



## Original Article

## Frequency of Lumbar Disc Degenerative Diseases in Patients with and without Radiculopathy and Low Back Pain Using Magnetic Resonance Imaging

Khadija Zafar<sup>1</sup>, Narjis Batool<sup>1</sup>, Abid Ali<sup>1</sup>, Nosheen Arshad<sup>1</sup>, Waqar Mahmood Dar<sup>1</sup> and Adrash Naeem<sup>1</sup><sup>1</sup>University Institute of Radiological and Medical Imaging Sciences, The University of Lahore, Gujrat Campus, Gujrat, Pakistan

## ARTICLE INFO

## Key Words:

Disc Degenerative Disease, MRI Lumbar, Disc Herniation, Low Back Pain, Radiculopathy

## How to Cite:

Zafar, K. ., Batool, N. ., Ali, A. ., Arshad, N. ., Dar, W. M. ., & Naeem, A. . (2022). Frequency of Lumbar Disc Degenerative Diseases in Patients with and Without Radiculopathy and Low Back Pain Using Magnetic Resonance Imaging. *Pakistan BioMedical Journal*, 5(1). <https://doi.org/10.54393/pbmj.v5i1.279>

## \*Corresponding Author:

Khadija Zafar  
The University of Lahore, Gujrat Campus, Gujrat, Pakistan  
[Khadija.zafarmid@gmail.com](mailto:Khadija.zafarmid@gmail.com)

## ABSTRACT

Degenerative lumbar disc disease is a condition in which an intervertebral disk and surrounding spinal components are weakened. This might be due to age or a pathogenic cause. Individuals may complain of low back pain. **Objective:** To determine the pattern of lumbar spine and disc degenerative diseases amongst patients having or not having Low Back Pain with or without radiculopathy diagnosed on Magnetic Resonance Imaging. **Methods:** Data was collected following inclusion criteria using convenient sampling technique. A total of 266 Patients undergone Lumbar MRI scans on MRI Machine 1.5T Phillips. Data was collected from Radiology Department of Tertiary Care Hospital in Lahore, Pakistan. Data was entered and analyzed on SPSS version 20. Age Groups, Gender frequencies were mentioned. Cross Tabulation of Lumbar Disc Degenerative Diseases with age and Gender was done and Chi square was applied. P-value  $\leq 0.05$  was considered significant. **Results:** The most prevalent age group for disc degeneration was 40-59 having 56.8 %. Females with disc degeneration have the highest frequency of 143 (53.8%) while males were 123 (48.2%). Lumbar Disc degeneration was 101 (38%), Disc Herniation 54 (20.3%), and last with lowest presence of Spinal Canal Stenosis 18 (6.8%). Patients with Radiculopathy with Low back Pain was 61 (22.93%) and only LBP was the most common between the patients having 205 (77.1%). Cross Tabulation of Age Groups with Lumbar Disc Pathologies was Significant having P value 0.05. **Conclusion:** In conclusion MRI can detect Disc Degeneration, Disc Herniation & Buldges, and Spinal Canal Stenosis & Nerve Root Compression. It can be considered significant and accurate to avoid any other interventional procedures. It is also concluded the LBP is an important factor in Disc Degenerative changes & radiculopathy is less seen.

## INTRODUCTION

Degenerative lumbar spine disease is a condition in which an intervertebral disk and surrounding spinal components are weakened due to age or a pathogenic cause [1]. Individuals with lumbar spine degenerative disease might be symptomatic and asymptomatic [2]. Individuals who are symptomatic may complain of back discomfort as back pain or radicular pain syndrome may have Sciatica [3,4]. Mechanical compression of neuronal components caused by disk herniation and biochemical and inflammatory causes are all potential origins of pain [5]. About 35% of people with no symptoms may show degenerative spine abnormalities such as disk degeneration, Modic alterations, disk bulges, spinal stenosis and facet joint arthropathy. Disk degeneration, Modic alterations, disk

