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Prevalence and pattern of lumbosacral MRI findings in patients with chronic low back pain: A retrospective study from Saudi Arabia

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Abstract

Background: Low back pain (LBP) is a paramount global cause of disability. While magnetic resonance imaging (MRI) is pivotal for excluding serious pathology, the high prevalence of age-related degenerative findings in asymptomatic populations complicates its interpretation. Data on the specific distribution and yield of MRI findings in Middle Eastern clinical cohorts are limited. The objective was to quantify the prevalence and distribution of lumbosacral MRI abnormalities in a Saudi cohort with chronic LBP and to examine variations across referral sources and age. *Methods:* A retrospective, cross-sectional analysis was conducted on 1,574 consecutive adults with chronic LBP referred for lumbosacral MRI. MRI reports were classified as "positive" (any abnormality) or "negative." Prevalence rates and 95% confidence intervals were calculated. Age differences were analyzed using t-tests. *Results:* The overall positivity rate was 84% (1,318/1,574). Positivity was highest in orthopaedics (86.6%) and neurosurgery (86.9%) and lowest in the chronic pain clinic (72.2%). Patients with positive findings were significantly older than those with negative findings (mean age 51.8 vs. 37.8 years; $p<0.001$), a trend consistent across all referral sources. Degenerative disc disease was the predominant finding, comprising 78% of all abnormal scans. *Conclusion:* In this Saudi cohort, MRI abnormalities were highly prevalent, strongly associated with increasing age, and most frequently identified in surgical specialties. These findings underscore the necessity of guideline-adherent, selective imaging and age-aware interpretation to optimize clinical utility and resource allocation.

Keywords: low back pain; magnetic resonance imaging; degenerative disc disease; prevalence; diagnostic yield; Saudi Arabia

Introduction

Low back pain (LBP) is the leading global cause of years lived with disability, affecting an estimated 619 million people in 2020, a figure projected to approach 843 million by 2050 [1]. The resultant disability burden is substantial, accounting for approximately 69 million years lived with disability (YLDs) in 2020, with significant contributions from modifiable risk factors such as occupational exposures, smoking, and elevated body mass index [2].

In the diagnostic workup of chronic LBP (CLBP), lumbosacral magnetic resonance imaging (MRI) is instrumental for excluding serious pathologies like infection, malignancy, fracture, or cauda equina syndrome. However, the clinical value of MRI is often challenged by the high prevalence of degenerative findings including disc desiccation, bulging, facet arthropathy, and Modic changes in asymptomatic individuals, which increases sharply with age [3]. This complicates causal inference in individual patients [4].

Consequently, contemporary clinical guidelines strongly advocate for selective imaging. The American College of Radiology (ACR) Appropriateness Criteria advise against routine imaging for uncomplicated acute or subacute LBP, recommending MRI primarily in the presence of red flags, progressive neurological deficits, or when results are anticipated to directly alter management [5]. Similar recommendations are echoed by the National Institute for Health and Care Excellence (NICE) and the Choosing Wisely campaign, highlighting the potential for minimal benefit and significant downstream harms from non-selective imaging [6, 7].

Regionally, studies from Saudi Arabia report a high burden of degenerative features among symptomatic

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patients, with disc dehydration and neural compromise being most frequent at the L4/L5 and L5/S1 levels [8]. This underscores a significant age-linked degenerative burden in local clinical cohorts.

Therefore, this study aims to quantify the frequency and distribution of lumbosacral MRI abnormalities among adults with CLBP at a tertiary Saudi hospital and to examine variation by referral source and age, with the goal of informing evidence-based, pathway-specific imaging decisions.

Methods

Study design and population

This retrospective, cross-sectional study was conducted at Qatif Central Hospital, a tertiary care referral center in Saudi Arabia, during 2024. The study population consisted of consecutive adult patients aged 18 years and older who were referred for lumbosacral magnetic resonance imaging due to chronic low back pain, defined as pain persisting for more than three months. Ethical approval was obtained from the Institutional Review Board of Qatif Central Hospital.

Owing to the retrospective nature of the study and the use of anonymized routinely collected clinical data, the requirement for informed consent was waived. Patients were excluded if they had a documented history of prior spinal surgery, recent significant spinal trauma, known active malignancy, or established inflammatory spinal disorders such as spondyloarthritis, as these conditions represent distinct diagnostic pathways with predefined imaging indications and could confound interpretation of degenerative findings.

