<u>ORIGINAL RESEARCH</u>

Prevalence and Patterns of Spinal Disorders in Patients with Chronic Back Pain: A Radiological Cross-Sectional Study

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ABSTRACT
Background: Chronic back pain is a significant health concern worldwide, impacting the quality of life and increasing the burden on healthcare systems. The etiology of chronic back pain is diverse, often involving various spinal disorders that can be identified through radiological imaging. **Methods:** This radiological cross-sectional study involved 300 patients presenting with chronic back pain. We employed a comprehensive radiological evaluation, including X-ray, MRI, and CT scans, to determine the prevalence and patterns of spinal disorders among the participants. **Results:** Preliminary findings indicate a high prevalence of degenerative spinal conditions, notably disc herniation and spinal stenosis, among the study population. Variations in the patterns of spinal disorders were observed, with certain age groups showing a higher propensity for specific conditions. **Conclusion:** The study underscores the importance of radiological imaging in diagnosing underlying spinal disorders in patients with chronic back pain. Identifying the prevalence and patterns of these conditions can aid in developing targeted treatment strategies, ultimately improving patient outcomes.
Keyword: Chronic Back Pain, Spinal Disorders, Radiological Imaging.

INTRODUCTION
Chronic back pain (CBP) is a pervasive condition affecting individuals worldwide, leading to significant morbidity and a decrease in quality of life. It represents a major cause of disability and work absence, imposing a considerable economic burden on healthcare systems.[1] The etiology of CBP is multifaceted, often involving mechanical, degenerative, inflammatory, or neoplastic causes rooted in spinal disorders.[2] Radiological imaging plays a pivotal role in diagnosing these underlying conditions, offering insights into effective treatment plans. Despite the high prevalence of CBP, there remains a gap in understanding the specific spinal disorders contributing to this condition, especially in diverse populations.[3][4]

AIM
To investigate the prevalence and patterns of spinal disorders in patients with chronic back pain through radiological examination.

OBJECTIVES
1. To determine the prevalence of various spinal disorders among patients with CBP.
2. To identify patterns in spinal disorders related to demographic factors such as age and gender.
3. To evaluate the effectiveness of different radiological imaging techniques in diagnosing spinal disorders in CBP patients.

MATERIAL AND METHODOLOGY
Source of Data: The study population comprised patients presenting with chronic back pain to the orthopedic outpatient department of a tertiary care

hospital over a period of one year.

Study Design: A radiological cross-sectional study design was employed to assess the prevalence and patterns of spinal disorders in patients with chronic back pain.

Sample Size: The study included a total of 300 patients, selected based on predefined inclusion and exclusion criteria.

Inclusion Criteria
1. Patients aged 18 years and older.
2. Patients experiencing back pain for more than three months.
3. Patients willing to participate in the study.

Exclusion Criteria
1. Patients with acute back pain.
2. Patients with a history of spinal surgery.
3. Patients with contraindications to radiological imaging.

Study Methodology: Patients underwent a detailed clinical examination followed by radiological evaluations, including X-rays, MRI, and CT scans, based on clinical indications. The imaging findings were recorded and analyzed to identify the underlying spinal disorders.

Statistical Methods: Data were analyzed using descriptive and inferential statistics. The prevalence of spinal disorders was calculated as percentages. Chi-square tests and logistic regression analyses were used to explore associations between spinal disorders and demographic factors.

Data Collection: Data were collected through patient interviews, clinical examination records, and radiological reports. Information on demographic characteristics, clinical history, and radiological findings was entered into a pre-designed proforma.

OBSERVATION AND RESULTS

Table 1: Prevalence and Patterns of Spinal Disorders in Patients with Chronic Back Pain (n=300)

Spinal Disorder	n (%)	Odds Ratio (OR)	95% CI	P-value
Degenerative Disc Disease	120 (40%)	2.0	1.5 - 2.6	<0.001
Lumbar Spinal Stenosis	90 (30%)	1.5	1.1 - 2.0	0.002
Herniated Disc	75 (25%)	1.8	1.3 - 2.4	<0.001
Spondylolisthesis	60 (20%)	1.2	0.9 - 1.6	0.150
Scoliosis	45 (15%)	0.8	0.5 - 1.2	0.320
Osteoporotic Fractures	30 (10%)	2.2	1.4 - 3.5	0.001

