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ROLE OF MAGNETIC RESONANCE IMAGING (MRI) IN THE CLINICAL DIAGNOSIS OF LUMBER DISC HERNIATION

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ABSTRACT

Objective: *to evaluate the role of magnetic resonance imaging MRI in clinical diagnosis of lumber disc herniation.* ***Clinical settings:*** *Islamabad Diagnostic Center, Faisalabad.* ***Study duration:*** *September 2024 to December 2024.* ***Study design:*** *Observational Cross sectional study.* ***Method:*** *MRI lumber spine scans were performed on 100 patients according to inclusion criteria. T1sagittal, T2 sagittal, STIR sagittal, T1 axial and T2 axial images were acquired with Phillips 1.5 Tesla MRI scanner. Interpretation of these images was done by Consultant Radiologists who had experience of reporting of lumber spine. Data was extracted systemically from each scan and analysis was done on statistical package for social sciences version 23. Frequencies and graphs were obtained for ever demographic variable.* ***Results:*** *Patient includes 66 females and 44 males. Lumber disc herniation was more prevalent in female patients of age group 30-40. In 94% cases lower back pain is most common symptom while only 12% was affected by trauma.77% patients complain of radiating lower back pain toward legs. 57% cases shows nerve compression due to disc bulge. 77% patients are observed with disc bulge. 40% patients are diagnosed with muscular spasm. 66% cases are observed with spine straightening.*

Conclusion*: MRI plays a critical role in the diagnosis of lumbar disc herniation. Understanding the diagnostic process can help patients and healthcare professionals work together to achieve accurate diagnosisand effective treatment.*

Keywords: *Lumbar disc herniation, Nerve compression, Muscular Spasm, Spine Straightening, Pain Radiating to Lower Limbs.*

INTRODUCTION

This article provides a comprehensive overview of the part of Magnetic Resonance Imaging in the diagnosis of lumbar disc herniation. Herniation of Lumbar Disks is a condition in which there is a tear in the outer layer allowing the inner layer to protrude and compress surrounding nerves. Accurate diagnosis of lumbar disc herniation is critical for effective treatment,and magnetic resonance imaging (MRI) is a key diagnostic modality. In this article, we provide an overview of the diagnostic process for lumbar disc herniation using MRI. MRI is a non-invasive imaging technique which uses strong magnetic field and electromagnetic radio waves to produce detailed images of the body. In the case of lumbar disc herniation. MRI can contribute in the production of highly detailed images of the spine and the affected disc. Healthcare professionals look for specific features on MRI scans to identify lumbar disc herniation, such as disc protrusion, disc extrusion, and nerve root compression. While MRI is a valuable diagnostic tool, it is not without limitations. False positives and false negatives can occur, and some patients might not be able to undergo MRI due to claustrophobia or other factors. Nevertheless, MRI remains the gold standard for diagnosing lumbar disc herniation, and its use has greatly improved patient outcomes.

When a spinal disc's inner gel-like material bulges or protrudes via a rupture or weakness in the disc's outer ring, it is known as a disc herniation, often called a herniated disc or slipping disc. About 70% of people will suffer low back pain at some point in their lives, making it a very common occurrence (1). Lumbar disc herniation is influenced by a number of risk factors, including psychological, physical, and

personal ones. The disease's origin is attributed to cumulative microtrauma, which is said to be more common in those who drive cars, don't play sports, and smoke. Frequently utilized bending and twisting motions, improper weight lifting, awkward static posture, and psychological stress are the factors which contribute to the development of LDH (2). With a 97% diagnostic accuracy and strong inter-observer reliability, magnetic resonance imaging (MRI) is the gold standard for imaging to confirm suspected LDH. A disc herniation is strongly suggested by MRI results of an elevated signal from dorsal ten percent of the diameter of the disc in T2 weighted protocol (3).

