

2023 - 2025

TANZILA ARBAB ARSHAD

SU91-MSAHW-S23-015

FAHS

Evaluation of Lumbar Disc Degenerative Disease on MRI in Patients with Chronic Back Pain Correlated with History



SUPERIOR UNIVERSITY

Thesis Submitted to

The Superior University Lahore

In Partial Fulfillment of the

Requirement for the Degree of

Master of Science in Allied Health Sciences

By

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DEDICATION

This research is dedicated to all the patients who have bravely endured the challenges of lumbar degenerative disease. Their pain, struggles, and resilience have been the driving force behind this study. Without their courage in sharing their experiences, this research would not have been possible. I hope that this work contributes to improving their diagnosis, treatment, and quality of life.

I also dedicate this work to my family, whose love, support, and encouragement have been my constant pillars throughout this academic journey. To my parents, who instilled in me the values of perseverance, hard work, and compassion, I am forever grateful. To my friends and colleagues, whose patience and understanding provided me with the strength to face every challenge, this work is a testament to your belief in me.

I would like to express my deepest gratitude to my mentors and academic advisors, whose guidance, wisdom, and expertise shaped this research. Their dedication to advancing scientific knowledge and improving patient care has inspired me to push the boundaries of my understanding and contribute meaningfully to the field of healthcare.

Finally, I dedicate this work to the medical professionals, researchers, and healthcare workers who tirelessly strive to make a difference in the lives of patients. Their commitment to improving healthcare, understanding complex medical conditions, and finding innovative solutions fuels progress and offers hope to many. This research is a small contribution to their ongoing efforts to better diagnose and treat lumbar degenerative disease and related conditions.

Tanzila Arbab Arshad

ACKNOWLEDGEMENT

With the pen in hand, we are proud to think that no words can adequately express my gratitude to Almighty Allah (The Omnipotent, The Omniscient, The Most Merciful, and The Most Beneficent), Who is the sole source of all knowledge and wisdom, as well as a constant source of benefit to His humankind and creatures. His abundant grace nourished our thoughts, fulfilled our objectives and modest efforts in the shape of this write-up, and added this material contribution to the vast ocean of scientific information that already exists.

All honor to the Holy Prophet Muhammad (Peace Be Upon Him), the city of wisdom, the enlightening torch, and the savior of humanity from adversity, whose teachings illuminated our hearts and flowered our minds.

The work described in this publication was completed with inspiring leadership, gorgeous support, constructive criticism, an enlightened route to achievement, and extremely kind supervision of Dr. Tahira Batool Faculty of Allied Health Sciences, Superior University, Lahore. We would like to convey our heartfelt gratitude to our deserving supervisor for his sharp and potential attention, the feeling of obligation, helpful recommendations, persistent encouragement, scholastic guidance, dynamic supervision, and sympathetic attitude during this research project.

It is an honor for us to express our heartiest gratitude and appreciation to the members of our supervisory committee, Prof. Dr. Muhammad Naveed Babur (Dean-Allied Health Sciences), Mr. Shahzad, Department of Allied Health Sciences Superior University Lahore, Shahid Manzoor (co-supervisor) for their skillful and marvelous guidance and positive attitude during the whole period.

This acknowledgment would be incomplete until we mention the thankfulness of our sweet and loving friends. Words can't adequately express the appreciation and gratefulness of our friends for their productive criticism, irreplaceable help, and support. They have always been our right hand throughout our academic careers. Our deepest indebtedness goes to Dr. Hammad Ahmed for providing us with continual support and reinforcement from the first day to the last.

Tanzila Arbab Arshad

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LIST OF ABBREVIATIONS

Abbreviation	Full-Form/Meaning
MRI	Magnetic Resonance Imaging
SPSS	Statistical Package for the Social Sciences
LV	Lumbar Vertebrae
T1	T1-Weighted Imaging (MRI sequence)
T2	T2-Weighted Imaging (MRI sequence)
CSF	Cerebrospinal Fluid
DSD	Degenerative Spine Disease
LBP	Low Back Pain
CT	Computed Tomography
STIR	Short Tau Inversion Recovery (MRI sequence)
SAG	Sagittal (MRI imaging plane)
CLBP	Chronic Low Back Pain
LDH	Lumbar Disc Herniation
CSA	Cross-Sectional Area
LSS	Lumbar Spinal Stenosis
IVD	Intervertebral Disc
SLDD	Segmental Lumbar Disc Disease
T-Test	Statistical Test
ANOVA	Analysis of Variance (statistical test)
H/O Trauma	History of Trauma
LDDD	Lumbar Degenerative Disc Disease
DDD	Degenerative Disc Disease
LDD	Lumbar Disc Degeneration

ABSTRACT

Introduction

Lower back pain secondary to degenerative disc disease is a condition that affects young to middle-aged persons with peak incidence at approximately 40 years. MRI is one of the most sensitive and specific modalities for evaluating the soft tissue pathologies of the lumbar spine. In addition, there are no radiation side effects. Provides information about the vertebral body, disc cavity, spinal canal, and spinal cord. Multiple sequences are taken at different levels, each useful for assessing different medical conditions.

Aim of the study

To evaluate the lumbar disc degenerative disease on MRI in patients with chronic back pain correlated with history.

Methodology

This descriptive cross-sectional study, conducted at Ghurki Trust and Teaching Hospital from May to September 2024, involved 245 patients diagnosed and studied on a 0.4-Tesla Magnetic Resonance Imaging equipment. Demographics were summarized using descriptive statistics, and correlations between categorical factors were investigated using chi-squared tests. Correlation tests were used to evaluate the association between MRI findings and clinical symptoms, with a significance level of $p < 0.05$. The data was analyzed using SPSS version 22.

Results

Total 245 patients with multiple presenting complaints, of which low backache was most common, were studied for the evaluation of lumbar spine on MRI. From 245 patients, 129 (52.7%) were males and 116 (47.3%) were females. Multiple risk factors were evaluated including radiating or non-radiating pain, history of trauma and weight lifting. Regarding MRI findings disc degeneration was seen in 204 (83.3%) patients. Regarding pathological involvement of lumbar discs, it was seen that LV1-LV2 disc level was affected in 21 (8.6%) patients, LV2-LV3 disc in 39 (15.9%) patients, LV3-LV4 disc in 93 (38.0%) patients, LV4-LV5 disc in 207 (84.5%) patients, and LV5-S1 disc in 157 (64.1%) patients.

Conclusion

Our study shows that disc wear at LV4–LV5 is the common reason for ongoing back pain. MRI is helpful as it gives a non-invasive look at changes in soft tissue for diagnosis. Moreover, more men (52.7%) reported back pain compared to women (47.3%), likely due to their less flexible way of living.

Keywords

Disc Degeneration, Radiating Pain, Magnetic Resonance Imaging, Chronic Back Pain, T1 Weighted Images, Axial Images.

CHAPTER 1

INTRODUCTION

There are five discs separating the five vertebral bodies that are piled on top of one another. The intervertebral discs are called after the upper and lower bones, and the vertebral bodies are often numbered 1 to 5. The LV4-5 disc thus serves as a divider between the LV4 and LV5 vertebral bodies. Because the sacrum is located slightly below the lumbar spine, the lower disc is referred to as LV5-S1. Cerebrospinal fluid is a sac located just behind the columns of the bones and discs that contains nerves and bodily fluids (CSF). Near T12-LV1 levels, the spinal cord itself comes to an end. The disc often comes in two pieces. Since they are minuscule, MRI cannot differentiate them with any accuracy. The nucleus pulposus is the soft heart of the disc, and the annulus fibrosus is its outer covering. Normally, the nucleus pulposus' annulus fibrosus occupies its core and is not in contact with the nerve roots [1]. Back pain is one of the world's most common medical diseases. Back pain can have a substantial negative impact on a person's quality of life since it is unpredictable, chronic, extremely painful, and incapacitating.

