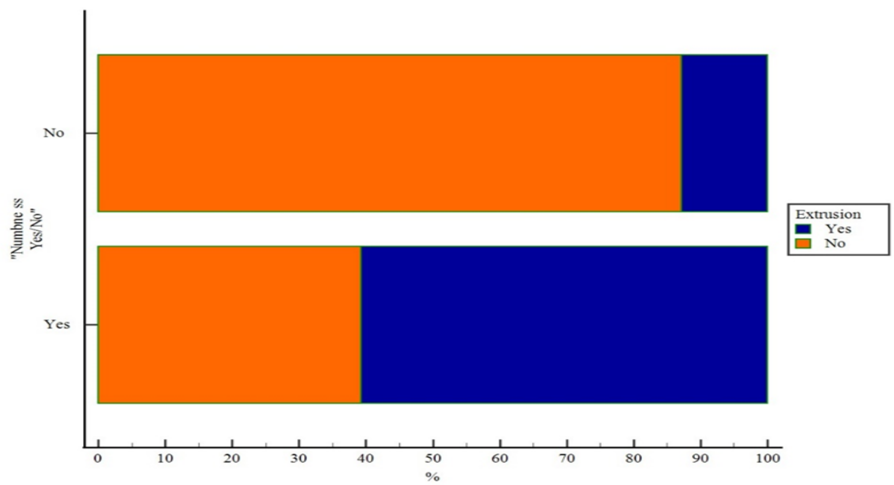

Figure 7 Show frequency between Numbness and Extrusion.

Table 8 Association between Numbness and Posterior Osteophytes

Classification X	"Numbness		
Classification Y	"Posterior Osteophytes		
	Numbness_		
Posterior_Osteophytes	No	Yes	
No	24	13	37 (62.7%)
Yes	7	15	22 (37.3%)

Pakistan Journal of Medical & Cardiological Review

https://pakjmcr.com/index.php/1/about

Online ISSN 3007-2387 Print ISSN 3007-2379

	31 (52.5%)	28 (47.5%)	59

Chi-squared	5.940
DF	1
Significance level	P = 0.0148
Contingency coefficient	0.302

37.3% of cases (22 out of 59) had posterior osteophytes, with a higher proportion (47.5%) of numb patients experiencing posterior osteophytes. The Chi-squared test results show a highly significant association (p = 0.0148) between numbness and the presence of posterior osteophytes. The contingency coefficient of 0.302 indicates a moderate relationship between numbness and posterior osteophytes.

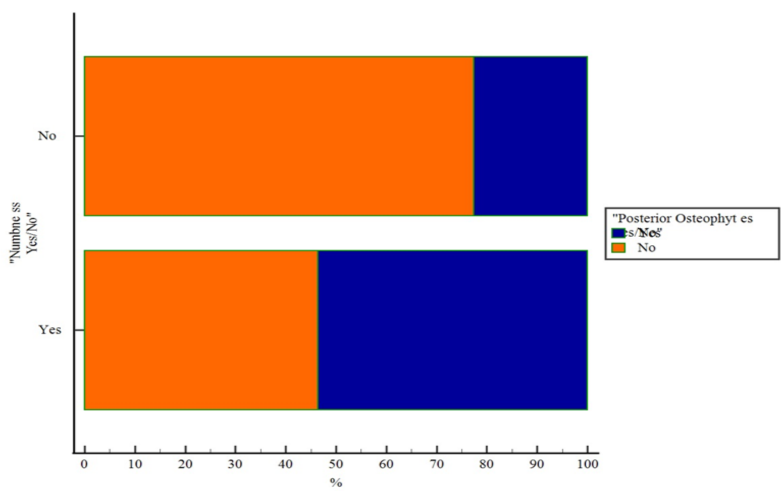

Figure 8 Show frequency between Numbness and Posterior Osteophytes

Table 9 Association between Pain Radiant (Bilateral/Unilateral) and Mid-Endplate Irregularities (Yes/No)

