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EVALUATING THE FREQUENCY OF LUMBAR SPINAL DISEASES WITH LOWER BACK PAIN ON MRI AT A TERTIARY CARE HOSPITAL

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Abstract

Background: Low back pain (LBP) is one of the most prevalent musculoskeletal conditions worldwide, contributing significantly to disability and economic burden. Magnetic resonance imaging (MRI) offers superior sensitivity in detecting degenerative, traumatic, neoplastic, and infective spinal pathologies.

Methods: A descriptive cross-sectional study was performed including 162 patients aged ≥15 years undergoing lumbar MRI. Data were analyzed using SPSS-22.

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Methods: A descriptive cross-sectional study was performed including 162 patients aged ≥15 years undergoing lumbar MRI. Data were analyzed using SPSS-22.

Results: Degenerative disc disease (DDD) was the most common pathology (85.8%), followed by traumatic lesions (7.4%), infections (5.5%), and idiopathic causes (1.2%). Disc bulge (82.2%) was the predominant degenerative abnormality. L4-L5 was the most frequently affected level. Females showed a slightly higher frequency of LBP compared to males.

Conclusion: Degenerative disc disease remains the leading cause of LBP, predominantly affecting individuals aged 30–45 years, with L4-L5 most frequently involved.

INTRODUCTION

Lower back pain (LBP) refers to stiffness or discomfort in the vertebral region below the lower costal margins and gluteal folds, with or without radiation to the lower limbs. It is one of the most common global health concerns, affecting nearly 80% of individuals during their lifetime and significantly contributing to disability, reduced productivity, and healthcare expenditure (1–3). LBP may be acute—lasting up to 12 weeks—or chronic when persisting beyond three months. Acute cases often arise from muscle strain or tissue injury, whereas chronic cases may persist even after the initial pathology has resolved (4,5).

The lumbar spine consists of five vertebrae (L1–L5), intervertebral discs, ligaments, and facet joints, all richly innervated and essential for stability and mobility. Intervertebral discs—composed of the nucleus pulposus, annulus fibrosus, and cartilaginous endplates— absorb mechanical loads and maintain spinal flexibility. Degenerative changes in these structures, particularly disc dehydration and matrix breakdown, contribute significantly to LBP (6–8).

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Multiple lumbar spinal pathologies are associated with LBP, including disc herniation, degenerative disc disease (DDD), spondylolisthesis, spinal stenosis, traumatic injuries, spinal infections, ankylosing spondylitis, and tumors. Disc degeneration is among the most frequent causes, resulting from age-related biochemical alterations, mechanical stress, or genetic predisposition (8–11). Nearly 90% of LBP cases, however, remain idiopathic (9).

Risk factors for LBP include obesity, aging, smoking, poor posture, pregnancy-related biomechanical changes, heavy workloads, and occupational vibration exposure (4,5,12). Globally, LBP ranks among the leading causes of disability, with more than 637 million people affected (1–3).

Assessment of LBP involves detailed history, physical examination, and appropriate laboratory testing. Imaging plays a central diagnostic role, particularly MRI, which offers superior soft-tissue contrast for evaluating disc hydration, nerve root compromise, spinal stenosis, and early degenerative changes without ionizing radiation (13–15). MRI is therefore considered the gold standard for diagnosing lumbar spinal pathologies.

Given the high burden of disease and its impact on quality of life, this study aims to evaluate the prevalence and frequency of lumbar spine pathologies associated with LBP using MRI among patients presenting to RMI. Understanding these patterns may support earlier diagnosis, targeted management, and improved long-term outcomes.

Materials and Methods

Study Design: A descriptive cross-sectional study was conducted at Rehman Medical Institute (RMI), Peshawar.

Study Duration: June 2022 to November 2022. Sample Size: 162 patients with LBP referred for MRI.

Sampling Technique: Non-probability convenient sampling.

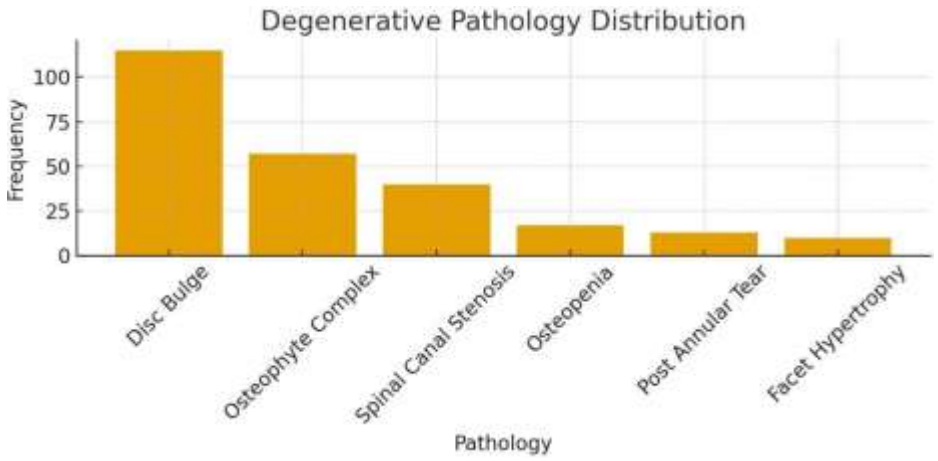
Inclusion Criteria: Patients aged ⩾15 years presenting with LBP suspected to be of spinal origin.