displacement, facet joint arthropathy, and related consequences are all symptoms of this illness (nerve root compression and spinal canal stenosis)[6,7]. In the further stages and progression of the disease, morphological abnormalities for example decrease of height in the disc, tears in annulus, rim lesions, and growth appear in osteophytes [8]. The occurrence of annular tears causes the annulus fibrosus to weaken, resulting in disk displacement beyond the vertebral borders [9,10]. Degenerative lumbar spine disease encompasses degeneration, lumbar spinal stenosis and spondylolisthesis which are a major cause of disability. Lumbar degenerative spine can affect degradation in quality of life due to a variety of clinical symptoms such as

weakness, lower leg discomfort, and low back pain of different severity. Low back pain was considered one of the 291 conditions evaluated for years in contribution of disability in the 2010. It was considered as the Global Burden of Disease with 83 million disable people losing life in 2010 [11,12]. Lumber radiculopathy is a condition in which pain radiates from the lower back and hip down the back of the thigh and into the leg. The Injury can be caused by the Compression of the nerve roots which are exiting the spine at L1-S4 levels [13]. The symptoms of compression can be pain with a Tingling sensation, radiating discomfort; following numbness and paresthesia. Radiculopathy can affect any section of the spine although it is most prevalent in the lower back particularly in the lumber region [14]. It frequently occurs as a result of substantial socioeconomic implications. The incidence of lumbar radiculopathy with a distant origin is roughly 2%. Lumbar radiculopathy accounts for 11 percent of the 12.9 percent of low back problems in the working population. Overall prevalence of lumbosacral radiculopathy has really been estimated to range from 9.9% to 25% [15]. Disk displacement is another symptom of spine degenerative degeneration. The displaced disk might be a simple bulge in case of disk protrusion, disc extrusion and sequestration [16]. In a weakened disc a disc bulge is a circumferential enlargement of the disc contour in a symmetrical way with the annulus intact and disc extension outward involving >50% of the disc circumference or diffuse disc bulge [17]. The displacement of a disc further than the intervertebral disc space is known as disc herniation [18]. A protruding, extruding, or sequestered disc may protrude, extrude, or sequester its own. Disk protrusion is 50 percent of the disc circumference displacement of disc material beyond the boundaries of adjoining vertebral endplates. A herniated disc with such a slight relationship to the parent disc is called an extrusion (narrow neck) [19]. Sequestration refers to a segment of disc tissue that migrates into the spinal canal hollow without being attached to the main disc [20]. Spinal stenosis is caused by degenerative lumbar alterations [21]. Facet joint hypertrophy, bulging or projecting discs, ligamentum flavum hypertrophy, and degenerative osteophytes are examples of these changes [22]. Paget disease-related bone overgrowth, achondroplasia, posttraumatic changes, and spondylolisthesis are also less common causes of central canal stenosis [23]. The most prevalent symptoms of canal stenosis are low back pain and symptoms associated with physical activities of lower limb (neurogenic claudication) [24]. MRI (Magnetic Resonance Imaging) is Radiographic imaging modality that orthopedic Physicians can rely on because it is possibly safe and long-lasting. MRI shows complete structural architecture of the intervertebral disk.

A randomized controlled trial was conducted at the Department of Anesthesiology, Rehman Medical Institute (RMI), and Peshawar from 15 Aug, 2020 to 15 Feb, 2021. The sample size was 60 (30 in each group) by keeping the confidence interval equal to 95% power equal to 80% and the anticipated duration of analgesia with BPV alone vs BPV with DXM as  $187.32 \pm 16.45$  as compared to  $357.46 \pm 30.64$  minutes respectively. Samples were selected using non-probability consecutive sampling technique. Women with age 20-40 years, ASA I, II Class and pregnant females with singleton pregnancy irrespective of parity and admitted for elective cesarean sections were included. Documented cases of any bleeding disorder i.e. factor deficiencies (assessed by history and medical record), documented cases of allergy to any of the study drugs. (assessed by history and medical record) and documented cases of end stage renal failure (creatinine > 3 mg/dl) and liver failure (ALT, AST > 60 IU/L) were excluded. Data from the patients were collected with the help of a pre tested questionnaire and it was analyzed using SPSS version 24.0.