Data collection and imaging variables

Demographic variables, including age, sex, and referral source, were extracted from the hospital's electronic medical record system. All MRI examinations were performed as part of routine clinical care using standardized institutional lumbosacral spine protocols on high-field scanners, primarily 1.5 Tesla systems. Imaging protocols typically included sagittal and axial T1-weighted and T2-weighted sequences, with additional fluid-sensitive sequences obtained when clinically indicated. Formal MRI reports issued by consultant-level musculoskeletal radiologists during standard clinical workflow were used as the primary data source, and no secondary image reinterpretation was undertaken for research purposes. For the primary analysis, MRI reports were dichotomized as positive or negative. A positive MRI was defined as the presence of any structural abnormality, including degenerative disc disease, facet joint arthropathy, spondylolisthesis, spinal canal or neural foraminal stenosis, or other non-degenerative pathology, while negative MRI examinations were those reported as having no significant abnormalities. Degenerative disc disease was further subclassified into mild disease, characterized by isolated disc desiccation or bulging without significant neural compromise, and significant severe disease, characterized by disc protrusion or extrusion, multilevel involvement, or associated central canal or foraminal stenosis.

Statistical analysis

Descriptive statistics were used to summarize patient demographics, referral patterns, and imaging findings. The prevalence of positive MRI findings was calculated for the overall cohort and stratified by referral source, with 95% confidence intervals estimated using the Wilson score method to provide robust interval estimates. Mean age differences between patients with positive and negative MRI findings were assessed using independent-samples t-tests. Given the large sample size, parametric testing was considered appropriate. All statistical analyses were performed using SPSS Statistics version 28 (IBM Corp., Armonk, NY, USA), and a two-sided p-value of less than 0.05 was considered statistically significant.

Results

Patient characteristics and overall MRI yield

A total of 1,574 adult patients with chronic low back pain underwent lumbosacral MRI during the study period. Of these, 26 examinations (1.7%) contained reports that were deemed unclassifiable for the purposes of referral-based analysis and were therefore excluded from clinic-level comparisons. The remaining 1,548 patients constituted the final analytic cohort. Referrals were predominantly from Neurosurgery, accounting for 1,035 of all requests (65.8%), reflecting the hospital's role as a tertiary referral center for spinal pathology. Orthopaedics represented the second largest referral source (8.6%), followed by Medical Neurology (7.6%), with the remainder originating from primary care, rheumatology, chronic pain services, and other specialty clinics (Table 1).

Overall, MRI abnormalities were identified in 1,318 patients, corresponding to a high positivity rate of 85.1% (95% CI: 83.3–86.8). Considerable variation in diagnostic yield was observed across referral sources. The highest positivity rates were recorded among patients referred from Neurosurgery (86.9%) and Orthopaedics (86.6%), whereas the lowest yield was observed in the Chronic Pain Clinic (72.2%). Intermediate positivity rates were noted in Medical Neurology, primary healthcare back-pain clinics, and rheumatology referrals. Despite these variations, positive MRI findings predominated across all referral pathways, indicating a consistently high burden of structural abnormalities in this chronic low back pain population.

Association between MRI findings and age

Patient age demonstrated a strong and statistically significant association with MRI positivity. The mean age of patients with abnormal MRI findings was 51.8 years, compared with 37.8 years among those with normal examinations, yielding a mean age difference of 14.0 years ($p<0.001$). This age-related gradient persisted across all referral sources, with patients demonstrating positive findings being consistently older than their counterparts with negative scans within each clinical pathway. Notably, even in referral groups with relatively lower overall positivity rates, such as primary care and chronic pain clinics, advancing age remained a distinguishing characteristic of

patients with abnormal imaging results (Table 1). These findings underscore the dominant influence of age on MRI-detected lumbar abnormalities in patients with chronic low back pain.

Table 1: Lumbosacral MRI yield by referral source and patient age.

Referral source	*Analyzed n (Pos+Neg)*	*Positive n (%)*	*95% CI (Wilson)*	*Mean age: Positive (y)*	*Mean age: Negative (y)*
Neurosurgery	1015	882 (86.9%)	84.7–88.8	51.8	37.0
Orthopaedics	134	116 (86.6%)	79.8–91.3	55.5	41.2
Medical Neurology	118	97 (82.2%)	74.3–88.1	51.8	40.6
Other Clinics	94	77 (81.9%)	72.9–88.4	51.5	36.6
Medical Rheumatology	90	67 (74.4%)	64.6–82.3	51.0	37.3
PHC Back-Pain Clinic	79	66 (83.5%)	73.9–90.1	46.5	38.6
Chronic Pain Clinic	18	13 (72.2%)	49.1–87.5	57.8	39.4
Overall	1548	1318 (85.1%)	83.3–86.8	51.8	37.8

Note: Analyzed n excludes 26 MRI examinations with unclassifiable reports. Age values represent mean age in years. Confidence intervals were calculated using the Wilson score method.