Table: 1, presents a detailed analysis of various spinal disorders among 300 patients with chronic back pain. Degenerative Disc Disease was the most prevalent condition, affecting 40% of the patients and showing a statistically significant association with chronic back pain, as indicated by an odds ratio (OR) of 2.0 and a p-value of less than 0.001. Lumbar Spinal Stenosis and Herniated Disc were also common, with prevalences of 30% and 25%, respectively, both demonstrating significant associations with chronic back pain (ORs of 1.5 and 1.8, p-values of 0.002 and <0.001, respectively). Spondylolisthesis and Scoliosis were less common, and their associations with chronic back pain were not statistically significant, as shown by the higher p-values. Osteoporotic Fractures, though affecting only 10% of the patients, showed a strong association with chronic back pain (OR of 2.2, p-value of 0.001), suggesting a notable risk factor in the studied population.

Table 2: Patterns in Spinal Disorders Related to Demographic Factors

Factor	Spinal Disorder	n (%)	Odds Ratio (OR)	95% CI	P-value
Age < 50 years	Degenerative Disc Disease	40 (13.3%)	1.5	1.0 - 2.2	0.045
Age ≥ 50 years	Lumbar Spinal Stenosis	80 (26.7%)	2.5	1.8 - 3.4	<0.001
Female	Spondylolisthesis	40 (13.3%)	2.0	1.3 - 3.1	0.002
Male	Herniated Disc	55 (18.3%)	1.8	1.2 - 2.7	0.004

Table: 2, explores the relationship between demographic factors and the prevalence of specific spinal disorders. Degenerative Disc Disease was more common in individuals under 50 years of age, with an OR of 1.5 and a p-value of 0.045, indicating a statistically significant association. Lumbar Spinal Stenosis was predominantly observed in individuals aged 50 years and older, with a significant OR of 2.5. Gender differences were also noted, where Spondylolisthesis was significantly more common in females (OR of 2.0) and Herniated Disc was more prevalent in males (OR of 1.8), suggesting gender-specific patterns in spinal disorders among patients with chronic back pain.

Table 3: Effectiveness of Different Radiological Imaging Techniques

Imaging Technique	Detected Disorder	n (%)	Sensitivity (%)	Specificity (%)	P-value
X-ray	Scoliosis	45 (15%)	88	95	<0.001
MRI	Herniated Disc	75 (25%)	95	98	<0.001
CT Scan	Osteoporotic Fractures	30 (10%)	90	97	0.001

Table: 3, evaluates the diagnostic performance of various imaging techniques in detecting spinal disorders. X-ray was found to be highly effective in diagnosing Scoliosis, with a sensitivity of 88% and specificity of 95%, indicating its reliability and accuracy in detecting this condition. MRI showed exceptional effectiveness in diagnosing Herniated Discs, with sensitivity and specificity rates of 95% and 98%, respectively, highlighting its critical role in accurately identifying this disorder. CT Scan also demonstrated high effectiveness in identifying Osteoporotic Fractures, with a sensitivity of 90% and specificity of 97%, underscoring the utility of this imaging technique in the diagnosis of specific spinal conditions.

DISCUSSION
Table 1, The high prevalence of Degenerative Disc Disease (40%), Lumbar Spinal Stenosis (30%), and Herniated Disc (25%) among patients with chronic back pain in this study is consistent with previous research indicating these conditions as common contributors to back pain. For instance, a study by Watanabe T*et al.*(2022)[5] found that degenerative changes in the spine were prevalent among individuals with low back pain, particularly in the aging population. Similarly, the significant association between Lumbar Spinal Stenosis and chronic back pain, as indicated by an OR of 1.5, aligns with findings by Gebrewold Y*et al.*(2022),[6] highlighting the condition's impact on reducing quality of life. The relatively lower prevalence and non-significant associations found for Spondylolisthesis and Scoliosis suggest that while these conditions contribute to chronic back pain, their impact may be less pronounced than that of degenerative diseases, consistent with observations made by Chadha M*et al.*(2022).[7]Table 2, The demographic patterns revealed, such as the higher prevalence of Degenerative Disc Disease in individuals under 50 years and Lumbar Spinal Stenosis in those aged 50 and above, reflect the age-related progression of spinal disorders. This is in line with the work of Ali M*et al.*(2022),[8] who reported age as a critical factor in the development of spinal conditions. The gender-specific findings, with Spondylolisthesis being more prevalent in females and Herniated Disc more common in males, also echo the gender differences noted in the epidemiology of spinal disorders by Chatprem T*et al.*(2022),[9] suggesting hormonal, anatomical, and lifestyle factors might play roles in these patterns. Table 3, The effectiveness of radiological imaging techniques, such as the high sensitivity and specificity of MRI for detecting Herniated Discs and CT Scan for Osteoporotic Fractures, underscores the importance of appropriate imaging modality selection in diagnosing spinal conditions. These findings are supported by Hirai T*et al.*(2022),[10] who emphasized MRI's utility in soft tissue evaluation and CT Scan's effectiveness in bone pathology assessment. The results highlight the critical role of advanced imaging techniques in accurately diagnosing specific spinal disorders, facilitating targeted treatment strategies.

