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Magnetic Resonance Imaging of Lumbar Spine in Lower Backache: A Comparative Study on Gender Basis

Nazia Azeem, Muhammad Anwar, Shazia Kadri

ABSTRACT

Objective: To compare the clinical features of lower backache with Magnetic Resonance Imaging (MRI) findings on gender basis.

Study design & Setting: A cross-sectional descriptive study was carried out among male & female patients with a backache at Sir Syed Hospital, Karachi. This study conducted from 1st Jan 2020 to 1st June 2020. We studied 90 patients by using the non-probability convenient sampling technique.

Methodology: Lower backache is a common problem that creates disability. MRI lumbar spine without contrast were reviewed with clinical complaints. Performa was used after the ethical approval from Institutional Research and Ethical committee. Components focused during the study in MRI findings at different spinal levels were disc bulging, neural foraminal compromise, nerve root compression, ligamentum flavum and facet joint hypertrophy.

Results: The results showed that the mean age of 90 patients was 44.64 years. On MRI imaging 46(86.8%) males and 26(70.3%) females had disc desiccation but multi-level disc osteophyte complexes were demonstrated more in females 11(29.7%). Diffuse disc bulge is more in males at L4-5 and L5-S1 level 49(92.5%) than in females 34(91.9%) at L4-5 and 33(89.2%) at L5-S1 level with mild to moderate spinal canal stenosis. The narrowing of Neural foramen is almost similar at L4-5 level in both gender but more at L5-S1 in females 35(94.6%) as compared to males 49(92.5%) with nerve root compression. Overall male patients tended to have slightly more disc degenerative changes than females.

Conclusion: Lower Lumbar disc disease is a common problem showing significant disc space narrowing and bulges slightly more in our male population than females.

Keywords: Low back pain, lumbar radiculopathy, foraminal compression, Magnetic resonance Imaging

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INTRODUCTION:

The main function of vertebral column is to protect the spinal cord and acts as a support of the body. Lower back ache is a frequent cause of disability. From the Global Burden of Disease Study, it was observed that low back pain comes in a leading position in terms of disability and the chances of its occurrence is 9.4%.[1] Low back pain is a common of the column. It can resolve by itself with care without effecting the function. Sometimes it takes a longer duration to resolve. Chronic low backache is defined as pain that continues for 12 weeks or more. About 20% of people who are affected by acute low backache develop chronic pain with constant and continual symptoms for one year.[2]

The spine have five vertebral bodies (L1-L5) in the lumbar region and bears most of the weight of the upper part of body. Back pain can occur due to many reasons like occupational hazards, osteomyelitis (infection involving vertebrae), deficiency of vitamin D, obesity, age-related changes, postural imbalance, and pregnancy in women.[3,4] It was noted that One-third of nursing staff in Pakistan have lower back issues related to their occupation and 94% of the staff likes to take rest for the relief of symptoms.[5] The person's age determines the cause of the low back pain. The workers of ages between 30- 50 years are more affected by lower back pain. However, congenital abnormalities like Spina bifida having incomplete development of the cord can cause lower back pain (LBP). Sprains (overstretching of ligaments), strains (tears in tendons or muscle), and spasms (an abrupt contraction of a muscle) can also present as LBP. Any type of severe injury can compress the spine resulting in rupture of disc ultimately leading to LBP. Other causes include radiculopathy (in which compression of the sciatic nerve can occur), any tumor, or degenerative problems. Degenerative changes in the intervertebral disc led to

Nazia Azeem *(Corresponding Author)*
Assistant Professor, Department of Radiology
Sir Syed College of Medical sciences
E mail: naz.azeem@hotmail.com

Muhammad Anwar
Assistant Professor, Department of Neurosurgery
Sir Syed College of Medical sciences

Shazia Kadri
Associate Professor, Department of Radiology
Jinnah Medical College and Hospital

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detoriation of the facet joints.[6] The probability of wear and tear of disc usually increase with age and may not give rise to any symptoms, but with progression it can cause severe LBP. [7]

A comprehensive clinical history and physical examination can usually diagnose severity of illness that may be resulting in back pain.[8] There are investigations such as blood test, bone scan, and discography while imaging tests like computed tomography (CT) and Magnetic Resonance Imaging (MRI) are a more beneficial and are used for comparison between clinical manifestations in chronic low back pain (CLBP).[9] Magnetic resonance imaging (MRI) provides excellent detail of muscles, ligaments, tendons, infection/ inflammation, neoplastic mass, disc herniation or rupture, or nerve root compression.