Classification X	Pain radiant Bilateral\Unilateral
Classification Y	"mid endplate irregular ities Yes/No"

mid_endplate_irregular_ities_Yes_No	Pain_radiant_Bilateral\Unilateral			
	Bilateral	No	Unilateral	
No	23	13	4	40 (67.8%)
Yes	10	0	9	19 (32.2%)
	33 (55.9%)	13 (22.0%)	13 (22.0%)	59

Chi-squared	14.393
DF	2
Significance level	P = 0.0007
Contingency coefficient	0.443

Mid-endplate irregularities were found in 32.2% of cases (19 out of 59), with a notable distribution: 52.6% of these irregularities were associated with bilateral pain radiation (10 out of 19). 47.4% of the cases with mid-endplate irregularities had unilateral pain radiation (9 out of 19). The Chi-squared test results indicate a statistically significant association between pain radiant (bilateral/unilateral) and mid-endplate irregularities (p = 0.0007).The contingency coefficient of 0.443 suggests a moderate association between the two variables.

Vol. 5 No. 1 (2026)

Pakistan Journal of Medical & Cardiological Review

https://pakjmcr.com/index.php/1/about

Online ISSN 3007-2387 Print ISSN 3007-2379

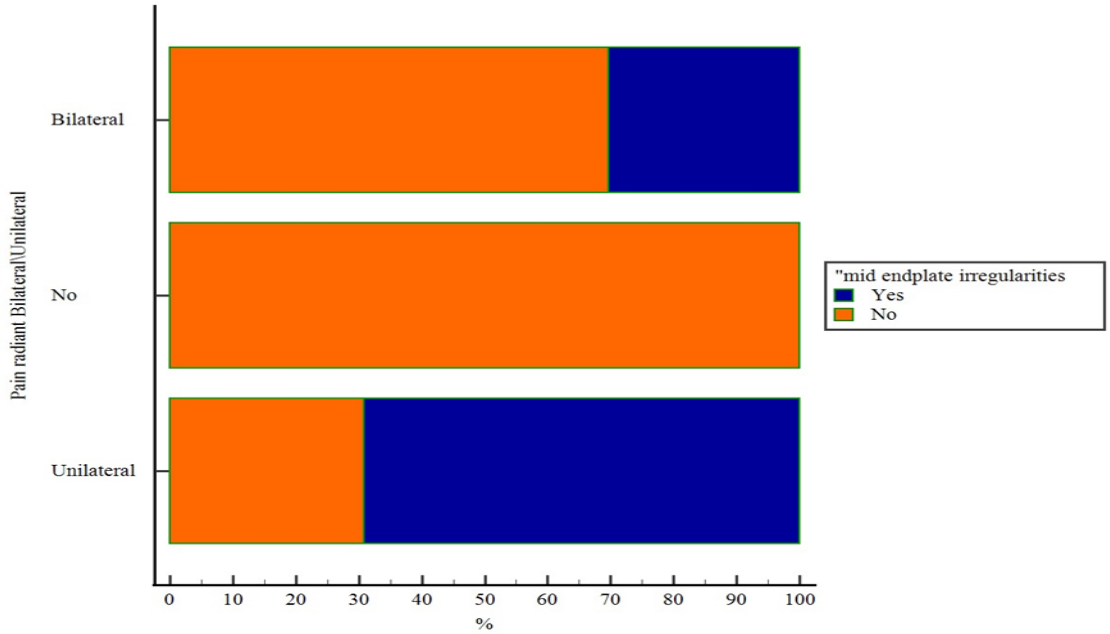

Figure 9 Show frequency pain radiant (Bilateral/Unilateral) and Mid-Endplate Irregularities

Table 10 Association between Pain Radiation (Bilateral/Unilateral) and Modic Changes

Classification X	Pain radiant Bilateral\Unilateral			
Classification Y	"Modic changes Yes/No"			
Modic_changes_Yes_No	Pain_radiant_Bilateral\Unilateral			
	Bilateral	No	Unilateral	
No	31	11	0	42 (71.2%)
Yes	2	2	13	17 (28.8%)
	33	13	13	59