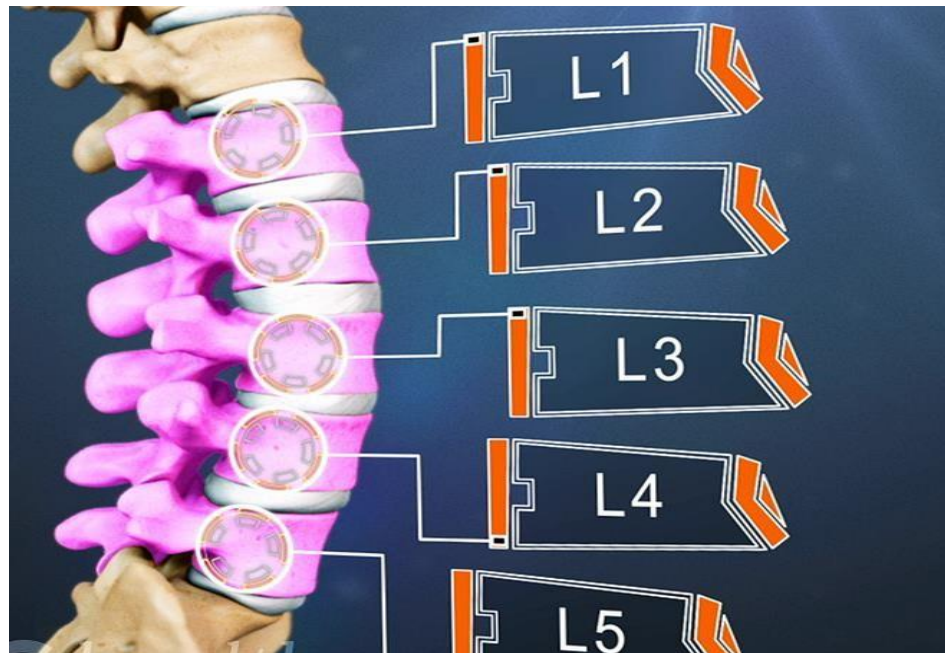


Figure 1.1: The lower back has five vertebrae (L1-L5). [10].

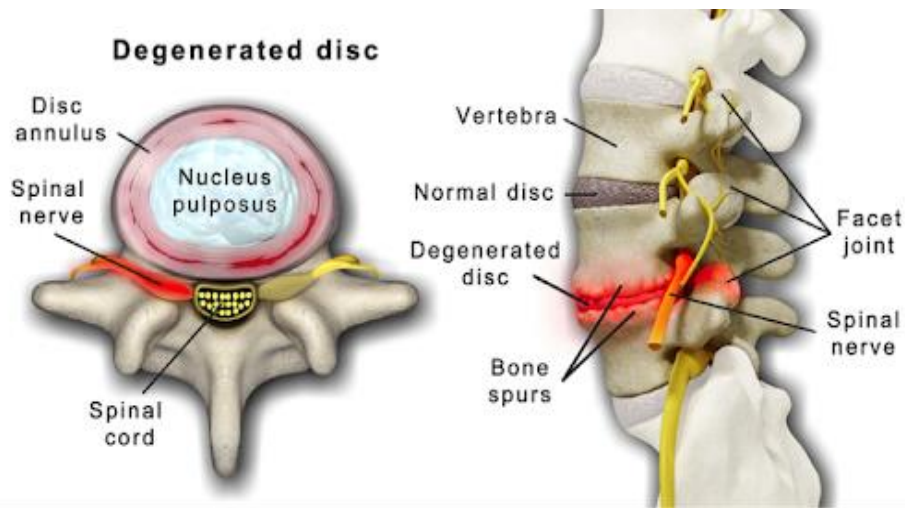


Figure 1.2: Showing the anatomy of the lumbar spine in the Axial, lateral view, and intervertebral disc [11].

Back pain does not occur due to any disease in most of the cases but some groups of symptoms can be marked as diffused, sub-acute, or chronic pain [2]. Patients who continue to have back pain beyond the acute period which lasts for about four weeks have sub-acute back pain which persists from 4 to 12 weeks. If pain or symptoms are not resolved in this sub-acute phase, they lead to a chronic condition that has a longer duration. During this phase, patients may suffer from diffused pain [3].

Low back pain can be caused not only by a pathology of the spine, such as a bone spur or disc herniation, but also by pathologies of the hip joint, pelvic, kidney, muscles, or unknown etiologies. Whatever the cause, the vast majority of people recover with rest, time, and over-the-counter medications. Changes in the spine occur naturally as we age. The disc's annulus fibrosus may bulge, protrude, or extrude. Bone spurs may form on the bones (osteophytes). The bones may collide with one another (subluxation or spondylolisthesis). Each of these events could occur without causing any symptoms. On the other hand, these issues may begin to press on nerves, resulting in pain, weakness, or numbness. A lumbar MRI scan can detect some commonly occurring changes. Because these are the most mobile levels in the lumbar spine, the most common levels affected are LV4-5 and LV5-S1 [3].

Disc bulge/disc extrude are synonyms for the same concept. Typically, a bulge indicates that the annulus fibrosus is weak and angled towards the nerve sac. Bulges and

herniations are extremely common, but they rarely cause pain or symptoms. They are common at multiple levels of the spine in many people. The processes are gradual, and the discs can press on the nerves. Extrusion or isolation frequently results in the symptom of part of the nucleus leaving the disc and pressing on the nerve. This usually necessitates intervention [3].

Osteophytes are also known as "bone spurs." Osteophytes are bone changes that occur as a result of the natural aging process. They are frequently found in conjunction with other findings such as herniated discs. As the disc swells, the edges of the bone attached to it can expand and may or may not compress the nerve. These, like herniated discs, are very common and rarely cause lumbar symptoms. Spondylolisthesis/subluxation Both of these terms refer to bone slippage. Every bone in the spine must be aligned. The ligaments that hold the bones together loosen with age, and the bones can slip. This is also possible with fractures. In both cases, the condition may or may not be symptomatic, but it frequently necessitates intervention over time. Spondylosis is very widespread and can be used to describe arthritis of the spine [1].



Figure 1.3: MRI images, such as T2 and T1 sagittal views, show degenerative changes with spondylolisthesis, disc bulging, and herniation.

In developed countries, the lifetime prevalence of low back pain is estimated to be 60% to 70%. The prevalence of a year's worth of low back pain ranges from 15% to 45%. Back pain causes the most global disability of any condition. A "disability-adjusted life year (DALY)" is another term for a mortality rate [5]. The prevalence of low back pain in Pakistan is 56.25%. There are 81 men (84.38%) and 15 women (15.63%) among them. Back pain is most common in people aged 18 to 24. That 58.8% were having difficulty at work due to their LBP [6]. We discovered that 266 million people (3.63%) worldwide suffer from DSD (degenerative spinal deformity) and LBP each year, with Europe (5.7%) and Africa (2.4%) having the highest and lowest estimated incidences, respectively. Low and middle-income countries have four times the number of cases as high-income countries based on population size. Spondylolisthesis was discovered in 39 million people (0.53%) worldwide, and symptomatic disc degeneration in 403 million people (5.5%) [7].