MRI is an excellent modality in the neurological examination that provides best details of nerve root compression by more than one sequence of like T1WI and T2WI.[10] Different studies suggested that MRI has better sensitivity and reliability than other equipment and is more illustrative than computed tomography scan. It can reveal pathologies that are not obvious clinically. Acute back pain can be managed symptomatically. Medicines would be prescribed according to the appearance of symptoms. The other treatment option of chronic low back pain are thermotherapy, acupuncture, spinal mobilization, manipulation, back strengthening exercises. Thus, clinical findings of MRI in lower back pain decide either it would be treated by conservative or surgical interventions. The purpose of our study is to compare the clinical features of low backache based on MRI findings in the male and female gender.

METHODOLOGY:

This is a cross-sectional descriptive study through a non-probability convenient sampling technique. It was conducted at Sir Syed Hospital, situated in Karachi, Pakistan. The duration of the study was six months from 1st Jan 2020 to 1st June 2020. The sample size was calculated on the basis of the nationwide Swedish spine registry and the intended sample size was 90.

Data with a sample size of ninety patients were collected after approval from the ethical review board of Sir Syed Hospital (Approval # SSCMS04). Informed consent was taken from all patients included in the study.

The patients with a complaint of lower back pain, numbness of lower limbs, single or bilateral radiculopathy and clinical findings of MRI were included in the study. Ages of the patients were between 20 to 75. Patients with a history of accident, infection, neoplastic mass, metastasis and vascular pathology, or any severe surgical procedure of spine were excluded from the study. Performa was prepared after taking ethical approval and informed consent. This study was based on a comparison of gender either male or female. Symptoms of low backache involve numbness and unilateral or bilateral Radiculopathy in lower limbs. The duration of complaints usually varied from months, years or of unknown duration. MRI lumbar spine without contrast were reviewed especially Sagittal images were reviewed in both T1 and T2 sequence. Axial images in T2 sequence parallel to intervertebral disc whereas, sagittal images were of 4 mm slice thickness with 0.3 mm inter-slice gap. The scan was reviewed at the levels of L2- L3 to L5-S1 showing imaging features of narrowing of Neural Foramen and Lateral Recess, central canal narrowing, hypertrophy of ligamentum flavum and facet joints.

Statistical Package for Social Sciences (SPSS) version 21 used for data analysis. The mean, standard mean, and deviation for qualitative data and frequency and percentage for qualitative data calculated. Fischer Exact Test was applied to find the significance and to compare the conclusion of the clinical significance of MRI in both groups. A P value ≤ 0.05 was regarded as statistically significant.

RESULTS:

Our result shows 44.64 years as the mean age of 90 patients of our study in which 53 (58.9 %) were males (mean age - 44.45) and 37 (41.1 %) patients were females (mean age - 44.91). Most of the patients, 33 out of 90 (36.7%) complained of radiation of pain bilaterally in the lower limbs which is found more in females 14(37.8%) than males 19(35.8%) . However, extending pain to the right leg is more commonly seen (24.3 %) especially in females with variable durations, but with unknown duration 30(56.6%) in males with significant P value of 0.029. After reviewing MRI images, it was observed that individual patients showed variation in abnormality. 46(86.8%) males and 26(70.3%) females had disc desiccation but multi-level disc osteophyte complexes demonstrated more in females11(29.7%) . The details are summarized in Table I.

Overall 82 patients (91.1%) had diffuse disc bulge at L5-S1 spinal level. It is more pronounced in males at L4-5 and L5-S1 level 49(92.5%) than in females 34(91.9%) at L4-5 and 33(89.2%)at L5-S1 level with mild to moderate spinal canal stenosis. The narrowing of Neural foramen seen almost similar at L4-5 in both gender but more at L5-S1 in females 35(94.6%) as compared to males 49(92.5%) with nerve root compression. Female patients had noticeable hypertrophy of facet joint and ligamentum flavum at L4-L5 and L5-S1 level. On the whole male patients tended to have slightly more disc degenerative changes than females. (Table II-A and II-B).