	(55.9%)	(22.0%)	(22.0%)	
Chi-squared				41.590
DF				2
Significance level				P < 0.0001
Contingency coefficient				0.643

Modic changes were present in 28.8% of the cases (17 out of 59), with the distribution as follows: 11.8% of cases with Modic changes had bilateral pain radiant (2 out of 17). 11.8% of cases with Modic changes had unilateral pain radiation (2 out of 17). A majority of the cases with Modic changes (76.5%, 13 out of 17) had no pain radiant. The Chi-squared test results show a highly statistically significant association (p < 0.0001) between Modic changes and pain radiant.The contingency coefficient of 0.643 indicates a strong association between Modic changes and pain radiant.

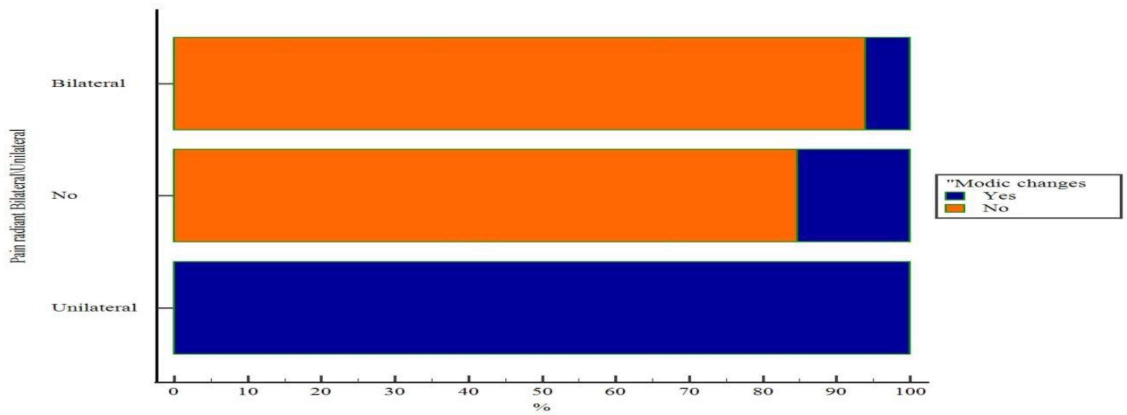

Figure 10 Show Frequancy pain radiant (Bilateral/Unilateral) and Modic changes

Vol. 5 No. 1 (2026)

Pakistan Journal of Medical & Cardiological Review

https://pakjmcr.com/index.php/1/about

Online ISSN 3007-2387 Print ISSN 3007-2379

Table 11: Association between Pain Radiation (Bilateral/Unilateral) and Neural Foraminal Stenosis

Classification X	Pain radiant Bilateral\Unilateral			
Classification Y	Neural Forminal Yess or No			
	Pain_radiant_Bilateral\Unilateral			
Neural_Forminal_Yess_or_No	Bilateral	No	Unilateral	
No	23	13	0	36 (61.0%)
Yes	10	0	13	23 (39.0%)
	33 (55.9%)	13 (22.0%)	13 (22.0%)	59

Chi-squared	29.699
DF	2
Significance level	P < 0.0001
Contingency coefficient	0.579

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Neural foraminal stenosis was present in 39.0% of cases (23 out of 59), with the distribution as follows: 43.5% of cases with neural foraminal stenosis had bilateral pain radiation (10 out of 23). 56.5% of cases with neural foraminal stenosis had unilateral pain radiation (13 out of 23). 61.0% of patients without neural foraminal stenosis had bilateral pain radiation. The Chi-squared test results show a highly statistically significant association ($p < 0.0001$) between neural foraminal stenosis and pain radiation. The contingency coefficient of 0.579 suggests a moderate to strong association between neural foraminal stenosis and pain radiation.

