Spectrum of Magnetic Resonance Imaging Findings in Patients with Low Back Pain

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Highlights:

- MRI is a gold standard to detect low back pain causes.
- It is best to detect soft tissue pathology.
- It is not ionized radiation modality.

Abstract:

Low back pain (LBP) is one of the most common health problems seen in medical practice. It affects the spine's pliability, solidity, & power, which can reason pain, discomfort, and stiffness. Magnetic resonance imaging (MRI) is the modality of choice for the analysis of various reason of low back pain.

Objective:

To determine the spectrum and frequency of MRI findings in patients with low back pain in Pakistan.

Methodology:

This cross-sectional descriptive research was conducted in neuroradiology department, Lahore General Hospital, Lahore. A sample of 100 individuals was selected conveniently, after obtaining informed written consent. MRI 1.5 Tesla system (Philips Archiva model 2005, Holland) was used for scanning the patients. Both T1 (axial & sagittal) and T2 (axial & sagittal) with slice thickness of 4mm and slice gap of 0.4 mm were used.

Results:

The mean age was 40.27 ±10.81 years. The highest percentage of individuals suffering from LBP were diagnosed for intervertebral disc (IVD) protrusion (89%). The lowest percentage of individuals was diagnosed with surrounding soft tissue changes (22%). Mid-range age and weight individuals were more prone to LBP.

Conclusions:

MRI is the modality of choice for the analysis of various causes of LBP. Intervertebral disc protrusion was the most common and surrounding soft tissue changes was the least common cause of LBP. Mid-range age and weight people were most commonly involved in LBP either due to heavy workload or demographic factors.

Keywords:

Low back pain, Magnetic Resonance Imaging, intervertebral disc protrusion, Age, body weight.

Introduction:

Low back-pain (LBP) is one of the most common health-problems seen in medical practice. The mean lifetime preponderance of LBP reported in earlier studies is about 38.9% which has been proposed to be due to less number of studies conducted in countries like Pakistan.[1, 2] The occurrence of LBP is more frequent in girls, with increasing age, during periods of rapid growth with high, and low levels of activity.[3] It is also common in individuals participating in sports involving spine moments. Familial LBP, psychological distress and behavioral factors are also associated with LBP.[4] Acute back pain is caused by muscular stretch or fractures on the muscles and the brain.

Fractures in compression to the spine from osteoporosis or cancer related to the spine, Sciatica, Bones Backbone, rheumatoid arthritis, or spinal cord infections, abnormal spinal surgery (such as scoliosis or vicious disease, etc)[5]. LBP can also be caused by arteriosclerosis, urinary incontinence, pregnancy-related problems, medical conditions that affect

reproductive organs of women, including endometriosis, ovarian cells, ovarian cancer, or fibroids uterus.[6,7] A study on 289 diseases and conditions in 2013 found that back pain was associated with the greatest number of years of life with illness.[1,8,9]

LBP is generally divided into two categories; specific and non-specific. Specific LBP has a specific, defined pathophysiologic mechanism such as jaw core, dysplasia, malignant, and fracture symptoms. However non-specific LBP (idiopathic), has no specific and clear-cut cause1. The first step in the diagnosis of patients with LBP is almost entirely based on the date and physical examination, primarily by the general practitioner. In addition, in a tinysection of patients, analytical imaging is required. Worldwide guiding principle proposes that imaging is performed only in case of serious pathology (fracture, malignancy & distress) or patients with severe sciatica shown for operation, since they have not been able to maintain a conservative care of at least 6 – 8 week.[1,10,11] There is a widespread agreement that no LBP is asymptomatic. However, despite these recommendations, there is little coordination between specialized skills in the level of spinal cord dysfunction.[12] The spine's earrings, such as CT and MRI, are still being done in patients with LBP, and often when there are no specific symptoms. These findings supported the hypothesis that most changes inside checkup care for back− pain can be due to the uncertainty of the physician.[13]

The MRI-scan description was very cooperative for assessing inter-vertebral disk disease and is also excellent for evaluation of soft tissue abnormalities.[14]

LBP is a very common clinical condition, very often compel the patient to visit emergency department, involving individuals from all ages, both genders and present in all seasons but specially aggravate during cold. LBP could be caused by a wide range of anatomic changes in the vertebral bodies, discs and spines etc.