## METHODS

Data was collected following inclusion criteria using convenient sampling technique. A total of 266 Patients undergone Lumber MRI scans on MRI Machine 1.5T Phillips. The data was collected from September, 2021 to January, 2022 after informed consent. The data was collected and filled in the Symptomatic Performa and their diagnostic reports were studied. Data was collected from Radiology Department of Tertiary Care Hospital in Lahore, Pakistan. This study Included Patients around 20-80 years of age patients presenting with LBP (low back pain) having radiculopathy or not in lumbar spine. SPSS version 20 was used to analyze and enter data. Age Groups, Gender frequencies were mentioned. Cross Tabulation of Lumber Disc Degenerative Diseases with age and Gender was done and Chi square was applied using P-value  $\leq 0.05$ .

## RESULTS

The Results are based on total of 266 Patients who came to Radiology Department for Lumber MRI scans for Disc Degenerative changes and Pathologies. The data was collected and included following inclusion criteria. The Socio demographic features like Age groups and Gender was considered as a variable in Disc Degenerative changes and Pathologies. In Table 1, a total of 3 Age groups were made following 20-39, 40-59, 60-80. In which the most prevalent Age group was 40-59 having 56.8 % following 16.9 % in 20-39 and 26.3 % in most senior age group of 60-80%. In Table 2 Females have the higher number of frequency in Disc degenerative changes and pathologies in Lumber Region of Vertebral disc. Females have the highest frequency of 143 (53.8%) while males are a little less in

number following frequency of 123 (48.2%). In Table 3 frequency of types of lumber disc pathology was written with the most common disease of disc degeneration 101 (38%), Disc Herniation 54 (20.3%), Disc Buldge 39 (14.7), Modic changes 28 (10.5%), Nerve Root Compression 26 (9.8%) and last with lowest presence of Spinal Canal Stenosis 18 (6.8%). In Table 4 the patients came with the complains of low back pain and low back pain with Radiculopathy in which distribution of frequency was the Patients with Radiculopathy with LBP was 61 (22.93%) and only LBP was common among all the patients having 205 (77.1%). In Table 5 Cross Tabulation of Age Groups with Lumber Disc Pathologies were mentioned and explained. Chi square was applied to check Significance using P Value  $\leq 0.05$ . In the results Age was Significant having P value 0.05 showing highest frequency in middle age group of 40-59.

| Age Group |       |           |         |               |                    |
|-----------|-------|-----------|---------|---------------|--------------------|
|           |       | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid     | 20-39 | 45        | 16.9    | 16.9          | 16.9               |
|           | 40-59 | 151       | 56.8    | 56.8          | 73.7               |
|           | 60-80 | 70        | 26.3    | 26.3          | 100.0              |
|           | Total | 266       | 100.0   | 100.0         |                    |

**Table 1:** Distribution of Age groups

| Age Group |        |           |         |               |                    |
|-----------|--------|-----------|---------|---------------|--------------------|
|           |        | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid     | Female | 143       | 53.8    | 53.8          | 53.8               |
|           | Male   | 123       | 46.2    | 46.2          | 100.0              |
|           | Total  | 266       | 100.0   | 100.0         |                    |

**Table 2:** Gender Distributions of Patients

| Type of Lumber Disc Pathology |                        |           |         |               |                    |
|-------------------------------|------------------------|-----------|---------|---------------|--------------------|
|                               |                        | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid                         | Disc Degeneration      | 101       | 38.0    | 38.0          | 38.0               |
|                               | Modic changes          | 28        | 10.5    | 10.5          | 48.5               |
|                               | Disc Buldge            | 39        | 14.7    | 14.7          | 63.2               |
|                               | Disc Herniation        | 54        | 20.3    | 20.3          | 83.5               |
|                               | Spinal Canal Stenosis  | 18        | 6.8     | 6.8           | 90.2               |
|                               | Nerve Root Compression | 26        | 9.8     | 9.8           | 100.0              |
|                               | Total                  | 266       | 100.0   | 100.0         |                    |