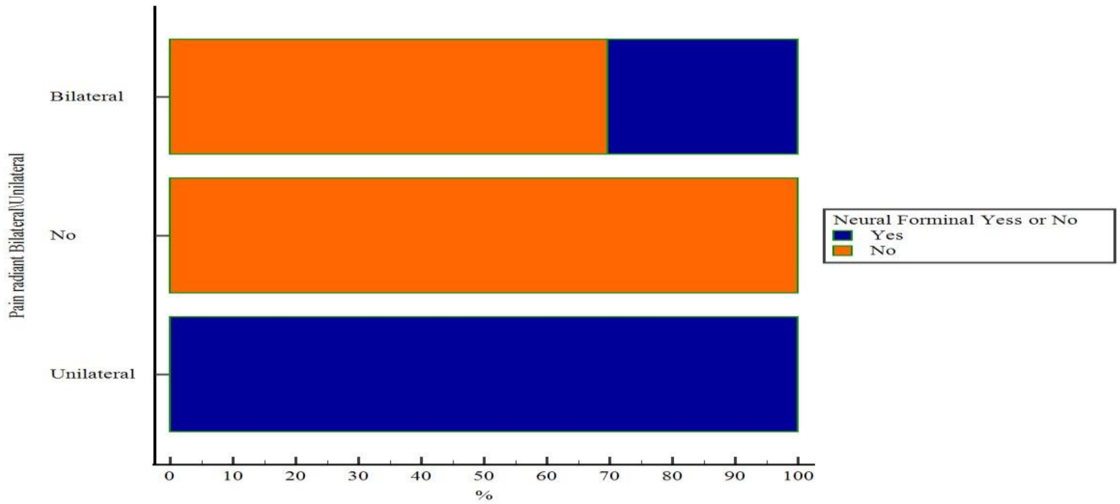

Figure 11 Show frequency between neural foraminal stenosis and pain radiation.

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Table 12 Association between Pain Radiation (Bilateral/Unilateral) and Disc Protrusion (Yes/No)

Classification X	Pain_radiant_Bilateral\Unilateral Pain radiant Bilateral\Unilateral			
Classification Y	Protusion Protusion			
Protusion	Pain_radiant_Bilateral\Unilateral			
	Bilateral	No	Unilateral	
No	2	8	11	21 (35.6%)
Yes	31	5	2	38 (64.4%)
	33 (55.9%)	13 (22.0%)	13 (22.0%)	59

Chi-squared	30.000
DF	2
Significance level	P < 0.0001
Contingency coefficient	0.581

64.4% of cases (38 out of 59) had disc protrusion, with a strong association with bilateral pain radiation, observed in 81.6% (31 out of 38) of cases with protrusion. 35.6% of patients (21 out of 59) did not have disc protrusion, with a higher proportion of these cases exhibiting unilateral pain radiation (52.4%). The Chi-squared test results indicate a highly statistically significant association (p < 0.0001) between disc protrusion and pain radiation. The contingency coefficient of 0.581 suggests a moderate to strong association between disc protrusion and pain radiation.

Pakistan Journal of Medical & Cardiological Review

https://pakjmcr.com/index.php/1/about

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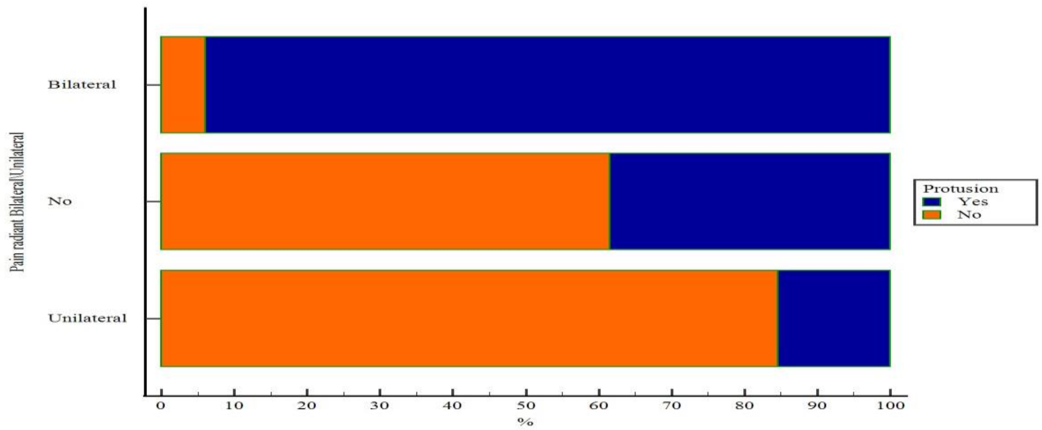