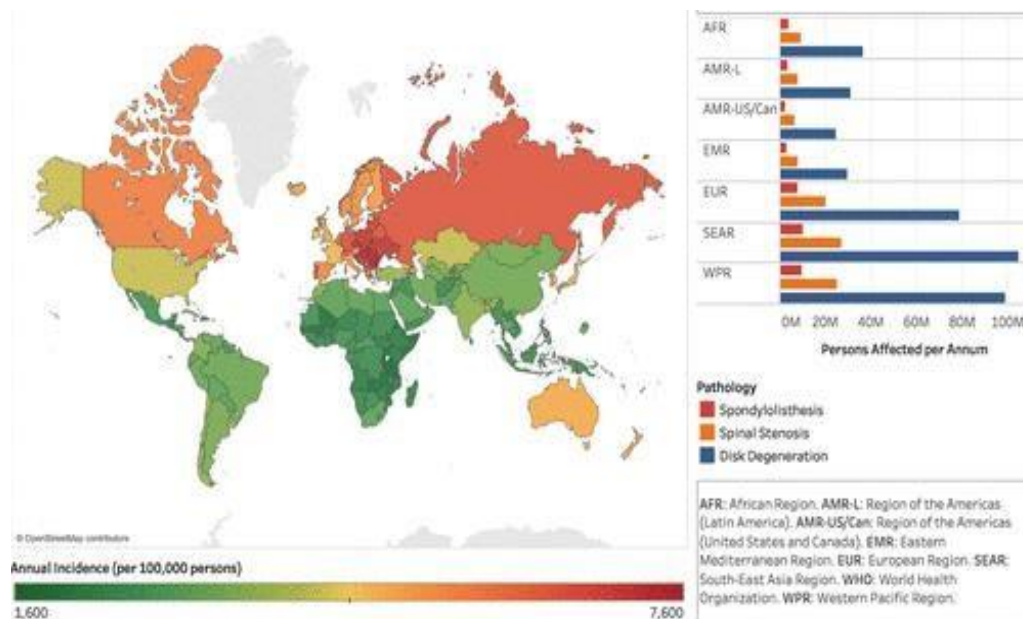


Figure 1.4: Incidence rates of low back pain in World Health Organization-recognized countries [7].

Various modalities can be used to evaluate the lower back or lumbar spine. The preferred radiography is radiography, which can visualize the bone structure of the spine, assess the condition of the spinal canal, and identify specific medical conditions like osteoarthritis increase. However, because the specifics of the spinal cord and nerve roots are unknown, x-rays are not considered the gold standard for spine diagnostic

testing. CT imaging accurately depicts spinal conditions such as nerve structure compression and lateral structure disease. The most recent spiral CT with multi-detector array allows for rapid and continuous data acquisition in seconds. Additionally useful for a thorough evaluation of bone structure, CT is highly sensitive to the presence of fractures. In order to screen trauma patients, particularly those who are at high risk of spinal cord injury, spine CT is a diagnostic imaging option. The ability to separate calcified disease from the surrounding soft tissue makes CT more effective than MRI. However, it is less sensitive than MRI and has limited ability to evaluate the spine, particularly the soft tissues of the nerve structure and ligaments [8].

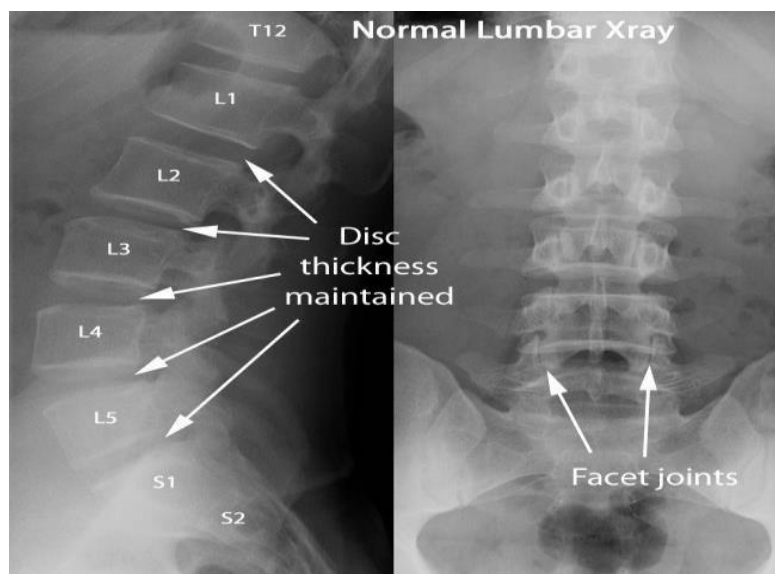


Figure 1.5: Normal lumbar x ray

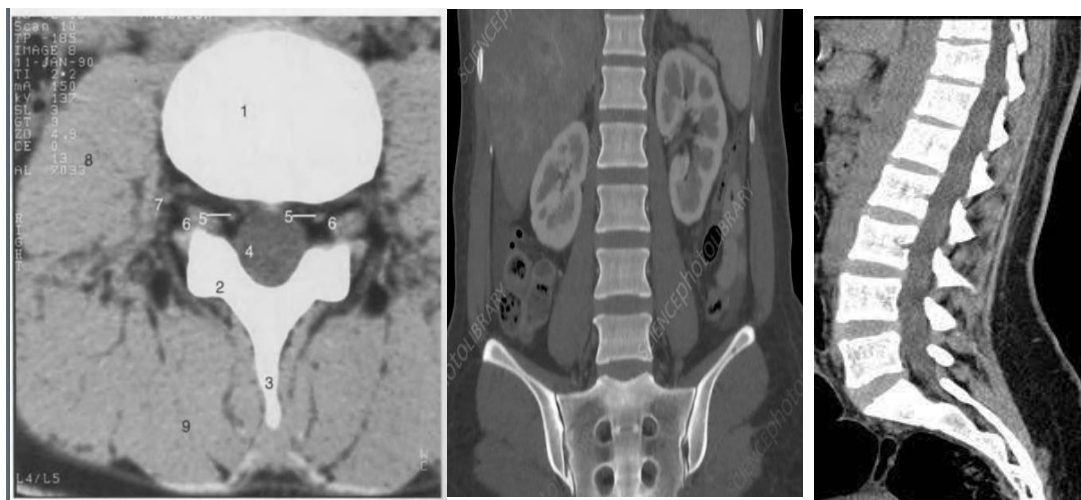


Figure 1.6: Normal MRI scan shows axial, coronal, and sagittal planes

CT is also helpful for a full study of bone structure because it may detect fractures very well. Spine CT is a diagnostic imaging technique for screening trauma patients, particularly those who are at high risk of spinal cord injury. CT is superior to MRI because it can distinguish calcified illness from the surrounding soft tissue. Its capacity to assess the spine, particularly the soft tissues of the nerve structure and ligaments, is restricted and it is less sensitive than MRI [8].

For determining the disease of the soft tissues of the lumbar spine, MRI is one of the most sensitive and precise diagnostic techniques. Additionally, radiation side effects don't exist gives details on the spinal cord, spinal canals, disc space, and vertebrae. A variety of sequences are taken at various levels, each helpful for evaluating various medical issues. The most used sequences include axial and sagittal T1 and T2 as well as sagittal STIR (short tau inversion recovery). Cerebrospinal fluid (CSF), a tissue with a high-water content, is visible as dark structures in the T1 picture. Adipose tissue, on the other hand, has a quicker T1 relaxation time and a stronger signal. T2 scans, on the other hand, exhibit significant signal intensity in tissues with high extracellular matrix water content. As a result, bright alcohol is a characteristic of T2 photos. Excellent anatomical features, such as changes in the bone marrow, bone structure, intervertebral discs, and soft tissues, are provided by T1-weighted images. Because STIR fat suppression technology reduces high-fat signals and improves the visibility of diseased structures, it is crucial. The STIR sequence is a highly sensitive method for fat suppression that can identify diseases in the musculoskeletal system [9].



Figure 1.7: The normal MRI images, T1 SAG, and T2 STAIR SAG

The purpose of this research is to study the relationship between lumbar disc degenerative disease diagnosed on MRI and clinical findings, including age, sex, body mass index, history of work, duration of working, number of lifting heavy weight work, duration of back pain, duration of activity impairment from back pain, and history of spinal injury [20].

This research study is to provide the right pathway to the patient and the physician to treat his/her chronic back pain in correlation with their clinical history is a good or beneficial method to prevent the patient or physician in future complications which occur due to misdiagnosing or late treatment of that chronic back pain.