**Table 3:** Types of Lumber Disc Pathologies

| LBP/ LBP with Radiculopathy |                                  |           |         |               |                    |
|-----------------------------|----------------------------------|-----------|---------|---------------|--------------------|
|                             |                                  | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid                       | Low Back Pain with Radiculopathy | 61        | 22.9    | 22.9          | 22.9               |
|                             | Low Back Pain                    | 205       | 77.1    | 77.1          | 100.0              |
|                             | Total                            | 266       | 100.0   | 100.0         |                    |

**Table 4:** Disc Degenerative Diseases with Low Back Pain & Low Back Pain with Radiculopathy

| Type of Lumber Disc Pathology * Age Group Cross tabulation |                        |           |       |       |       |
|--|------------------------|-----------|-------|-------|-------|
|  |                        | Count     |       |       | Total |
|  |                        | Age Group |       |       |       |
|  |                        | 20-39     | 40-59 | 60-80 |       |
| Type of Lumber Disc Pathology                              | Disc Degeneration      | 22        | 48    | 31    | 101   |
|  | Modic changes          | 5         | 16    | 7     | 28    |
|  | Disc Buldge            | 6         | 23    | 10    | 39    |
|  | Disc Herniation        | 6         | 38    | 10    | 54    |
|  | Spinal Canal Stenosis  | 3         | 10    | 5     | 18    |
|  | Nerve Root Compression | 3         | 16    | 7     | 26    |
| Total  |                        | 45        | 151   | 70    | 266   |

**Table 5:** Cross Tabulation of Age Groups with Lumber Disc Pathologies

## DISCUSSION

It is well acknowledged that MRI can be used to assess soft tissue illness without exposing patients to ionizing radiation. Disc degeneration is a normal aspect of growing older, and every human has a chance of getting discs change over time. A degenerating disc, on the other hand, does not always result in symptoms. Degenerative disc disease is in reality highly varied in terms of its type and severity. The common prevalent reasons of low back and neck discomfort, as well as one of the ignored factor, is degenerative disc disease. In certain patients, degenerative disc disease causes weakness, numbness, and hot, shooting sensations in the arms and legs (radicular pain). Low-level chronic pain interspersed with more acute pain episodes characterizes degenerative disc disease, which is occasionally accompanied by radiculopathy. In Current study a total of 266 Participants were included having Disc Degenerative Changes and pathologies showing most of the frequency in 143 females with 53 % and age groups showing 40-59 having most complications and disc degenerative changes. The current study related with the cross sectional study of De Schepper [10], in which he investigated the relationship between radiographic characteristics of individuals with low back pain who had been reported. The connection between Low Back Pain status and the frequency of various persons exhibiting radiographic signs of lumbar disc degeneration is shown. It also shows the role of age and gender as variables in the study. A semi quantitative score such as grade 0-3 was used to assess the existence and severity of disc degeneration and disc space narrowing in the intervertebral disc spaces starting from L1/2 to L5-S1). A total of 1204 males and 1615 women had their lumbar radiographs graded and formulated. Women had a higher rate of disc space narrowing than males. Its radiographic features increased in number with age. 40-59 have the highest frequency of Disc Degeneration and Pathologies. The Current study shows the significance results in the age group of middle aged which may have some weakened

bones. A total of 3 Age groups were made following 20-39, 40-59, 60-80. In which the most prevalent Age group was 40-59 having 56.8 % following 16.9 % in 20-39 and 26.3 % in most senior age group of 60-80%. In 2015 a research by Pukhraj Suthur [1] used Magnetic Resonance Imaging to assess the characterization, extent, and effects associated with degenerative lumbar disc disease. It also demonstrates that lower back discomfort is caused by degenerative disc disease, which is a disorder that primarily affects younger to middle-aged people, peaking around the age of 40 to 50. MRI results included lumbar disc degeneration, disc annular tear, disc height loss, disc herniation, disc bulging, and disc herniation. Nerve roots are compressed due to narrowing of the spinal canal, lateral recess, and neural foramen. The most prevalent cause of low back pain is lumbar disc degeneration which was also a component in our research and relates with current study results. A study by Christopher Alexander in 2021 also supported to research by showing the similarity in the factors like age, gender, Disc Degenerative changes and Low back Pain with and Without Radiculopathy. According to Christopher One of the most prevalent musculoskeletal symptoms seen in clinical practice is low back pain. Low back pain is believed to affect anywhere from 5% to 30% of people at some point in their lives, with a lifetime prevalence of 60% to 90%. Radiculopathy symptoms, on the other hand, can be a sign of a more serious illness, such as acute disc herniation. Lumbosacral radiculopathy can occur even if there is no back discomfort [22]. These findings are closely related to the current study and objectifies the similar points. Plain radiographs can also be useful in visualizing gross anatomic changes in the intervertebral disc, according to the current investigation. However, because of its advantages of absence of radiation, multiplanar imaging capacity, high spinal soft-tissue contrast, and accurate localization of intervertebral disc alterations, MRI is the standard imaging technique for identifying disc disease.