METHODOLOGY

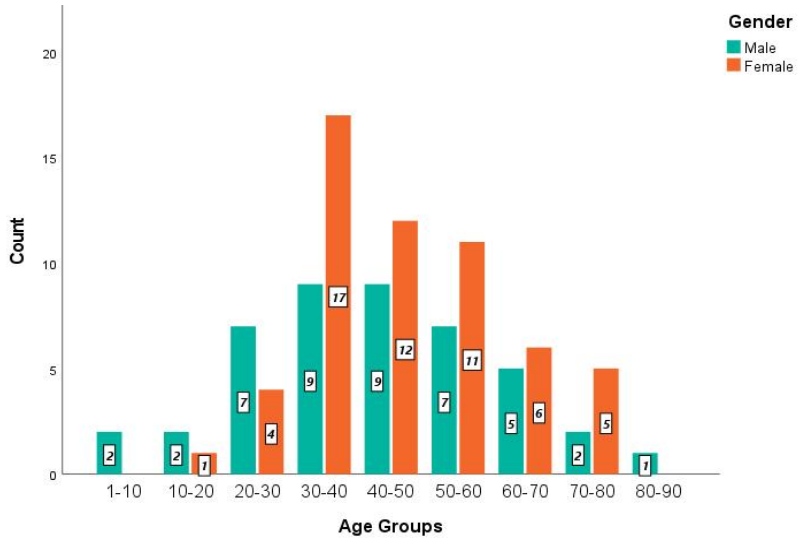
This study employed a prospective design to investigate the diagnosis of lumbar disc herniation using magnetic resonance imaging (MRI). Data was collected from a defined cohort ofpatients presenting with suspected lumbar disc herniation. MRI scans were performed using MRI 1.5T machine, including protocols such as Sagittal T2, T1, STIR and Axial T1 and T2. This was an observational study conducted at IDC Faisalabad. Patients from all age groups were included who exhibited MRI evidence of Lumbar disc degeneration or herniation and provided their consent to participate in the study were included.

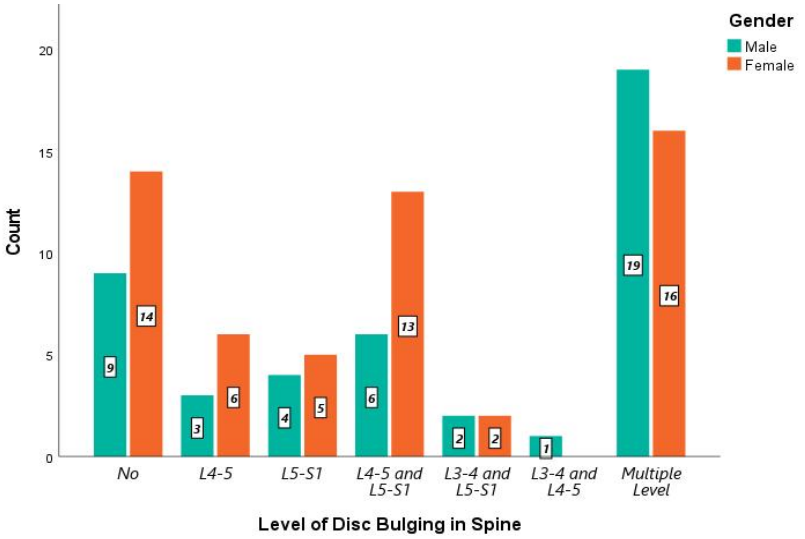
Observational data collection was performed by systematically enrolling eligible patients during their visits to the clinic. After obtaining informed consent, relevant clinical information, including patient demographics and presenting symptoms, was documented.

The study includes in 100 participants. All MRI scans were independently reviewed and interpreted by experienced radiologists specialized in musculoskeletal imaging. The radiologists were blinded to the patients' clinical information to minimize bias. The diagnostic criteria used for identifying lumbar disc herniation included the evaluation of disc morphology, such as disc bulging, herniation type (protrusion, extrusion, or sequestration), and assessment of disc location.