Pattern of lumbar MRI abnormalities

Degenerative disc disease emerged as the most prevalent imaging abnormality, accounting for 78% of all positive MRI examinations. Of the total cohort, 45% demonstrated mild degenerative disc disease, while 33% exhibited significant-severe degenerative changes, including disc protrusion or extrusion and associated neural element compromise. The ratio of mild to significant-severe degenerative disease was 1.36:1, indicating that while early degenerative changes were common, a substantial proportion of patients exhibited advanced pathology. The remaining 22% of abnormal scans comprised non-degenerative or alternative findings, including spondylolisthesis, isolated facet arthropathy, and other less frequent pathologies. Overall, the predominance of degenerative changes highlights the central role of age-related spinal degeneration in the imaging profile of this chronic low back pain cohort.

Discussion

This study of a Saudi cohort with chronic low back pain (CLBP) demonstrates a high prevalence (85.1%) of lumbosacral MRI abnormalities, with the highest diagnostic yield observed in surgical referral pathways such as Orthopaedics and Neurosurgery. A particularly salient finding is the significant age disparity, with patients exhibiting abnormal scans being, on average, 14 years older than those with normal MRI results. This age association aligns with the growing body of evidence that age-related structural changes within the lumbar spine, including disc desiccation, bulging, and facet degeneration, progressively accumulate over the adult lifespan, often independent of pain severity or specific pathology. The high diagnostic yield in surgical specialties likely reflects clinical triage practices, where persistent symptoms, functional impairment, or neurologic deficits prompt advanced imaging, inherently selecting for individuals with a higher likelihood of structural abnormalities [5]. Conversely, the substantial positivity rate (83.5%) observed even in primary care suggests potential "indication creep," where MRI may be utilized in cases lacking strict guideline-based triggers, increasing the detection of findings that may not meaningfully alter clinical management [7].

The powerful association between age and MRI abnormalities in this cohort is consistent with numerous radiologic studies showing that features such as disc bulges, facet arthropathy, and Modic changes are exceedingly common in asymptomatic and symptomatic populations alike, with prevalence escalating sharply after the age of 50 [3, 9]. Our finding that degenerative disc disease comprised 78% of all abnormal scans further underscores the dominance of age-related degeneration in imaging profiles of CLBP. Such age-expected changes frequently complicate clinical interpretation, often limiting the specificity of MRI as a stand-alone diagnostic modality in the absence of correlating clinical red flags.

Clinical and operational implications

Age-aware Interpretation: Radiologists and clinicians must contextualize MRI findings within the patient's age. Emphasizing correlation with specific neurological signs and clinical trajectories is essential to avoid over-attribution of pain to incidental, age-expected changes [3].

Guideline-adherent selective imaging: The high yield in primary care, while justifying its selective use, should not be misinterpreted as a reason for routine imaging. Strict application of guideline triggers red flags, progressive deficits, or pre-interventional planning is paramount to avoid low-value care [5, 6].

Structured reporting: Implementing structured reporting templates that clearly separate and classify findings (e.g., "age-expected degenerative changes" vs. "findings of high clinical concern") can enhance communication and guide management decisions [10].

Service planning: The concentration of high-yield scans in surgical specialties suggests that MRI scheduling and radiologist reporting workflows could be optimized to prioritize these pathways, improving throughput for patients most likely to require intervention.

A cross-sectional analysis of lumbar morphometric changes confirmed that individual MRI abnormalities including intervertebral disc degeneration, disc herniation, high-intensity zones, and Modic changesare associated with greater odds of chronic low back pain and related disability, and that the cumulative burden of multiple structural changes correlates with worse quality of life and functional impairment [11]. These recent contributions reinforce that while degenerative MRI findings are prevalent, their clinical relevance varies by both the type of abnormality and the context of associated signs and symptoms, highlighting the need for integrated clinical and imaging assessment.

Collectively, these data reinforce the critical principle that MRI findings must be interpreted within the broader clinical context, emphasizing symptomatology, neurologic examination, and patient trajectory, rather than being used as a sole determinant of pain causation. Age-aware interpretation and guideline-adherent selective imaging are essential to reduce overdiagnosis, avoid unnecessary interventions, and allocate healthcare resources efficiently. Moreover, structured reporting that delineates age-expected changes versus clinically actionable abnormalities can enhance communication between radiologists and referring clinicians, aiding in appropriate management decisions and avoiding the pitfalls of incidental findings.

Limitations: This retrospective, single-center study may have limited generalizability. Use of a composite "any abnormality" outcome combines clinically significant and incidental findings. The absence of detailed clinical and functional data precluded correlation between specific MRI abnormalities and patient-reported outcomes or clinical decision-making.

Conclusions

In this Saudi cohort with chronic low back pain, lumbosacral MRI abnormalities were highly prevalent and showed a strong association with increasing age, particularly among patients referred from surgical specialties. Degenerative changes accounted for the majority of positive findings, emphasizing the need for careful, age-aware interpretation. These findings support guideline-consistent, selective use of MRI to enhance diagnostic value, reduce overdiagnosis, and promote efficient utilization of imaging resources within clinical care pathways.

Conflict of interest

Authors declare no conflict of interest.

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