## CONCLUSION

In Conclusion MRI is the most accurate and precise Imaging modality to detect most Disc Degenerations and Pathologies of the Lumbar Disc. In current study it was accurate in detecting all the pathologies as Disc Degeneration, Disc Herniation & Buldges, and Spinal Canal Stenosis & Nerve Root Compression. MRI diagnosis can be considered significant and accurate to avoid any other interventional procedures. Low back Pain is also found to be the most prevalent cause in all Disc Degenerative alterations, although radiculopathy is less common.

## REFERENCES

[1] Suthar P, Patel R, Mehta C, Patel N. MRI evaluation of

lumbar disc degenerative disease. *Journal of clinical and diagnostic research: JCDR*. 2015;9(4):TC04. doi: 10.7860/JCDR/2015/11927.5761.

- [2] Peng Y, Lv F-J. Symptomatic versus asymptomatic intervertebral disc degeneration: is inflammation the key? *Critical Reviews™ in Eukaryotic Gene Expression*. 2015;25(1):13-21 doi: 10.1615/critreveukaryotgeneexpr.2015012369.
- [3] Brinjikji W, Diehn F, Jarvik J, Carr C, Kallmes DF, Murad MH, et al. MRI findings of disc degeneration are more prevalent in adults with low back pain than in asymptomatic controls: a systematic review and meta-analysis. *American Journal of Neuroradiology*. 2015;36(12):2394-2399. doi: 10.3174/ajnr.A4498.
- [4] Liu C, Cai H-X, Zhang J-F, Ma J-J, Lu Y-J, Fan S-W. Quantitative estimation of the high-intensity zone in the lumbar spine: comparison between the symptomatic and asymptomatic population. *The Spine Journal*. 2014;14(3):391-396. doi: 10.1016/j.spinee.2013.06.078.
- [5] Farshad-Amacker NA, Farshad M, Winklehner A, Andreisek G. MR imaging of degenerative disc disease. *European journal of radiology*. 2015;84(9):1768-1776. [doi.org/10.1016/j.ejrad.2015.04.002](https://doi.org/10.1016/j.ejrad.2015.04.002)
- [6] Kushchayev SV, Glushko T, Jarraya M, Schuleri KH, Preul MC, Brooks ML, et al. ABCs of the degenerative spine. *Insights into imaging*. 2018;9(2):253-274. doi: 10.1007/s13244-017-0584-z.
- [7] Witwit WA, Kovac P, Sward A, Agnvall C, Todd C, Thoreson O, et al. Disc degeneration on MRI is more prevalent in young elite skiers compared to controls. *Knee Surgery, Sports Traumatology, Arthroscopy*. 2018;26(1):325-332. doi: 10.1007/s00167-017-4545-3.
- [8] Elfering A, Semmer N, Birkhofer D, Zanetti M, Hodler J, Boos N. Young investigator award 2001 winner: Risk factors for lumbar disc degeneration: A 5-year prospective MRI study in asymptomatic individuals. *Spine*. 2002;27(2):125-134. doi: 10.1097/00007632-200201150-00002.
- [9] Kakitsubata Y, Theodorou DJ, Theodorou SJ, Trudell D, Clopton PL, Donich AS, et al. Magnetic Resonance Discography in Cadavers: Tears of the Annulus Fibrosus. *Clinical Orthopaedics and Related Research (1976-2007)*. 2003;407:228-240. doi: 10.1097/00003086-200302000-00032.
- [10] de Schepper EI, Damen J, van Meurs JB, Ginai AZ, Popham M, Hofman A, et al. The association between lumbar disc degeneration and low back pain: the influence of age, gender, and individual radiographic features. *Spine*. 2010;35(5):531-536. doi: 10.1097/BRS.0b013e3181aa5b33.