Research on this topic is necessary in Pakistan because patients with back pain misjudge the condition due to a lack of knowledge about it and take unnecessary painkillers, which temporarily reduce pain but leave the underlying cause untreated, eventually developing into a chronic disorder with numerous complications that may require surgery.

AIM AND OBJECTIVE

To evaluate MRI of lumbar disc degenerative disease in patients with chronic back pain and to correlate the MRI evaluation in these patients with the history, both clinically and radiologically.

CHAPTER 2

LITERATURE REVIEW

Luoma et al (2012) Their research indicates that lumbar disc degeneration is one of the fundamental causes of low back pain (LBP), while the relationship between the two is still up for discussion. There is no concrete proof that there is a connection between radiographic findings and nonspecific low back pain, despite the fact that numerous cross-sectional population studies have found one to exist. However, this relationship is not seen in many referenced case studies. causative link in a relationship. Although degenerative changes have also been observed in asymptomatic patients, some magnetic resonance imaging (MRI) investigations have found a relationship. In most investigations, the relationship between the timing of MRI results and symptoms is unclear. Uncertainty surrounds the influence of a person's line of work on the relationship between disc degeneration and low back pain. There is no universally accepted classification for low back pain. Different standards for intervertebral disc degeneration and general symptoms may help to explain the discrepancy in epidemiological study findings. Nucleus pulposus signal intensity, anterior and posterior disc herniation, and nucleus pulposus signal intensity were the three signs of intervertebral disc degeneration that were examined in this study. We investigated the relationship between lumbar disc degeneration and additional types of low back pain [12].

In this research, Asghar et al (2013) Low back pain (back pain) with or without lower extremities pain is the most frequent ailment associated with chronic pain diseases. It has a substantial impact on society, the economy, and health. Low back pain that lasts more than three months and is constant or intermittent is referred to as chronic low back pain. Although low back pain is not a disease, it is associated with a wide range of morbidities. According to statistics, chronic low back pain affects 80% of people at some point in their lives, 15% to 45% of people annually, and 30% of people at a single point. Chronic low back pain has a variety of different reasons and is a complicated condition. The dura-mater of the intervertebral discs, facet joints, ligaments, fascia,

muscles, and nerve roots may all be involved in the transmission of lower back pain. Spinal pain is the most prevalent type of chronic pain. The outer fibrous annulus (annulus fibrosus) of the intervertebral disc tears in lumbar disc herniation, allowing the nucleus pulposus, the soft interior component, to protrude from the disc (hernia). The four main causes of lumbar disc herniation are trauma, smoking, obesity, and inactivity. The first step in making a diagnosis of a possible lumbar disc herniation is an MRI. Patients with lumbar disc herniation are more likely to experience low back pain that radiates to the limbs, which is aggravated by activity and relieved by rest. In some situations, bladder dysfunction may manifest as dysuria or foot drop. The purpose of this study is to determine the prevalence of lumbar disc herniation in individuals with chronic back pain and how different performance levels impact it [13].

Atsushi et al (2010) study discovered that the use of MRI in the diagnosis of facet joint osteoarthritis is questionable. The association between disc degeneration and the condition was established after devising a grading system for the severity of facet joint osteoarthritis using MRI. The accuracy of MRI in detecting facet joint osteoarthritis on computed tomography is 94%. Each individual has a different level of intervertebral disc degeneration before the age of 40. The majority of intervertebral discs deteriorate during 60 years. In people under the age of 40, facet joint osteoarthritis does not significantly change. People over 60 have been found to have varying degrees of osteoarthritis in their facet joints, however, some facet joints have not been found to have osteoarthritis. Without disc degeneration, there was no osteoarthritis of the facet joints. The intervertebral disc, which was also accompanied by late disc degeneration, was the most typical location of facet joint osteoarthritis. Ageing and osteoarthritis of the facet joints are more intimately related to intervertebral disc degradation. This study supports the notion that facet joint osteoarthritis may occur up to 20 years after intervertebral disc degeneration and that "intervertebral disc degeneration precedes facet joint osteoarthritis." This study also seeks to determine whether facet syndrome and intervertebral disc degeneration are related. Historically, the classification of disc degeneration has been done by gross morphological examination or magnetic joint osteoarthritis. By creating a classification scheme for facet joint osteoarthritis, the relationship between intervertebral disc degeneration and the condition may be more

clearly identified [15].

Regarding the research Chou et al (2019) According to a study's findings, back soreness is a common condition. Around 70% of people in industrialised countries have back discomfort at some point in their lives. Previous studies have shown that patients with chronic back pain experience depression significantly more often. Nepalese people with persistent back pain. This descriptive cross-sectional study was carried out by Bhairahawa, Nepal's School of Global Medical Sciences. Referrals for mental evaluations were made for patients who had been experiencing back pain for 12 weeks before visiting the orthopaedic OPD. Based on the inclusion/exclusion criteria, a total of 100 cases were included within 6 months (January 1, 2019, to June 30, 2019). The psychiatrist performed a comprehensive evaluation to determine whether there was depression. Depression is diagnosed using the ICD10 DCR. The data was examined using SPSS. Of the 100 participants in the study, women made up 56% of the total. The participants' average age was under 45 in 61 per cent of the individuals. The average age of the participants was 45 years old, while the youngest was 16 and the oldest was 77. Approximately 59% of persons additionally experience depression. The results showed that a significant proportion of patients with chronic back pain who went to tertiary hospitals' outpatient departments were depressed. Therefore, it's crucial to do a depression screening on these individuals [15].

In the research of Bellabarba et al (2011) five cross-sectional studies were used to analyze degenerative changes on MRI and CLBP. In all but one of these studies, a statistically significant relationship between the presence of disc degeneration and CLBP was discovered (odds ratio range: 1.8–2.8). However, the overall quality of the evidence across studies was deemed inadequate. No studies were comparing the surgical and nonsurgical management of degenerative MRI abnormalities. Although there may be a connection between degenerative MRI changes and CLBP, it is difficult to determine whether these estimates accurately reflect the association due to the quality of the included studies, the lack of a conclusive correlation between degenerative MRI changes and CLBP, and study heterogeneity. As a result, there is a strong recommendation against routinely employing MRI for CLBP testing. It is strongly advised against performing surgical therapy for CLBP based merely on degenerative

MRI alterations because there is no data demonstrating its efficacy [16].

The study of Kohat et al (2017) the results suggest that adults are likely to experience low back pain at some point in their lives. The most frequently found abnormalities are spinal stenosis, tumours, infections, and lumbar disc degeneration, but they are all brought on by degenerative processes. Since it is a non-invasive imaging technology with excellent spatial and contrast resolution, magnetic resonance imaging (MRI) has become the investigation of choice in the evaluation of patients with low back pain. The purpose of this study was to examine the MRI signs of degenerative disc degeneration in people with low back pain. 202 individuals who underwent lumbar spine MRIs between January and June 2014 who complained of chronic low back pain, radicular discomfort, neurogenic claudication, or other symptoms and signs suggestive of lumbar degenerative disc disease had their MRI records reviewed. Based on the results of the MRI, metabolic diseases, malignancies, recent trauma, acute spinal infections, and spinal dysraphism were all ruled out. At the L4-L5 level, disc formation is most common when grade 4 involvements occur repeatedly. An annular tear can occur, albeit it is uncommon, and is common at the L4-L5 level [17].