Exclusion Criteria: MRI-contraindicated patients and those with pregnancy, prior spinal surgery, or LBP of non-spinal origin.

MRI Protocol: MRI scans were performed using a 1.5 Tesla system with lumbar spine coils.Standard sequences included T1-weighted, T2-weighted, STIR, and axial sequences. Evaluated parameters included disc hydration, bulging, protrusion, extrusion, osteophyte formation, canal stenosis, ligamentous hypertrophy, and vertebral marrow signal abnormalities.

Data Analysis: Data were analyzed using SPSS-22. Frequencies, percentages, and distribution of pathologies across age, gender, and spinal levels were calculated. Graphs and tables were used to illustrate key findings.

Results Graphs



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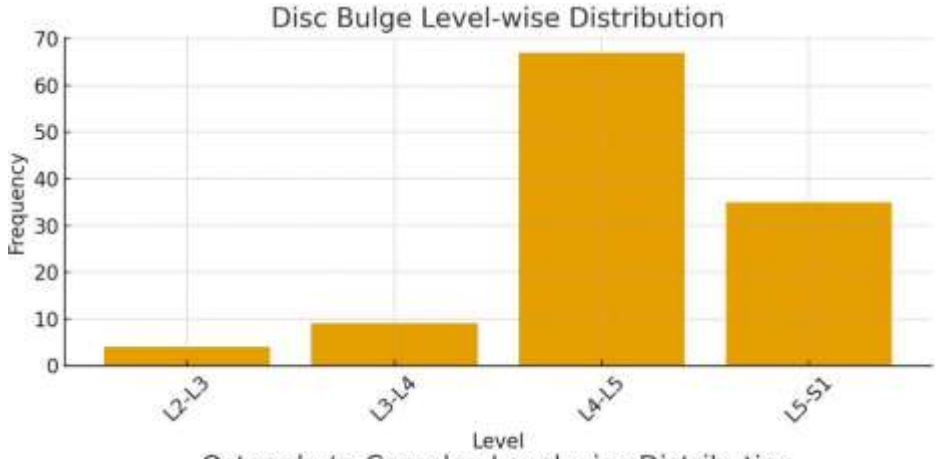