- [11] Hoy D, March L, Brooks P, Woolf A, Blyth F, Vos T, et al. Measuring the global burden of low back pain. *Best practice & research Clinical rheumatology*. 2010;24(2):155-165. doi: 10.1016/j.berh.2009.11.002.
- [12] Driscoll T, Jacklyn G, Orchard J, Passmore E, Vos T, Freedman G, et al. The global burden of occupationally related low back pain: estimates from the Global Burden of Disease 2010 study. *Annals of the rheumatic diseases*. 2014;73(6):975-981. doi: 10.1136/annrheumdis-2013-204631.
- [13] Berry JA, Elia C, Saini HS, Miulli DE. A review of lumbar radiculopathy, diagnosis, and treatment. *Cureus*. 2019;11(10). doi: 10.7759/cureus.5934.
- [14] Van Der Windt DA, Simons E, Riphagen II, Ammendolia C, Verhagen AP, Laslett M, et al. Physical examination for lumbar radiculopathy due to disc herniation in patients with low-back pain. *Cochrane database of systematic reviews*. 2010(2). doi: 10.1002/14651858.CD007431.pub2.
- [15] Clark R, Weber RP, Kahwati L. Surgical management of lumbar radiculopathy: a systematic review. *Journal of general internal medicine*. 2020;35(3):855-864. doi: 10.1007/s11606-019-05476-8.
- [16] Hirata FH, Guimarães AS, Oliveira JXd, Moreira CR, Ferreira ETT, Cavalcanti MGP. Evaluation of TMJ articular eminence morphology and disc patterns in patients with disc displacement in MRI. *Brazilian oral research*. 2007;21(3):265-271. doi: [10.1590/s1806-83242007000300013](https://doi.org/10.1590/s1806-83242007000300013)
- [17] Sener S, Akgunlu F. MRI characteristics of anterior disc displacement with and without reduction. *Dentomaxillofacial Radiology*. 2004;33(4):245-252. doi: 10.1259/dmfr/17738454
- [18] Amin RM, Andrade NS, Neuman BJ. Lumbar disc herniation. *Current reviews in musculoskeletal medicine*. 2017;10(4):507-516. doi: 10.1007/s12178-017-9441-4.
- [19] Okada E, Matsumoto M, Fujiwara H, Toyama Y. Disc degeneration of cervical spine on MRI in patients with lumbar disc herniation: comparison study with asymptomatic volunteers. *European Spine Journal*. 2011;20(4):585-591. doi: 10.1007/s00586-010-1644-y.
- [20] Xu B-S, Xia Q, Ma X-L, Yang Q, Ji N, Shah S, et al. The usefulness of magnetic resonance imaging for sequestered lumbar disc herniation treated with endoscopic surgery. *Journal of X-ray science and technology*. 2012;20(3):373-381. doi: 10.3233/XST-2012-0336.
- [21] Haig AJ, Tomkins CC. Diagnosis and management of lumbar spinal stenosis. *Jama*. 2010;303(1):71-72. doi: 10.1001/jama.2009.1946.
- [22] Alexander CE, Varacallo M. Lumbosacral radiculopathy. *StatPearls*[Internet]. 2021.
- [23] Madsen R, Jensen TS, Pope M, Sørensen JS, Bendix T. The effect of body position and axial load on spinal canal morphology: an MRI study of central spinal stenosis. *Spine*. 2008;33(1):61-67. doi: 10.1097/BRS.0b013e31815e395f.
- [24] Minamide A, Yoshida M, Maio K. The natural clinical course of lumbar spinal stenosis: a longitudinal cohort study over a minimum of 10 years. *Journal of Orthopaedic Science*. 2013;18(5):693-698. doi: 10.1007/s00776-013-0435-9