Figure 12 Show frequency between disc protrusion and pain radiation

Table 13 Association between Numbness (Yes/No) and Disc Extrusion (Yes/No)

Classification X	Numbne_ss_Yes_No "Numbne ss Yes/No"		
Classification Y	Extrusion		
	Numbne_ss_Yes_No		
Extrusion	No	Yes	
No	27	11	38 (64.4%)
Yes	4	17	21 (35.6%)
	31 (52.5%)	28 (47.5%)	59
Chi-squared		14.421	
DF		1	
Significance level		P = 0.0001	
Contingency coefficient		0.443	

Vol. 5 No. 1 (2026)

Pakistan Journal of Medical & Cardiological Review

https://pakjmcr.com/index.php/1/about

Online ISSN 3007-2387 Print ISSN 3007-2379

35.6% of cases (21 out of 59) had disc extrusion, which was mostly associated with unilateral pain radiation. Of the patients with disc extrusion, 81% (17 out of 21) had unilateral pain radiation. 64.4% of patients (38 out of 59) did not have disc extrusion, with a larger proportion (64.4%) not reporting numbness. The Chi-squared test results show a highly statistically significant association (p = 0.0001) between numbness and disc extrusion. The contingency coefficient of 0.443 suggests a moderate association between numbness and disc extrusion.

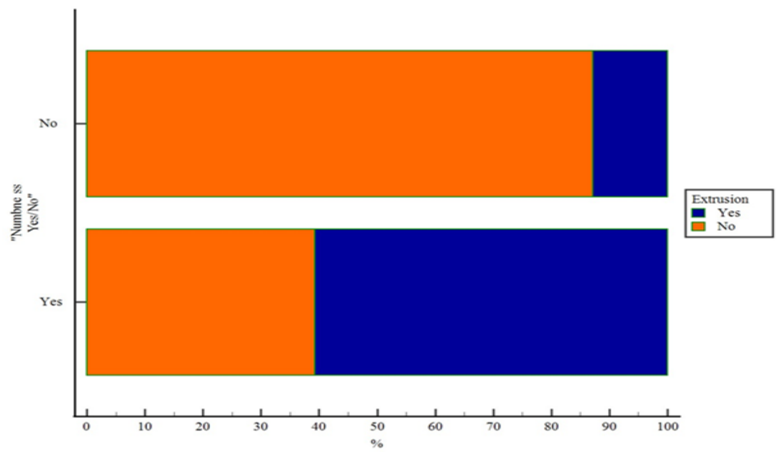

Figure 13 Show frequency between numbness and disc extrusion

Table 14 Association between Numbness (Yes/No) and Mid-Endplate Irregularities (Yes/No)

Classification X	Numbne_ss_Yes_No "Numbne ss Yes/No"
Classification Y	mid_endplate_irregular_ities_Yes_No "mid endplate irregular ities Yes/No"

mid_endplate_irregular_ities_Yes_No	Numbne_ss_Yes_No		
	No	Yes	
No	21	19	40 (67.8%)
Yes	10	9	19 (32.2%)

Vol. 5 No. 1 (2026)

Pakistan Journal of Medical & Cardiological Review

https://pakjmcr.com/index.php/1/about

Online ISSN 3007-2387 Print ISSN 3007-2379

	31 (52.5%)	28 (47.5%)	59

Chi-squared	0.000
DF	1
Significance level	P = 0.9925
Contingency coefficient	0.001

32.2% of cases (19 out of 59) had numbness, and 52.5% of cases (31 out of 59) had mid-endplate irregularities. The contingency coefficient of 0.001 suggests an extremely weak association between the two variables. The Chi-squared test results show no significant association (p = 0.9925) between numbness and mid-endplate irregularities. No significant correlation was found, indicating that the presence of numbness does not seem to be associated with mid-endplate irregularities.