RESULTS

100 patients were included in our study, consisting of 44 males and 56 females. Out of total patient population, 77 were diagnosed with disc herniation while 23 were found to have other medical problems related to lumbar disc. The diagnostic accuracy measures of MRI for lumbar disc herniation were analyzed based on the available data. The sensitivity could not be calculated due to the unavailability of negative predictive values. There are 39 men and 55 women among those who have experienced back discomfort in the past. There are five men and seven women suggesting that some people of both sexes have suffered trauma or falls. There are 39 men and 49 women indicating that a greater proportion of people in both sexes do not have a history of trauma or falls. 36 men and 41 women reported having discomfort that radiates to their lower limbs, suggesting that females are more likely to experience this condition. Eight men and fifteen women were noted as individuals who did not feel this pain. In the "L4-5" category, the number of males and females is equal at six each. There are five females and four males in the "L5-S1" category. There are more girls (13) than males (6) in the "L4-5 and L5-S1" category. There are two males and six females for "L3-4 and L5-S1," respectively. There are two girls and one male in the "L3-4 and L4-5" category. There are more males (19) than females (16) in the "Multiple Level" category. 29 females and 28 males among individuals who have nerve compression. There are sixteen men and twenty-seven females for individuals without nerve compression. 16 females and 24 males suffer from muscle spasms. In contrast, there are 40 girls and 20 males among those who do not have muscle spasms. There are 42 females and 24 males among individuals without spine straightening, according to the data. On the other hand, there are 20 men and 14 women in the group that has spine straightening. that there are more women (17) in the 30–40 age group than men (9), with the former having the largest number. Likewise, there are more women (12) than men (9), in the 40–50 age range. There is no discernible difference in the numbers for the two sexes in the younger age groups (1–20). The female population, however, continuously surpasses the male population from the age of 20 to 30, with significant peaks in the 30–40, 40–50, and 50–60 age groups. With the exception of the 70–80 and 80–90 age ranges, when the numbers become more balanced, females continue to have a stronger presence in most categories, but the counts decline for both genders in the older age groups (60–90).



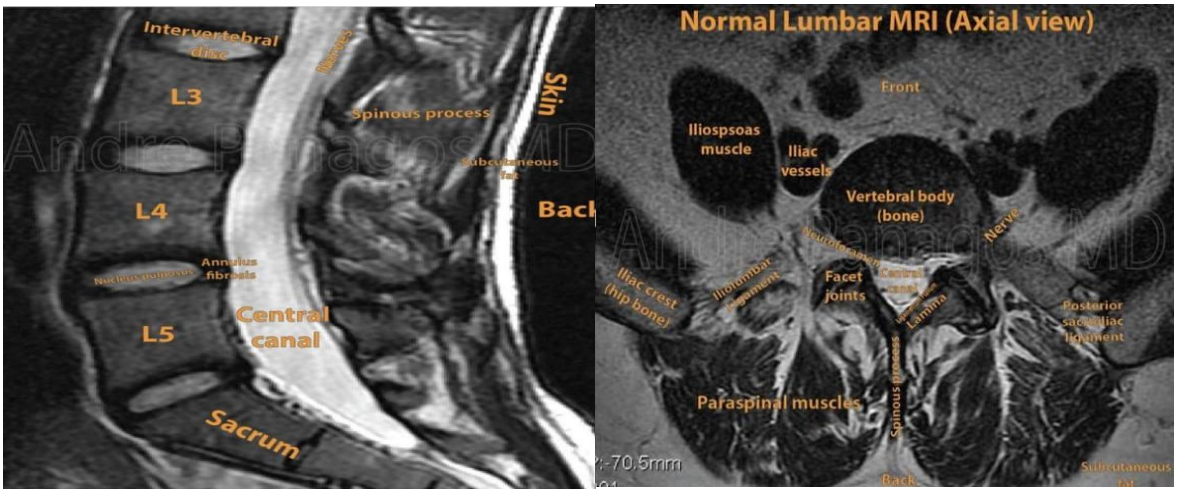


DISCUSSION

This study aimed to explore gender differences in clinical and MRI findings related to lumbar disc pathologies, with a focus on disc herniation and related conditions. The results revealed notable gender disparities in the prevalence of back pain, trauma history, lower limb discomfort, disc bulging, nerve compression, muscle spasms, and spine straightening. These findings are consistent with existing literature while offering new insights into the understanding of lumbar disc disorders across genders.