Videman et al (2010) 115 monozygotic male twin pairs with ages ranging from 35 to 69 were included in the study. Among the MRI traits that were qualitatively assessed were disc height, bulging, herniation, annular tears, osteophytes, spinal stenosis, and endplate changes. The signal's strength was measured. After age was taken into consideration, annular rips were connected to LBP frequency and severity in the 12 months prior to imaging, and disc height was linked to all of the back pain factors examined. Both were associated with disability, the frequency of low back pain interfering with daily activities, and the severity of the worst lifetime pain episode. Other MRI findings were insufficient to account for the varied symptom histories. When physical loads from the previous 12 months were taken into account in the relationships between annular tears and "low back pain today" and 12-month low back pain parameters, the links between annular tears and "low back pain today" and 12-month low back pain parameters improved. After adjusting for genetics and other family influences, within-pair changes in disc height and annular rips contributed 6% to 12% of the overall variance in the low back pain variables. These findings give rise to new questions about the mechanisms

behind LBP. The two most crucial MRI criteria, disc height narrowing and annular rips, have limited sensitivity and minimal clinical significance on their own [18].

Tischer et al (2006) According to research, facet joints are essential for rotational kinematics and are crucial for the transfer of intervertebral strain. Clinically, it is controversial whether facet joints play a role in low back pain, and there is currently little research on the topic. In this study, degenerative changes in human lumbar facet (zygapophysial) joints from elderly donors were analysed macroscopically. The objective was to examine the morphology and extent of degenerative changes in these joints. We looked at the lumbar facet joints (L1-L5) of 32 donors, with an average age of 80.111.2 years. With the use of magnifying glasses and probes, the capsules of the joints were carefully removed, and the surfaces of the joints (5 zones) were examined. As a result, the majority of facet joints had varying degrees of cartilage defects. The articular surface's margins were where defects were most frequently found, whereas the core zone typically remained undamaged. The location of the faults varied between the superior and inferior faces, with the majority of cartilage abnormalities occurring in the superior zone. Furthermore, elderly individuals had more severe caudal anomalies (level L5). Up to 30% of cases had osteophytes, most frequently on the superior facet's later dorsal entheses of the joint capsule. As a result of ageing, the majority of articular facets margins in the lumbar spine are susceptible to degenerative changes, with superior and inferior facets having different topographical patterns. This finding might be explained by segmental motion patterns during flexion and extension motions of the facets; however, due to the marginal extension, not all modifications can be seen by CT or MRI [19].

Fujiwara et al (1999) According to a study, MRI may not help determine the extent of osteoarthritis in the facet joints. The association between disc degeneration and facet joint osteoarthritis was found by creating a grading system for the condition's severity using MRI. When it came to detecting osteoarthritis of the facet joints, MRI was 94% more accurate than CT. Individuals under 40 years of age showed varying degrees of disc degeneration. Most of the discs significantly deteriorated after the age of 60. Osteoarthritic alterations in facet joints were rather uncommon in individuals under 40. While some facets did not exhibit osteoarthritis, people over 60 showed variable degrees

of facet joint osteoarthritis. The majority of facet joint osteoarthritis developed at the intervertebral levels with severe disc degeneration and no facet joint osteoarthritis was observed in the absence of disc degeneration. Osteoarthritis of the facet joints has a closer relationship to ageing than disc degeneration. According to the most recent studies, facet joint osteoarthritis may take 20 years or longer to develop after disc degeneration, and disc degeneration "precedes facet joint osteoarthritis [20].

Kärkkäinen et al (1993) Using radiography and 0.02 T and 0.04 T low field magnetic resonance imaging, eleven canine patients and three healthy controls were studied for degenerative lumbar spine diseases, such as sacrolumbar stenosis, intervertebral disc degeneration and protrusion, and spondylosis deformans of the canine lumbar spine. The transverse and sagittal planes were used to record the T1 and T2 weighted images. Both T1 and T2 weighted imaging can be used to assess the nucleus pulposus's decreased hydration, which is thought to be an indication of intervertebral disc degeneration. Compared to radiography, magnetic resonance imaging provides more precise information about the state of the intervertebral discs as a non-invasive method. Without the use of a contrast agent, Sacro lumbar stenosis, compression of the spinal cord or cauda equina, and surrounding tissue, can all be determined [21].

Masui et al (2005) by gathering knowledge of Twenty-one lumbar disc herniation patients who underwent non-surgical treatment were monitored for a minimum of seven years, during which time the clinical outcomes and the stage MRI results at the initial, two-year, and final stages were assessed. Serial MRI was utilised to evaluate the degree of disc degeneration and the space-occupying ratio of the herniation to the spinal canal. The mean space-occupying ratio of herniation showed a significant decline on both the 2-year and final images. All patients exhibited advanced intervertebral disc degeneration at the study's conclusion. The baseline and 2-year MR scans of patients with and without symptoms did not reveal any clues as to who was more likely to experience lumbago and/or sciatica in the future. Morphologic changes in the lumbar disc herniation persisted even after two years. The degree of intervertebral disc degeneration or the amount of the herniation had no bearing on the clinical outcome throughout the required 7-year follow-up [22].

Heo et al (2009) This study's objectives were to introduce the oblique lumbar MRI

technique and assess its clinical applicability in the diagnosis of extraforaminal disc herniation. Herniated lumbar discs are frequently found using conventional axial and sagittal lumbar MRI. On the other hand, nerve root compression in the extraforaminal region may go undetected by conventional lumbar MRI. Oblique lumbar MRI may provide good view of the dorsal root ganglion and lumbar nerve root in the foramina and extraforaminal regions. Ten patients with extraforaminal disc herniation had bilateral oblique lumbar MRIs before surgery (turbo spin-echo T2-weighted sequence). The asymptomatic contralateral side was contrasted with the symptomatic extraforaminal disc herniation side. Oblique lumbar MRI was successful in demonstrating pedicles, dorsal root ganglions, and lumbar nerve roots in the foramina and extraforaminal regions. Nine out of ten patients had nerve root compression caused by the herniated disc in the extraforaminal region as compared to the unaffected contralateral side (90.0 percent). In one patient with scoliosis and spinal stenosis, oblique MRI was unable to accurately reveal foramina or extraforaminal anatomy due to spinal deformity. We think that oblique lumbar MRI may be able to detect nerve roots in foramina and extraforaminal regions as a result of these findings. This method is a simple and reliable diagnostic tool for extraforaminal lumbar disc herniations [23].

Clin et al (2015) According to research, the incidence of low back pain due to degenerative disc degeneration peaks around the age of 40 and affects people in their twenties to forties. Due to its advantages—including its lack of radiation, ability to image in several planes, high contrast of the soft tissues of the spine, and precise placement of disc lesions—MRI is the go-to imaging modality for diagnosing disc problems. Magnetic resonance imaging is used to evaluate the characteristics, severity, and changes related to degenerative disc disease. studies that are cross-sectional and observational. By using magnetic resonance imaging at 1.5 Tesla, 109 patients with lumbar disc degeneration between the ages of 17 and 80 were identified and evaluated. Several MRI abnormalities were noted, including lumbar hyperlordosis, Schmorl's node, decreased disc height, disc rupture, disc hernia, disc protrusion, and disc extrusion. The presence of nerve stenosis together with a compressed nerve root, lateral recess, and spinal canal was noted. Facet joint disease and ligamentum flavum thickening have been noted. Degenerative spinal diseases often affect men more than women, and most

patients lose their lumbar hyperlordosis. At the LV5-S1 level, disc height decreases were frequent. Per person, numerous discs were seen to be involved. The most frequently impacted discs were LV4-5 discs. Cricoid herniated discs, herniated discs, spinal canal stenosis, lateral cavity stenosis, compression of the nerve foramen, thickening of the yellow ligament, and disc arthritis were all prevalent at the L4 to L5 disc level. There was a lot of disc protrusion at the LV3–4 and LV45 disc levels. At the LV3-4 and LV5-S1 disc levels, posterior osteophytes are frequent. LV1-2 Spondylolisthesis and disc lesions are less frequent. Back discomfort is most frequently caused by disc degeneration. The intervertebral disc's gross anatomical changes can be seen with a straightforward x-ray. However, due to its lack of radiation, capability for multiplanar imaging, greater soft tissue contrast of the spine, and ability to pinpoint the exact location of disc lesions, MRI is a standard imaging modality for diagnosing disc disease [24].