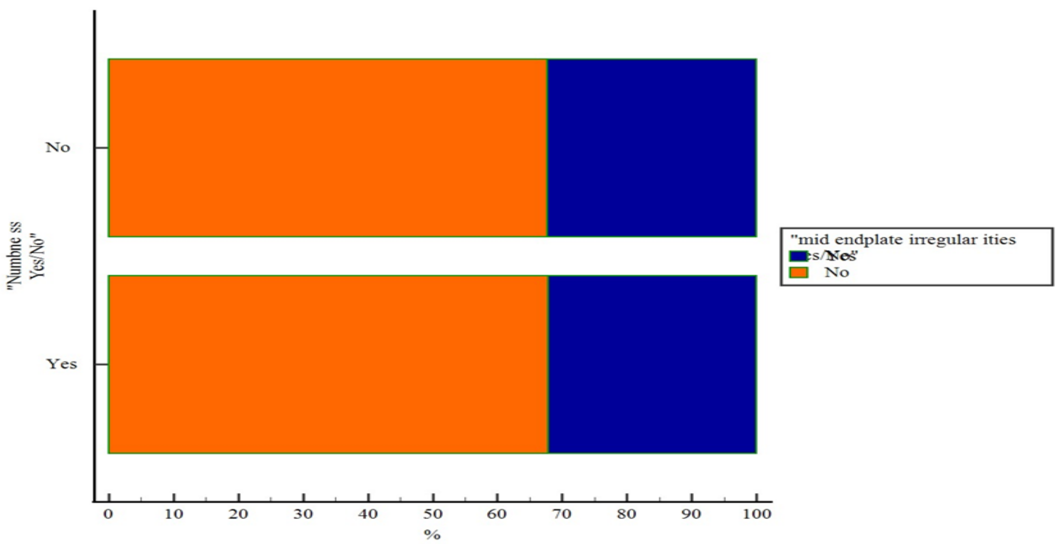

Figure 14 Show Frequency Between Numbness And Mid-Endplate Irregularities.

Table 15 Association between Numbness (Yes/No) and Modic Changes (Yes/No)

Classification X	Numbne_ss_Yes_No "Numbne ss Yes/No"
Classification Y	Modic_changes_Yes_No "Modic changes Yes/No"

Modic_changes_Yes_No	Numbne_ss_Yes_No: No	Numbne_ss_Yes_No: Yes	
No	29	13	42 (71.2%)
Yes	2	15	17 (28.8%)
	31 (52.5%)	28 (47.5%)	59

Chi-squared	15.655
DF	1
Significance level	P = 0.0001
Contingency coefficient	0.458

28.8% of cases (17 out of 59) had Modic changes, which were mostly associated with bilateral pain radiation. 71.2% of patients (42 out of 59) did not have Modic changes, and most of them did not report numbness (71.2%). The Chi-squared test results show a highly statistically significant association ($p = 0.0001$) between numbness and Modic changes. The contingency coefficient of 0.458 suggests a moderate association between numbness and Modic changes.

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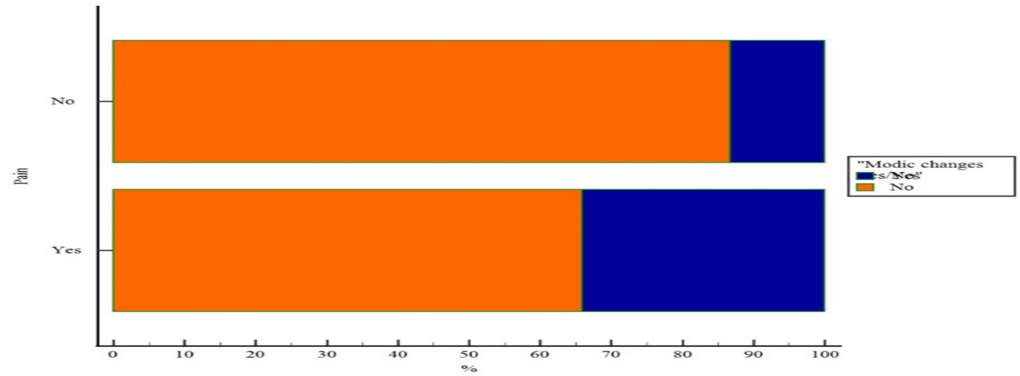