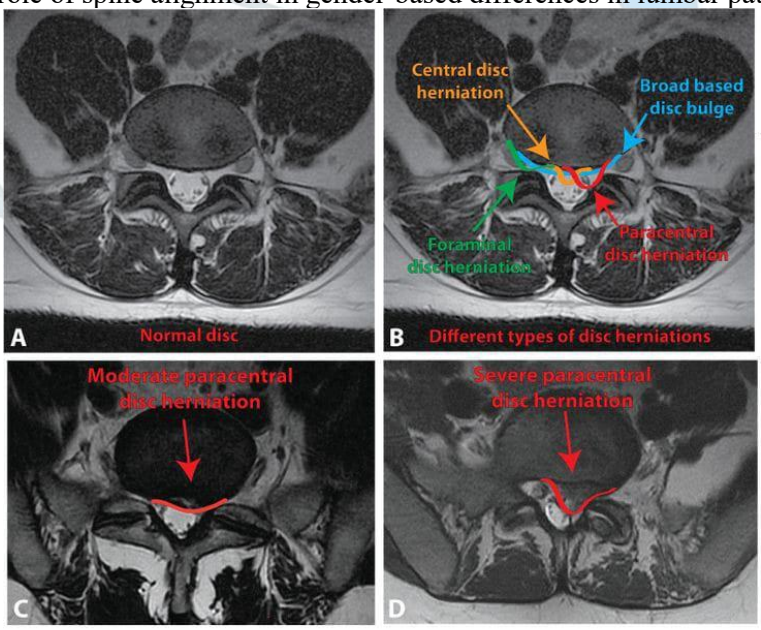
Our results showed a higher prevalence of back pain in women (55 females vs. 39 males), supporting findings from recent studies that suggest women are more likely to report chronic pain, including low back pain [5,6]. Various factors, including hormonal fluctuations, psychosocial stressors, and differing pain thresholds, may contribute to this gender difference in the perception and reporting of back pain [7]. Additionally, the greater frequency of lower limb discomfort in women (41 women vs. 36 men) aligns with findings from a study also reported that women are more likely to experience radiating pain from the lumbar spine [8].

When examining the history of trauma or falls, our study found that the majority of patients from both sexes had no prior history of trauma or falls (49 women and 39 men), which is consistent with the literature indicating that disc herniation is often not precipitated by specific traumatic events [9]. The prevalence of disc bulging was slightly higher in women, with 42 females and 35 males showing signs of bulging. This result is consistent with the work of Cook et al., who noted a higher frequency of lumbar disc degeneration and bulging in women, potentially due to differences in body composition, hormonal changes, or spinal loading patterns [10].