Gamada et al (2021) In patients with acute lumbar spondylolysis who received conservative care by the protocol, the incidence of union was investigated. The study comprised patients in high school and younger with lumbar spondylolysis displaying bone marrow edema. We assessed the union rate, time till union, unilateral or bilateral vertebral level, laterality (right or left), and pathological stage during the initial visit. Since some unilateral cases included bilateral spondylolysis with contralateral pseudoarthrosis lesion, the union rate of the "actual" unilateral case in which the contralateral side was normal was evaluated. Lesions with many levels were excluded. With conservative treatment for lumbar spondylolysis, 189 lesions in 142 cases healed, whereas 45 were categorized as nonunion. The typical length of treatment up until the unification was 106 days. While the union of bilateral cases was discovered in 71/94 lesions, the union of "genuine" unilateral instances in which the contralateral side was normal was found in 68/71 lesions. The L3, L4, and L5 vertebrae were discovered to be fused in 15/17, 40/49, and 89/123 lesions. In tests 63/87 and 86/102, the union was found on the right and left, respectively. The union was observed in the pre-lysis, early, and progressive phases at 36/39, 81/97, and 27/53 lesions, respectively. Furthermore, lesions at stages 0, 1a, 1b, 1c, and 2 were found to have the union in 13/15, 47/52, 30/36, 34/42, and 20/44, respectively. An accurate union assessment using CT and MRI

demonstrated a union rate of 76% with conservative therapy for spondylolysis. The union rate for "genuine" unilateral patients with a typical contralateral side was 96%, which was significantly higher than the union rate for bilateral cases. Additionally, compared to lesions in earlier stages, axial progressive and sagittal stage 2 lesions exhibited a decreased rate of union [25].

Forristall et al (1988) by acquiring information 32 patients with lumbar disc herniation were analyzed by magnetic resonance imaging (MRI) and contrast computed tomography (CT). A total of one hundred disc levels were assessed. Anatomical confirmation of the diagnosis was made possible by surgery on 31 discs in 25 individuals. While the CT diagnostic was only accurate at 24 of 31 levels (77.4 percent accuracy), surgery confirmed the MRI diagnosis at 28 of 31 levels (90.3 percent accuracy). At eight of the levels that were surgically investigated, there was a discrepancy between the interpretation of MRI and CT. MRI scans have three levels of error while CT scans had seven levels of error. The MRI had a sensitivity of 91.7% compared to the CT's 83.3%, and a specificity of 100% vs the CT's 71.4%. This study shows that surface coil MRI is more clinically useful than contrast CT in evaluating lumbar disc herniation. A surface coil MRI may be utilized as the initial diagnostic test for a suspected herniated lumbar disc, followed, if necessary, by invasive contrast investigations and a CT scan to clarify an uncertain MRI result [26].

Colakoglu et al (2019) used MRI evaluation methods (qualitative and quantitative) to analyze the lumbar multifidus muscle composition in people with unilateral lumbar disc herniation causing nerve compression. Two radiologists retrospectively evaluated the multifidus muscle's MRI signal intensity in patients who had unilateral subarticular lumbar disc herniations; higher signal intensity suggests more fat; and visually graded the fat content using a 5-point grading system. Results were evaluated between the contralateral and herniated sides. Investigations were also conducted into the association between fat content, degree of nerve compression, and persistence of symptoms. Ninety people, ranging in age from 24 to 70, took part in the study. For both quantitative measurements and qualitative evaluation, both researchers discovered that the signal intensity of the affected multifidus muscle was significantly higher than the contralateral muscle. It has been demonstrated that the severity of nerve compression and the length

of the symptoms are significantly correlated with the degree of fat content in the affected multifidus muscle. The lumbar disc herniation's ipsilateral multifidus muscle had more fat than the opposite side. A simple visual assessment of muscle composition appears to be just as instructive regarding fat invasion as a quantitative assessment [27]. Yamada et al (2014) Cross-sectional research should be done. This study aimed to assess the amount of lumbar endplate and facet joint erosion in patients with rheumatoid arthritis (RA), quantify the prevalence of erosion, and search for associated variables using magnetic resonance imaging. There haven't been many investigations on the lumbar spine in RA, specifically the relationship between RA-related lumbar lesions and endplate and facet joint erosions. The study comprised 201 RA patients in total. The lumbar endplate and facet joint erosion, which were identified on magnetic resonance imaging as anomalies and low-intensity alterations, were scored using the Rheumatoid Arthritis Magnetic Resonance Imaging Score. Scoliosis, spondylolisthesis, and spinal fracture were among the lumbar anomalies visible on plain X-rays. With the aid of multivariable logistic regression analysis, relationships between erosion and spinal level, RA-related factors, and x-ray data were examined. At 33.8 percent and 38.7 percent of the lumbar intervertebral levels, endplate and facet erosion were present in 70.6 percent and 76.6 percent of the population, respectively. The severity of each patient's lumbar lesions was related to how severe their erosion was. In the mid-lumbar and lower-lumbar levels, endplate and facet erosion were more common, and they were associated with considerable disease activity. Strong correlations were found between endplate erosion and adjacent vertebral body fracture or disc degeneration, as well as between facet erosion and spondylolisthesis. Endplate and facet erosion are common in RA, and they occur more frequently at mid-to-low disease levels and when the condition is poorly treated. The development of lumbar lesions in RA may depend on this erosion pattern [28].

Regarding the research of Kim et al (2018) To detect lumbar disc herniation (LDH) in adult patients, this study aims to synthesise the data on the diagnostic efficacy of imaging (index test) vs surgery (reference test). We looked for studies that examined the diagnostic efficacy of imaging for LDH in adult patients with low back pain who underwent surgery as the gold standard in MEDLINE, EMBASE, and CINAHL (as of

June 2017). Two reviewers selected the papers, gathered the data, and independently assessed the probability of bias. We produced connected ROC charts for direct comparisons of diagnostic imaging tests using bivariate analysis, determined summary estimates of sensitivity and specificity using bivariate analysis, and assessed the quality of the evidence using the GRADE method. 14 trials totaling 940 patients were uncovered; all except one were finished prior to 1995. Eight studies examined myelography, nine examined computed tomography (CT), and six examined magnetic resonance imaging (MRI) (MRI). The probability of the preceding LDH varied from 48.6% to 98.7%. MRI and myelography had similar sensitivity and specificity to CT (sensitivity: 81.3 percent, 95% confidence interval: 72.3-87.7%, and specificity: 77.1 percent) (95 percent confidence interval: 61.9–87.5 percent). The quality of the evidence ranged from fair to poor. We found no studies evaluating the more advanced imaging techniques used today, therefore we are unable to determine the diagnostic efficacy of CT, myelography, or MRI. In the previous techniques, we found very limited diagnostic accuracy for all CT, myelography, and MRI, indicating a significant rate of false positives and false negatives [29].

Janssen et al (1994) According to the study's findings, 180 individuals with suspected lumbar disc disease underwent preoperative magnetic resonance imaging (MRI) 9 myelography and a postmyelogram computed tomography (CT) scan. Surgery on 102-disc levels was performed on 60 people, providing anatomic confirmation of the diagnosis. Eight bad excursions in total were made. Investigations were made into the statistical relationship between preoperative test interpretations and actual surgery outcomes. According to this study, myelography (81%) and post-myelogram CT scan (57%) were substantially less reliable than MRI, which properly predicted surgical outcomes in 98 of 102-disc levels (96%) The combined accuracy of myelography and CT scan was 84 percent, which was a significant improvement above either test used alone as a diagnostic tool. There was one false positive MRI scan in the evaluation of the lumbar herniated disc. The results of this study demonstrate that, where accessible, MRI should be employed as the preferred diagnostic investigation for patients with suspected lumbar disc herniation since it is a clinically superior diagnostic tool. Both medical professionals and patients value its noninvasiveness, multiplanar capabilities,

and lack of ionizing radiation [30].