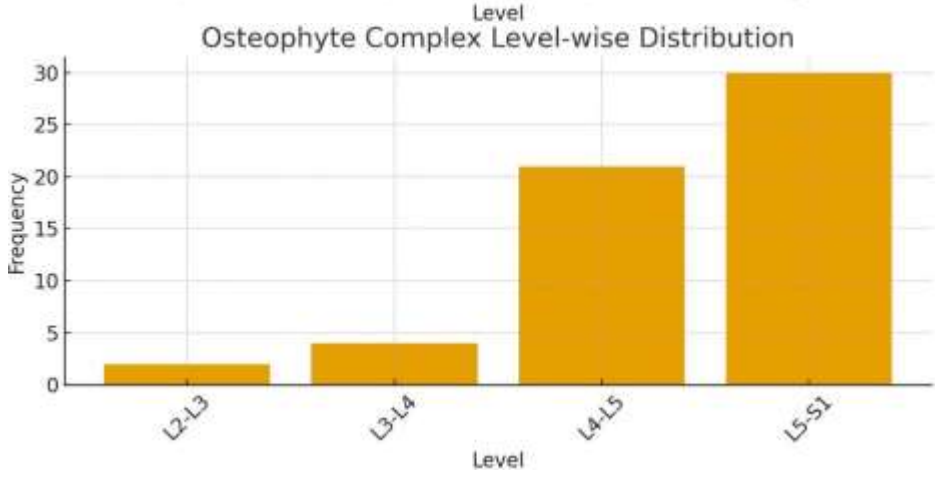

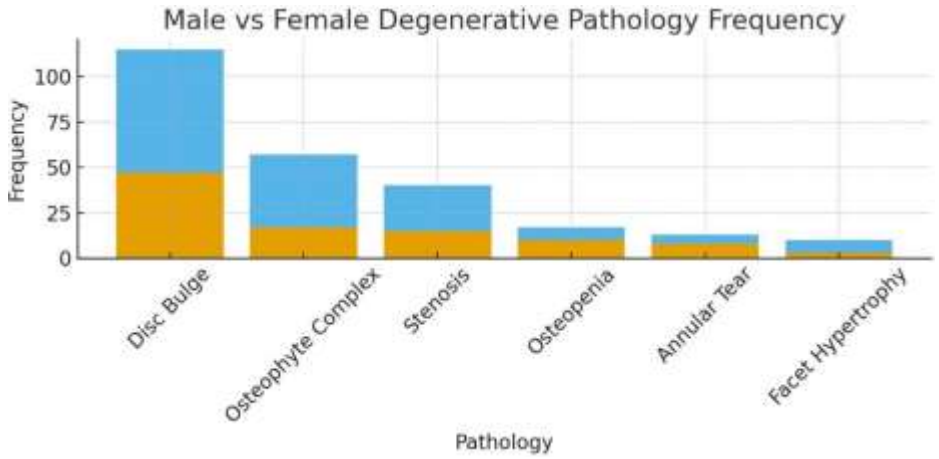

Tables

Table 1. Frequency of Degenerative Pathology

Pathology	Frequency
Disc Bulge	115
Osteophyte Complex	57
Spinal Canal Stenosis	40
Osteopenia	17
Post Annular Tear	13
Facet Hypertrophy	10

Table 2. Disc Bulge Distribution by Level

Level	Frequency
L2-L3	4
L3-L4	9
L4-L5	67
L5-S1	35

Table 3. Osteophyte Complex Distribution by Level

Level	Frequency
L2-L3	2
L3-L4	4
L4-L5	21
L5-S1	30

Table 4. Male vs Female Degenerative Pathology Frequency

Pathology	Male	Female
Disc Bulge	47	68
Osteophyte Complex	17	40
Stenosis	15	25
Osteopenia	10	7
Annular Tear	8	5
Facet Hypertrophy	3	7

Discussion

Lower back pain (LBP) is a widespread musculoskeletal condition affecting nearly two-thirds of the global population and consistently remains one of the leading reasons for

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healthcare visits (1–3). It is a major contributor to disability and reduced productivity, posing substantial socioeconomic challenges worldwide. Although LBP may arise from various etiologies—including degenerative, traumatic, infectious, and neoplastic causes—degenerative disc disease (DDD) is the most common underlying factor (6–10). DDD results from cumulative structural deterioration influenced by age, trauma, nutritional deficits, and biomechanical stressors, leading to conditions such as disc herniation, spinal stenosis, spondylosis, osteoarthritis, and osteophyte formation (7–11). Several risk factors, including age, gender, obesity, posture, smoking, and occupational strain, are strongly associated with its development (4,5,12).

The present study aimed to determine the frequency of lumbar spinal pathologies in patients presenting with LBP and compare their occurrence between males and females. Among the 162 patients evaluated, females exhibited a higher prevalence (52.8%) than males (47.2%). Middle-aged individuals (30–45 years) were most frequently affected, reflecting increased vulnerability during peak working years. Female predominance in the 30–45 age group aligns with findings linking hormonal factors, reduced bone mineral density, and postural strain to higher degenerative susceptibility in women (4,5).

Acute LBP accounted for 34.6% of cases, while chronic symptoms were observed in 65.4%, supporting global data indicating that most degenerative spinal conditions present chronically (1–3,6). DDD was the leading pathology (85.8%), with a higher proportion in females (55.39%). Post-traumatic lesions were the second most common pathology (7.40%), predominantly affecting males, likely due to increased involvement in physically demanding activities. Infectious causes (5.5%) occurred more frequently in males, whereas idiopathic cases comprised 1.23%.

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Among degenerative changes, disc bulge was the most prevalent abnormality (82.27%), with a higher incidence in females—consistent with earlier reports demonstrating disc degeneration in 79–82% of LBP patients (6,7,14). Osteophyte complex (41%) and spinal canal stenosis (28.77%) were also more common in females. In contrast, osteopenia (12.23%) and posterior annular tears (9.35%) were more frequently observed in males.

Level-based analysis revealed L4–L5 as the most commonly affected segment, followed by L5–S1, mirroring previous studies and biomechanical evidence that these segments experience the highest axial load and mobility (6–8). Osteophyte formation followed a similar pattern, with L5–S1 involvement being more common, again supporting the anatomical vulnerability of the lumbosacral region.

MRI remains the preferred imaging modality for assessing lumbar spine pathology due to its excellent soft-tissue contrast, capacity to detect early degenerative changes, and lack of radiation exposure (13–15). It outperforms CT and radiography in evaluating disc hydration, neural compression, infections, marrow changes, and ligamentous abnormalities, reaffirming its central role in the diagnostic workup of LBP.

Overall, this study reinforces that degenerative disc disease is the predominant cause of LBP, with higher prevalence in females and greatest involvement at the L4–L5 and L5–S1 levels. These findings highlight the importance of early diagnosis, ergonomic education, preventive strategies, and timely intervention to reduce the long-term impact of LBP on quality of life and productivity.

Conclusion

Degenerative disc disease is the leading cause of LBP in the studied population, affecting predominantly females and individuals aged 30–45 years. Disc bulge was the most

common degenerative feature, with L4-L5 being the most frequently involved level. MRI remains an indispensable tool for accurate diagnosis and treatment planning.

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