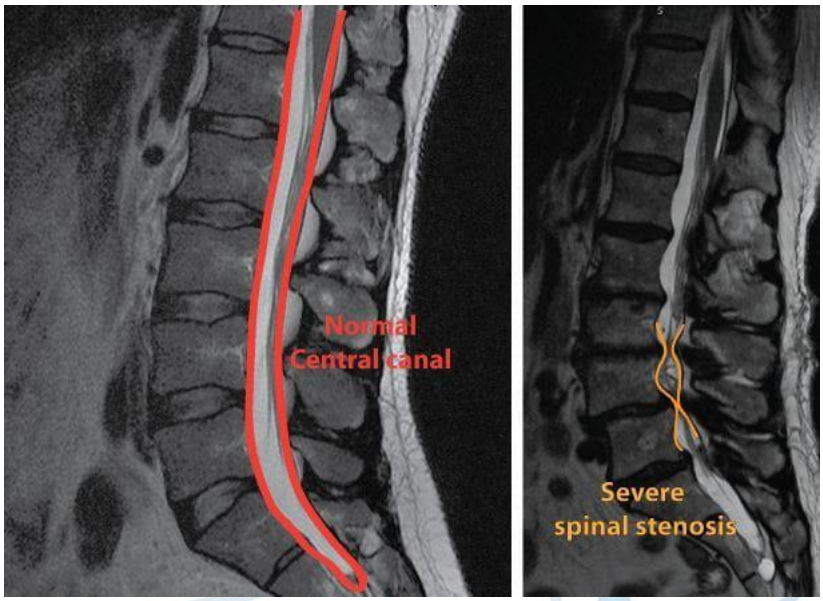
The data also showed that nerve compression related to disc bulging affected 29 females and 28 males, with a slightly higher number of females experiencing nerve compression. This is in agreement with previous studies that have linked higher rates of disc herniation and nerve root compression to female patients. [11] As nerve compression is often associated with clinical symptoms such as sciatica, this finding reinforces the need for targeted interventions that address the gender-specific presentation of lumbar disc disorders.

Interestingly, our study found a higher prevalence of muscle spasms in men (24 males vs. 16 females). These findings are supported by recent research suggesting that men may be more prone to musculoskeletal spasms due to factors such as muscle mass and physical activity levels, which can influence the development of spasms and pain. [12]. Conversely, women appeared to have a higher rate of spinal straightening, with 42 females and 24 males exhibiting a lack of natural spinal curvature. This is contrary to some studies that suggest a higher prevalence of abnormal spinal curvatures in women [13], highlighting the need for further investigation into the role of spine alignment in gender-based differences in lumbar pathology.



The age distribution analysis revealed that women were more prevalent in the middle-aged groups (30-40, 40-50, and 50-60 years), with a significant decline in both genders after 60 years. This trend is consistent with other studies, which have found that lumbar disc degeneration and related symptoms are more commonly reported in middle-aged women, possibly due to hormonal changes and the cumulative effects of

mechanical stress on the spine. [14] However, the decline in prevalence in the older age groups (60-90) for both men and women may reflect a natural reduction in the active patient population due to aging or other comorbidities.



In conclusion, this study corroborates the findings of prior research regarding the gender differences in the presentation of lumbar disc pathologies, particularly the higher prevalence of back pain, lower limb discomfort, and disc bulging in women. These differences may be influenced by biological, anatomical, and psychosocial factors. Further research with larger sample sizes and longitudinal data is needed to better understand the underlying mechanisms contributing to these gender-based disparities and to guide more tailored treatment approaches for both genders.

CONCLUSION

Magnetic resonance imaging, or MRI, has emerged as a crucial diagnostic technique for lumbar disc herniation (LDH) due to its remarkable ability to see soft tissues, nerve roots, and the form of the intervertebral disc. Unlike imaging modalities like CT scans or X-rays, magnetic resonance imaging (MRI) provides detailed information on the extent of disc disease, including bulges, protrusions, extrusions, and sequestrations, without exposing patients to ionizing radiation. Despite its numerous advantages, there are drawbacks as well, including as subjective interpretation, limited access in resource-constrained contexts, and disparities in diagnostic precision across radiologists. Furthermore, the use of innovative imaging techniques, notably quicker MRI methods and complex sequences like T2-weighted imaging, has decreased scanning times and improved patient comfort without compromising diagnostic accuracy. As healthcare systems adopt these developments, MRI continues to be crucial in enhancing the treatment of LDH. It aids in distinguishing between circumstances that necessitate conservative therapy and those that call for surgical intervention in order to create customized care regimens for improved patient outcomes. The focus on accessibility, particularly in underprivileged regions, and ongoing advancements in AI and imaging technologies will further solidify MRI's standing as the gold standard for the diagnosis and treatment of LDH in the future.

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