Wassenaar et al (2012) undertook research and found that LBP is associated with significant underlying disease in about 5% of patients, necessitating confirmation of the diagnosis and focused therapy. The usefulness of magnetic resonance imaging (MRI), despite its widespread use for this diagnostic purpose, is still debatable. The goal of this research was to compile the information that was already available regarding the diagnostic effectiveness of MRI in detecting lumbar spine disease in adult patients who had sciatica or low back pain (LPB). For observational studies comparing the diagnostic effectiveness of MRI to a conventional test for the diagnosis of lumbar spinal pathology, we searched MEDLINE, EMBASE, and CINAHL (till December 2009). The papers were independently chosen for inclusion by two reviewers, who also assessed the methodological quality and extracted the data. For homogeneous subgroups of trials, pooled summary sensitivity and specificity values with 95% CIs were produced. A total of eight papers were reviewed. Strata were established for spinal stenosis and lumbar disc herniation (HNP). Five studies that examined the detection of HNP using MRI and surgical findings are included in a metaanalysis. Based on the combined studies, the aggregate estimates for sensitivity were 75% (95% CI 65-83%) and specificity were 77% (95% CI 61-88%). Because of the spinal stenosis, pooling was not possible. The results suggest that a considerable number of people's MRI classifications of HNP and spinal stenosis may be incorrect. However, given the limited sample size and significant heterogeneity of the studies, the evidence for MRI's diagnostic accuracy revealed in this review is unclear [31].

Regarding the research Cleary et al (2011) Spine surgeons say that whether or not a patient has lumbar radiculopathy, epidural steroid injections are a common form of treatment for persistent low back pain. Despite being a popular and well-known treatment, nothing is known regarding the precise illness degree that the caudal epidural may treat. The purpose of this prospective study, which involved roughly 50 participants, was to investigate the distribution pattern of epidurography. The effects of lumbar lordosis eradication and variations in Trendelenburg tilt were examined about the injectate's cephalic distribution. 52 patients who had low back pain and radiculopathy had caudal epidurals. Thirteen milliliters of local anesthesia (1 percent

lignocaine), two milliliters of triamcinolone (AcetylTM Squibb), and twenty milliliters of contrast (UltravistTM Schering) were administered to each subject. Using the lumbar spine as a reference point, patients were given either a 0° or 30° Trendelenburg tilt. Additionally, groups of patients were created based on whether or not they had lumbar lordosis, which was corrected by placing a flexion device beneath the prone patient. To identify sacral geometry variations that were more resistant to injectate dispersion cephalically, a lateral image of each sacrum was acquired. The tallest segment obtained on fluoroscopy after injection was noted. There were 52 patients with an average age of 50 who had caudal epidurals. 31 of the participants had a head tilt of 0°, whereas 21 had a head tilt of 30°. 50% of the patients in each of these groups had their lumbar lordosis flattened before caudal injection. The median segmental level obtained ranged from T9 to L5, and it was L3. The distribution of injectate in the cephalad is unaffected by the ablation of lumbar lordosis. The peak level attained by caudal injection was observed to increase with a 30° tilt ($p = 0.08$). This series had no unfavorable outcomes. A caudal epidural is a dependable and generally secure procedure for treating low back pain. Using this technique, pathologies at the L3/4, L4/5, and L5/S1 levels can be investigated. Although it is possible to obtain high lumbar and thoracic levels in some situations, it is not always the case. We propose that, if disease at levels above L3 needs to be addressed, a 30° head tilt may enhance cephalic medicine delivery. The caudal technique works best for treating pathology that is below L3 [32].

Yong et al (2012) Due to the growing accessibility and employment of magnetic resonance imaging (MRI) to evaluate low back pain, general practitioners are exposed to a set of preferred terminology used among the numerous specialists involved in lumbar spine issues. This article aims to define this jargon as well as the many lumbar spinal diseases and their clinical implications for treatment. Discussion: Although MRI may be beneficial in some clinical situations, such as lumbar back pain, the need of a thorough clinical evaluation cannot be overstated. A greater understanding of the benefits and limitations of MRI in evaluating lumbar back pain should improve communication between healthcare practitioners and allow for the best possible treatment of the patient's radiologically matched clinical issues [33].

Kang et al (2007) studied the lumbar musculature of those with chronic low back pain

and people with lumbar degenerative kyphosis (LDK) (CLBP). Women with CLBP (54 women, 45 to 73, mean 60) and patients with LDK (54 women, 44 to 74, mean 60) were contrasted with a control group of women with CLBP (54 women, ages 45 to 73, mean 60). The cross-sectional areas (CSA) of the psoas, erector spine, multifidus, and disc at the L4-L5 level were measured using magnetic resonance imaging (MRI). Lumbar muscularity was assessed using the ratio of the CSA of the psoas, the erector spine, the multifidus, and the disc (PS: disc, ES: disc, MF: disc). Multifidus and erector spine atrophy were evaluated at the L3-L4 level, and the severity of fatty atrophy was categorized into three categories: mild, moderate, and severe. The thoracolumbar fascia's shapes at the L5-S1 level were examined and classified as flat or convex. Lumbar muscularity was found to be significantly lower ($p = 0.001$) in patients with LDK (PS: disc = 0.79, SD 0.22; ES: disc = 1.36, SD 0.49; MF: disc = 0.55, SD 0.21) than in patients in the control group (PS: disc = 0.98, SD 0.23; ES: disc = 1.71, SD 0.46; MF: disc = 0.86, SD 0.30). Patients with LDK were more likely to have fat deposits in the multifidus and erector spine muscles ($p = 0.001$), and the thoracolumbar fascia at the L5-S1 level was more frequently flat ($p = 0.01$). The paraspinal musculature must be considered while analyzing lumbar spine MRI images. By calculating the CSA, visually grading fatty atrophy, and examining the fascia, doctors, and radiologists may be able to make a more certain diagnosis for individuals with clinically suspected LDK [34].

Aprile et al (2007) did a study and concluded that low back pain is the most common symptom among persons who have degenerative-inflammatory lumbar spinal pathology, which is one of the most common causes for people to seek medical attention. Although many different spinal and per-spinal structures, such as discs, bone, facet joints, ligaments, and muscles, may all undergo degenerative-inflammatory phenomena and cause pain, pain is frequently associated with degenerative disc disease, particularly ruptured discs. People with non-radicular low back pain may develop this condition due to changes in the posterior elements/per spinal tissues of the lumbar spine (also known as the "posterior vertebral compartment"). Spondylolysis, degenerative-inflammatory changes in the spine/per spinal ligaments, facet joint pathology (such as osteoarthritis, joint effusion, synovitis, and synovial cysts), and anomalies in the per spinal muscles are a few of them. Particularly in the early phases of the disease, magnetic resonance

imaging is well known for being the most sensitive imaging modality for assessing spinal degenerative pathology. When indicated, contrast-enhanced T1-weighted images with fat saturation and T2-weighted sequences with fat saturation make it possible to see degenerative-inflammatory changes in the posterior elements of the lumbar spine that, in most cases, would not have been visible with non-fat suppressed imaging [35].

In this research, Benditz et al (2015) Patients with lumbar spinal stenosis (LSS) are being identified at a quick rate, and their expectations are high. However, there is not yet enough data to support effective therapy. The majority of the treatment is down to the surgeon's skill and clinical care. Results from magnetic resonance imaging (MRI) frequently don't match the patient's concerns. According to the experts, treatment should begin with a cautious multimodal approach. Increased discomfort from neurogenic claudication symptoms should be surgically treated as part of conservative therapy. Absolute surgical indications are rare and include conditions like conus cauda syndrome. All surgical techniques attempt to open up the spinal canal without endangering the stability of the motion segment. Perhaps a second fusion will be required for this [36].