MRI has very high contrast resolution as compared to other imaging modalities in the depiction of lumber spine therefore, it has very high reliability in the diagnosis of the causes of LBP. This research was aimed to learn more about the application of MRI as diagnostic tools in patients with LBP. Furthermore, to identify the Spectrum of MRI-findings in the various cases of LBP. The application of MRI in the evaluation of LBP make it possible to identify various causes timely and proper management plane accordingly for the reduction in the morbidity and quick recovery.

Methodology:

This cross-sectional, descriptive study was conducted in the neuroradiology department, Lahore General Hospital, Lahore. Sample from the target population was selected with convenient sampling with inclusion of all the individuals having LBP. All the individuals with spinal surgeries and road traffic accidents involving spines were excluded. A total of 100 cases of age 18-60 years were selected. MRI 1.5-Tesla system (Philips Archiva model 2005, Holland) was used for the scanning of patients. Slice thickness of 4mm and slice gap of 0.4 mm were selected. Both T1 (axial & sagittal) and T2 (axial & sagittal) was used. Contrast-enhanced studies (T1 only) were performed when needed such as in cases of tumors or infections. Following observations were made on MR images, intervertebral disc bulging/prolapse or herniation; end plate changes; intraspinal (thecal sac) changes; vertebral body height changes; neural foraminal narrowing/nerve root compression and surrounding soft tissue changes.

The quantitative variables like age were presented by mean and standard deviations. Collected data were recorded and analyzed with the help of Microsoft Excel and SPSS Version-22.0. The qualitative variables like; disc bulging, herniation, prolapse, were presented by frequency and percentage.

Results:

One hundred individuals suffering from low backpain were recruited their mean age was 40.27 ±10.81 years ranging from 17 to 60 years.

The mean weight of the included patients was 82.88 ± 6.569 Kg. and ranging from 68 to 96 Kg. MRI findings for the LBP is given in Table 1. The maximum number of individuals having LBP diagnosed with MRI for the combination of condition; Intervertebral disc Protrusion, Thecal sac changes, Neural Foramen narrowing 34 (34.0%). All the individuals were grouped in five classes of age. The maximum number of individuals belongs to 36 – 45 years details are given in Figure 1.
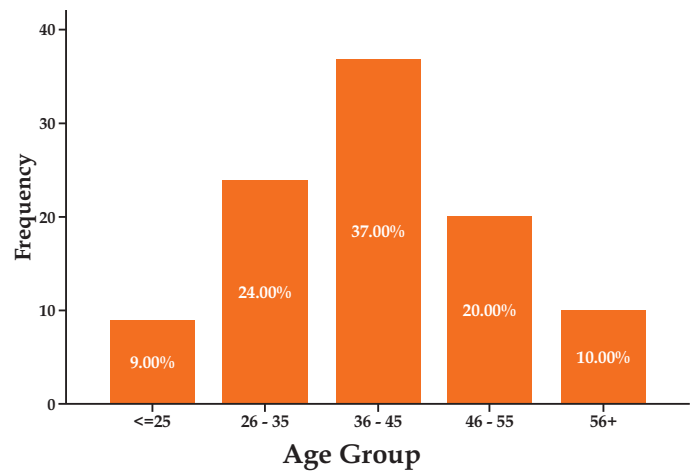

Figure 1: Classes of ages of the participants and their respective percentage

Findings	Frequency
End Plate changes	3
End Plate changes, Vertebral body height changes	3
End Plate changes, Vertebral body height changes Surrounding soft Tissue changes	1
IVD Protrusion	5
IVD Protrusion, End Plate changes,	2
IVD Protrusion, End Plate changes, Thecal sac changes	2
IVD Protrusion, End Plate changes, Thecal sac changes, Neural Foramen narrowing	10
IVD Protrusion, End Plate changes, Thecal sac changes, Neural Foramen narrowing, Surrounding soft Tissue changes	2
IVD Protrusion, End Plate changes, Thecal sac changes, Surrounding soft Tissue changes	1
IVD Protrusion, End Plate changes, Thecal sac changes	1
IVD Protrusion, End Plate changes, Thecal sac changes, Vertebral body height changes	1
IVD Protrusion, End Plate changes, Thecal sac changes, Vertebral body height changes, Neural Foramen narrowing	5