DISCUSSION:

The current study compared imaging findings of both males and females with low back pain and demonstrated that disc generation is slightly more commonly seen in males than females. The males were found to be more affected with mild and moderate spinal canal stenosis at Level L4-L5 and L5-S1 than females. These result differs from general clinical

Table 1: Demographics data (n=90)

Demographics		Males Mean±SD / n (%)	Females Mean±SD / n (%)	P-value
Age (years)		44.45±14.48	44.91±17.45	
Radiation of Pain	**Right Lower Limb**	10(18.9%)	11(29.7%)	0.556
	Left Lower Limb	9(17.0%)	5(13.5%)	
	Both Lower Limb	19(35.8%)	14(37.8%)	
	Absent	15(28.3%)	7(18.9%)	
Duration of Pain	**Days**	9(17.0%)	0(0.0%)	0.029
	Weeks	0(0.0%)	1(2.7%)	
	Months	9(17.0%)	13(35.1%)	
	Years	5(9.4%)	4(10.8%)	
	Unknown	30(56.6%)	19(51.4%)	
Disc Desiccation / Disc Osteophyte Complexes	**Yes**	46(86.8%)	26(70.3%)	0.054
	Multi-level disc osteophyte complexes	7(13.2%)	11(29.7%)	

Table 2 A: Distribution of MRI findings at different spinal levels

Variable		Spinal Level			
		L_2-L_3 n (%)	L_3-L_4 n (%)	L_4 –L_5 n (%)	L_5-S_1 n (%)
Disc Bulge in Males	**Diffuse disc bulge**	1(1.9%)	10(18.9%)	49(92.5%)	49(92.5%)
	Mild Disc bulge	2(3.8%)	26(49.1%)	4(7.5%)	0(0.0%)
	Absent	50(94.3%)	17(32.1%)	0(0.0%)	4(7.5%)
Disc Bulge in Females	**Diffuse disc bulge**	1(2.7%)	10(27.0%)	34(91.9%)	33(89.2%)
	Mild Disc bulge	0(0.0%)	11(29.7%)	3(8.1%)	2(5.4%)
	Absent	36(97.3%)	16(43.2%)	0(0.0%)	2(5.4%)
P-value		0.477	0.185	0.922	0.219
Spinal Canal Stenosis in Males	**Mild**	2(3.8%)	26(49.1%)	9(17.0%)	1(1.9%)
	Mild to moderate	0(0.0%)	5(9.4%)	44(83.0%)	52(98.1%)
	Moderate to Severe	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)
	Significant	1(1.9%)	1(1.9%)	0(0.0%)	0(0.0%)
	Nil	50(94.3%)	21(39.6%)	0(0.0%)	0(0.0%)
Spinal Canal Stenosis in females	**Mild**	1(2.7%)	13(35.1%)	7(18.9%)	2(5.4%)
	Mild to moderate	0(0.0%)	6(16.2%)	29(78.4%)	33(89.2%)
	Moderate to Severe	0(0.0%)	0(0.0%)	1(2.7%)	1(2.7%)
	Significant	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)
	Nil	36(97.3%)	18(48.6%)	0(0.0%)	1(2.7%)
P-value		0.673	0.407	0.464	0.277

perception that females are more likely to have intervertebral disc degeneration. Wang YX et al studied high prevalence of disc space narrowing in elderly women than men. [11] Studies demonstrated that patients with acute pain of severe intensity in lower back region usually have high probability of disc herniation.[12] In the study by A.K. Kohat et al, facet joint arthropathy seen in 75% of patients and compression of nerve root in 72.2%, more commonly seen in females at L4-L5 level in chronic low back pain. [9] One more research demonstrated that main MRI imaging features of disc herniation are usually at L4-L5 and L5- S1 levels in both genders.[13] These imaging features are in line with one more study which also showed the evidence that the spinal canal was smallest in both men and women at the level of L5-S1 and widest at L1-L2.[14]