Figure 15 Show frequency between numbness and Modic changes

DISCUSSION

Low back pain (LBP) affects a substantial number of adults, with estimates indicating that between 60% to 80% will experience it during their lifetime. By the age of 30, approximately 50% of individuals had at least one episode of LBP. Despite most instances being short-lived, resolving within about six weeks irrespective of treatment, lumbar disc herniation is a common cause, particularly among those with active work lives. Herniations predominantly occur in the L4-L5 and L5-S1 vertebral levels, influenced by factors such as physical inactivity, extended driving, persistent coughing, pregnancy, smoking, and heavy lifting. MRI is a valuable tool for evaluating disc disorders, providing detailed information on various disc abnormalities, including bulges, protrusions, extrusions, or sequestrations, and their effects on spinal cord and foraminal compression.

Our research involved patients all of whom reported back pain, averaging 37.37 ± 15.5 weeks in duration. This is consistent with a study from Kathmandu, Nepal, where the average duration was 30.54 ± 27.043 weeks. We noted 100 distinct dermatomal pain levels among 60 patients, with L5 and S1 being the most frequently affected areas. This aligns with findings from a study in Pakistan, where radiculopathy along the L5 and S1 nerve roots was prevalent. The Straight Leg Raise Test (SLRT) yielded positive results in 83.8% of our participants, a rate similar to other research showing SLRT positivity between 82.5% and 94%.

Determining the exact cause of LBP can be complex due to its multifactorial nature. Disc herniation is a frequent contributor to LBP, with a strong correlation between the extent of disc damage and the severity of pain. Discogenic pain, stemming from disc degeneration and disruption, can result in spinal instability due to muscle spasms, ligament and muscle strains, disc prolapse, height loss, mechanical tears, and biochemical inflammation.

This investigation aimed to examine the relationship between clinical symptoms and MRI findings in patients with lumbar disc herniation, specifically those with confirmed L4/5 and/or L5/S1 disc prolapse. We identified a statistically significant link between abnormal physical examination results and nerve root compression on MRI. However, not all studies reported this correlation, indicating variability in clinical and imaging findings. Previous research, including studies by Chou et al., has demonstrated frequent degenerative changes in patients with severe back pain, with some studies finding significant associations between MRI results and clinical outcomes. For example, Bechara et al 2008. observed a strong relationship between the %MRI index and pain scores in older adults with chronic low back pain (CLBP). Additionally, McNee et al 2013. found MRI abnormalities in many individuals, although these were not always linked to the sudden onset of LBP.

Saleem et al 2015. reported common disc degeneration at L4–L5 and L5–S1 levels, with worsening of LBP and sciatica during walking and standing. De Schepper et al 2003. identified a significant association between disc-space narrowing and LBP, particularly in men. Conversely, Semin Musculoskelet Radiol et al 2004. introduced a new MRI scoring system for evaluating degenerative changes comprehensively, underscoring the need for standardized diagnostic tools.

Saleem et al 2015. noted that disc degeneration was most commonly observed at the L4-L5 and L5-S1 levels, with LBP and sciatica symptoms worsening during activities like walking and standing. De Schepper et al 2003. discovered a significant correlation between disc-space narrowing and LBP, particularly in men. Conversely, the study by Semin Musculoskelet Radiol et al 2004. introduced a new MRI scoring system designed to comprehensively assess degenerative changes, emphasizing the need for standardized tools in evaluating MRI findings.

Vol. 5 No. 1 (2026)

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Online ISSN Print ISSN

3007-2387 3007-2379

CONCLUSION

7.1CONCLUSION(S)

There is a statistically significant correlation between clinical features and MRI findings in patients with lumbar disc herniation. MRI is a valuable diagnostic tool for assessing the extent of disc disease and its impact on patients' symptoms.

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