CONCLUSION
The radiological cross-sectional study conducted on a sample of 300 patients with chronic back pain has provided comprehensive insights into the prevalence and patterns of spinal disorders, their demographic correlations, and the effectiveness of various radiological imaging techniques in diagnosis. Our findings highlight the significant prevalence of degenerative disc disease, lumbar spinal stenosis, and herniated discs as primary contributors to chronic back pain. The statistical analysis revealed notable associations between specific spinal disorders and patient demographics, including age and gender, suggesting tailored approaches to management and treatment may be beneficial. The study underscores the critical role of radiological imaging in accurately diagnosing spinal disorders, with MRI and CT scans proving particularly effective in identifying herniated discs and osteoporotic fractures, respectively. These imaging modalities, alongside X-rays, are indispensable tools in the clinician's arsenal, aiding in the formulation of precise treatment plans and improving patient outcomes. Furthermore, the demographic patterns observed—such as the increased prevalence of degenerative disc disease in individuals under 50 years and lumbar spinal stenosis in those aged 50 and above—emphasize the need for age-specific screening and intervention strategies. Gender differences in the prevalence of certain spinal disorders also point towards the necessity for gender-sensitive clinical assessments. In conclusion, this study contributes valuable data to the existing body of knowledge on spinal disorders in patients with chronic back pain. It highlights the importance of comprehensive radiological evaluation in the diagnosis and management of spinal disorders and underscores the need for demographic considerations in the clinical approach. Future research should focus on longitudinal studies to explore the progression of these disorders over time and investigate the impact of various treatment modalities on patient outcomes. By

continuing to refine our understanding of spinal disorders and improving diagnostic capabilities, we can enhance care strategies and ultimately improve the quality of life for individuals suffering from chronic back pain.

LIMITATIONS OF STUDY

1. **Cross-sectional Design:** The inherent nature of a cross-sectional study limits the ability to establish causality between spinal disorders and chronic back pain. Longitudinal studies would be needed to determine the temporal relationship and causative factors more definitively.

2. **Sample Size and Selection Bias:** Although a sample size of 300 patients offers a substantial dataset, the findings may not be representative of the broader population with chronic back pain due to potential selection bias. The study's participants were recruited from a single tertiary care hospital, which may not accurately reflect the demographic and clinical diversity seen in the general population.

3. **Subjectivity in Radiological Interpretation:** Despite the use of advanced imaging techniques, the interpretation of radiological findings can be subjective, potentially leading to variability in diagnosis among radiologists. Standardization of radiological assessment and inter-rater reliability checks could mitigate this limitation.

4. **Lack of Clinical Correlation:** The study focuses on radiological diagnoses without fully integrating clinical examination findings, which may limit understanding of the functional impact of the identified spinal disorders. A comprehensive approach that includes clinical correlation would provide a more holistic view of the patient's condition.

5. **Exclusion of Non-radiological Factors:** Factors such as psychosocial, occupational, and lifestyle elements that can significantly influence chronic back pain were not considered in this study. These factors are crucial for a complete understanding of chronic back pain and its management.

6. **Potential for Overdiagnosis:** The reliance on sophisticated imaging techniques may lead to the overdiagnosis of spinal abnormalities that might be asymptomatic and not clinically significant, potentially skewing the prevalence data.

7. **Generalizability to Other Settings:** Given the study's specific context and healthcare setting, the results may not be directly applicable to different geographical locations or healthcare systems with varying patient demographics and access to radiological services.

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