IVD Protrusion, End Plate changes, Thecal sac changes, Vertebral body height changes, Neural Foramen narrowing, Surrounding soft Tissue changes	2
IVD Protrusion, End Plate changes, Thecal sac changes, Vertebral body height changes, Surrounding soft Tissue changes	2
IVD Protrusion, Neural Foramen narrowing	3
IVD Protrusion, Surrounding soft Tissue changes	1
IVD Protrusion, Surrounding soft Tissue changes	5
IVD Protrusion, Thecal sac changes, Neural Foramen narrowing,	34
IVD Protrusion, Thecal sac changes, Neural Foramen narrowing, Surrounding soft Tissue changes	2
IVD Protrusion, Thecal sac changes, Neural Foramen narrowing	1
IVD Protrusion, Thecal sac changes, Surrounding soft Tissue changes	3
IVD Protrusion, Thecal sac changes, Neural Foramen narrowing,	1
IVD Protrusion, Thecal sac changes, Vertebral body height changes, Neural Foramen narrowing,	2
IVD Protrusion, Thecal sac changes, Vertebral body height changes, Surrounding soft Tissue changes	1
IVD Protrusion, Vertebral body height changes, Neural Foramen narrowing, Surrounding soft Tissue changes	1
IVD Protrusion, Vertebral body height changes, Surrounding soft Tissue changes	1
IVD Protrusion, Vertebral body height changes	1
Surrounding soft Tissue changes	3
Vertebral body height changes	1
Total	100

Table 1: Various isolated and combinations of conditions diagnosed by MRI in patients with low back pain

Discussion:

In routine medical practice, one of the most common problems and the main cause of disability is low back-pain. It affects the body's moments, flexibility, stability, and strength, which can cause pain, discomfort, and stiffness.[15] The mean lifetime prevalence of low back pain is reported 38.9% in the previous articles.[16] In the study of Loney and Straford the prevalence of low back pain was calculated as 33% in Belgium, 28.4% in Canada, 14% in the United Kingdom, 13.7% in Denmark, 12% in Sweden, and 6.8% in North America.[17] No demographic data is available for low back-pain in Pakistan. Low back-pain is affecting a wide spectrum of ages of both genders, about one-fourth patient seeks for treatment in the initial half year of the onset of low back pain. Sometimes low back pain settles spontaneously but recurrence rate is very high. Only one-third resolve completely over a period of one year but three-fifth recur and one out of ten don't resolve at all. Walker concluded that there was a great variation between the results of various articles. they attributed this variation the defect of methodologies acquired by researchers.[18] It was conducted that a demographic study while surveyed three thousand adults the point-prevalence of low back pain was 25.5% and 64.6% at six-month period while 79.2% at lifetime. A huge variation exists between the point and the six-month prevalence of low back pain, which is also seen in other epidemiological studies. The possible cause of this variation is the episodic nature of low back pain. The results of the current study agree with the previous work. Back–pain is very rare in children, its prevalence was estimated as 1%-6% but in adulthood, it increases rapidly to about 8% to 50%. The maximum prevalence of low back pain was estimated at the age of 60 to 70 years. In a prospective one-year peak prevalence was estimated in 45 - 59 years age group individuals. Similarly, according to American low back pain, epidemiological study maximum prevalence was estimated at 55 to 64 years age group. Some studies showed peak prevalence in women at 75 years of age.[19] Current study results were also supported by there results that all the individuals were categorized in five age groups, maximum individuals participated were 36 to 55. Clinically, no relation was seen between low back pain and obesity. But some epidemiologic studies determine risk factors that can help develop lower back pain, for example, occupation, exercise, and migrate smoking.[20] In current study, it was concluded that individuals seeking for medical therapy of low back pain mostly belong to group 76-91Kg. There for, our results for the patient weight and low back pain agree with the international studies. Many studies were conducted to compare low back pain with age and mechanism of developing pain. It was reported that demographic factors like environmental and age and gender control the onset and process of low back-pain. It was also observed that Back-pain is utmost in the third decade, and overall prevalence increases with age until the 60–65-year age group and then gradually declines.[21,22]

Conclusions:

Magnetic resonance imaging is the modality of choice for the diagnosis of various pathologic and anatomical changes givin grise to low back pain. Additionally, there was an association between low back pain with patient age and body weight.

Recommendations:

Diagnostic role of MRI should be observed in a large sample size with low back pain. Additionally, MRI findings should be compared with occupational and demographic data to describe various aspects of the mechanism of low back pain development.

Acknowledgment:

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