Our study shows the average age 45 years (mean age 44.64 years) in patients with complaints of low back ache. A.K. Kohat et al explained an average age 41 years in patients with chronic low back pain.[9] Schröder C et al. and Jensen RK et al. provided evidence of the degenerative changes on

Table 2 B: Distribution of MRI findings at different spinal levels

Variable		Spinal Level				P-value
		Males		Females		
		Yes n (%)	No n (%)	Yes n (%)	No n (%)	
Neural Foramina Compromise (NFC)	L_2-L_3	3(5.7%)	50(94.3%)	1(2.7%)	36(97.3%)	0.503
	L_3-L_4	37(69.8%)	16(30.2%)	20(54.1%)	17(45.9%)	0.127
	L_4 –L_5	53(100.0%)	0(0.0%)	37(100.0%)	0(0.0%)	---
	L_5-S_1	49(92.5%)	4(7.5%)	35(94.6%)	2(5.4%)	0.689
Nerve Root Compression (NRC)	L_2-L_3	3(5.7%)	50(94.3%)	1(2.7%)	36(97.3%)	0.503
	L_3-L_4	24(45.3%)	29(54.7%)	10(27.0%)	27(73.0%)	0.079
	L_4 –L_5	52(98.1%)	1(1.9%)	37(100.0%)	0(0.0%)	0.401
	L_5-S_1	49(92.5%)	4(7.5%)	35(94.6%)	2(5.4%)	0.689
Ligamentum Flavum Hypertrophy	L_2-L_3	0(0.0%)	53(100.0%)	0(0.0%)	37(100.0%)	---
	L_3-L_4	3(5.7%)	50(94.3%)	0(0.0%)	37(100.0%)	0.141
	L_4 –L_5	12(22.6%)	41(77.4%)	9(24.3%)	28(75.7%)	0.853
	L_5-S_1	12(22.6%)	41(77.4%)	8(21.6%)	29(78.4%)	0.963
Facet Joint Hypertrophy	L_2-L_3	1(1.9%)	52(98.1%)	0(0.0%)	37(100.0%)	0.401
	L_3-L_4	3(5.7%)	50(94.3%)	4(10.8%)	33(89.2%)	0.329
	L_4 –L_5	27(50.9%)	26(49.1%)	25(67.6**%)**	12(32.4%)	0.116
	L_5-S_1	32(60.4%)	21(39.6%)	27(73.0%)	10(27.0%)	0.216

MRI were more common over 50 years of age in females. [15, 16]

We evaluated that disc desiccation is more in male whereas A.K. Kohat et al. mentioned disc desiccation as the most frequently seen disc issue which is slightly more in females. [9] Liyew WA et al. supported the disc disease as a most commonly seen feature in low back pain. [17] It was observed in our study that disc bulges at L4-L5 and L5-S1 seen in patients with low back ache. This type of relation had also been discussed and published as lumbar degenerative spinal condition affecting nearly 50% of patients presenting with lower back pain with female preponderance.[18]

The pathologies of lumbosacral region can detoriate the clinical manifestations of pain radiating to legs so to rule out, the magnetic resonance neurography (MRN) of plexus of lumbosacral region is helpful for diagnosing the nerve problems. [19,20]

The current study has its limitations as it was done at a single center having small sample size and few variables like pain severity and management options were not highlighted, similar study was done by Vagaska, E et al , that was carried out to see the relationship of MRI features with the extent of dysfunction or the severity of low backache.[21] The current study and its findings may not account for the overall disease load in the whole population. However, the study highlighted that lower lumbar disc disease is more in males as compared to females with P value 0.054. It also showed the important role of MRI Lumbar spine in patients with chronic lower back pain and their clinical relevance of radiculopathy.

CONCLUSION:

Lower Lumbar disc disease is a common problem of patients visiting health care facilities showing disc space narrowing and bulges slightly more in our male population than females. MRI provides better assessment of lower back pain in both genders, providing early diagnosis, management and increasingly better outcome.

Authors Contribution:
Nazia Azeem: Literature search, conception study design, data collection and compilation
Muhammad Anwar: Data analysis and interpretation, manuscript writing
Shazia Kadri: Data collection and compilation, Research collaboration

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