Ikuta et al (2016) conducted an inquiry in the past This study's goal was to identify the clinical and radiological features of low back pain (LBP) that were treated solely by decompression of lumbar spinal stenosis (LSS) linked to grade I lumbar degenerative spondylolisthesis (LDS). Although decompression and fusion are the surgical treatments for LDS that are most frequently recommended, several authors have found that decompression alone may offer sufficient clinical benefits, including relief from LBP. The cause of the LBP relief after decompression is uncertain, though. Forty patients who underwent a minimally invasive surgical decompression and had LSS and grade I LDS were included in the current study. Before surgery, all patients mostly expressed discomfort with their legs and LBP (4 points on the Numeric Rating Scale). Clinical and radiological examinations were carried out at the final follow-up one year after surgery (a relief of LBP: a decrease of 3 points on the Numeric Rating Scale and a valuation of 3 points). Comparative studies between patient groups receiving and not receiving LBP treatment were conducted (groups R and N, respectively). Group R received a total of 29 patients, while Group N received the remaining 11 patients. Age and radiographic

flexibility for a lumbar extension were significantly different between the two groups preoperatively. Following surgery, there was a significant improvement in both LBP and leg symptoms. The clinical outcomes of group R were noticeably superior to those of group N during the course of the follow-up period (mean 37 mo.). Sagittal lumbopelvic radiography values in group R significantly increased after surgery. Although the cause of LBP varies from patient to patient, our research indicates that in certain people with grade I LDS, simultaneous LSS, which involves neural tissue impingement and discordant sagittal lumbopelvic alignment, may result in LBP [37].

Zotti et al (2017) This study sought to determine whether lumbar multifidus muscle (LMM) For patients with symptomatic spinal stenosis, MRI before surgery may be able to predict clinical results after lumbar spinal decompression. A prospective group of patients who had confirmed spinal stenosis on pre-operative MRI and neurogenic claudication symptoms received spinal decompression. Before surgery and one and two years after the procedure, all subjects performed standardized outcome assessments (Core Outcome Measures Index (COMI), Oswestry Disability Index) (ODI v2.1). Access was gained by performing a standard lumbar spinous process osteotomy. The central canal, lateral recess, and foramina zones were then advised to be decompressed by the pre-operative MRI. Using lumbar MRI data, two independent observers assessed the bilateral axial CSA of the LMM and the degree of muscle atrophy following the Kader classification (2000). For statistically significant correlations with CSA of LMM and Kader grading at 1 and 2 years, changes in COMI and ODI scores were evaluated. In statistical investigations, the Student's t-test, kappa coefficient for interobserver agreement, and Bland-Altman Limits of Agreement were utilised (BALOA). 44 patients (41 female) received single-level decompression between the ages of 29 and 86, 16 received two-level decompression, and 6 received three-level decompression. Age, posterior fat thickness, psoas CSA, and the degree of stenosis did not substantially associated with improvements in the ODI and COMI. According to psoas CSA and L5 vertebral body area on pre-operative MRI, the patients with the most LMM atrophy had the least absolute improvement in both ODI and COMI scores ($p = 0.006$). Following lumbar spinal decompression, poorer results were associated with lower LMM CSA (8.5 cm²) and muscle atrophy. Compared to the Kader Grading Score, the preoperative CSA

of LMM seemed to be a more accurate indicator of postoperative clinical outcomes. The predictive value of pre-operative MRI appearance and LMM CSA in terms of postoperative outcome following lumbar decompression surgery is being examined for the first time in this study. A healthy LMM before surgery is associated with better outcomes following lumbar spinal decompression [38].

Selkirk et al (2016) Look into it, low back pain is a prevalent complaint in the adult population. Most people with low back discomfort do not require imaging because they often recover on their own within 12 weeks. However, a very small percentage of persons with low back pain will have a serious underlying condition that calls for additional research. The imaging modalities that should be employed in patients with low back pain are described in this chapter together with the signs and symptoms that could point to a substantial underlying cause [39].

Lingawi et al (2004) a study was conducted to see what percentage of those with sciatica or low back pain who underwent an MRI had a significant aberration that wasn't disc damage. In patients with low back pain or sciatica, 634 consecutive lumbar spine MRIs were analysed six months later (January to June 2002). The study was conducted at the University Hospital of King Abdul-Aziz University in Jeddah, Saudi Arabia. All of the patients were scanned using a 1.5-T MRI machine. The evaluation made use of T-1 weighted sagittal images, proton density, and T-2 weighted sagittal and axial images. Pictures with selective contrast enhancement were obtained. 625 individuals remained after 9 patients were dropped from the study because they were being monitored for a known diagnosis. Seven patients (1.1%) had a known initial malignancy, four patients (0.6%) had no known starting malignancy, and 11 patients (1.7%) had a new diagnosis of metastatic disease to the bony spine. Two people (0.3%), one with a conus ependymal tumour and the other with a schwannoma, developed spinal tumours. One of the non-neoplastic reasons of low back pain in four of the patients was an osteoporotic compression fracture, along with syringomyelia, discitis, spondylolisthesis, and discitis. In all, 17 of the 625 patients (2.7%) had their original diagnosis of disc disease changed to a treatable cause of low back pain or sciatica. 2.7 percent of persons with low back pain or radiculopathy had significant diseases other than disc disease [40].

Singh et al (2020) According to a study, low back pain (LBP) frequently leads to overall

disability and activity restriction. Although the vast majority of people have LBP, which is vague, diagnostic confirmation is required to rule out serious underlying disorders such as infection, cancer, fracture, or degenerative disease. To do this, some imaging techniques may be applied. MRI is currently the preferred imaging modality among all currently used techniques since it doesn't use radiation, has multiplanar reformation capabilities, and has good contrast resolution. to pinpoint various MRI patterns and the spinal degenerative lesions' most typical sites in LBP patients. 622 people with non-traumatic LBP who were referred for a lumbar spine MRI were included in this study. From the MRI database of the study population, axial T2-weighted, sagittal STIR, T1 and T2-weighted, and coronal STIR images were assessed. After excluding patients with h/o prior surgery and MR data indicating infectious or neoplastic etiologies, the sample size for our study was 598 participants. In a study of 598 persons with LBP, degenerative disc changes were the most often observed abnormality. Disc bulging was the most frequent abnormality, followed by disc desiccation, protrusion, extrusion, HIZ/annular tear, reduced IVD space, and Schmorl's nodes. The non-disc degenerative findings included morphic endplate changes, facet joint arthropathy, osteophytes, Spinal canal stenosis, and Ligamentum Flavum hypertrophy. According to the research, individuals with low back discomfort frequently experience lumbar disc degeneration. Research initiatives should concentrate on lowering risk factors while enhancing quality of life [41].

Dagistan et al (2020) studied to quantify the frequency and reporting rates of incidental findings (IF) in routine lumbar spine magnetic resonance imaging (MRI), and to emphasize the clinical importance of these findings. This study concentrated on people who had sciatica and low back pain and were thought to have lumbar spinal illness. Extra-spinal abnormalities were categorized and assessed using a modified CT Colonography Reporting and Data System (C-RADS). The average age of the patients was between 17 and 87. The patients were 1540 men and 2472 women. In 3834 instances, disc pathology was discovered. In 1282 cases, extraspinal pathology was discovered. The largest cohort in the study was C-RADS E2, which included 1048 participants (82.5 percent). There were 195 patients in the C-RADS E3 group (28.3%), compared to 23 in the C-RADS E4 group (1.8%), which may be important. According

to our research, lumbar spine MRI scans often show random extraspinal anomalies and accurate MRI evaluation and reporting are essential [42].

Cheung et al (2012) a cross-sectional cohort study based on the general public This study compared contiguous multilevel disc degeneration (CMDD) and skipped level disc degeneration (SLDD) in the lumbar spine in terms of clinical importance. Additionally, the researchers sought to identify the many types of SLDD, as well as its prevalence and effects on people's lives. On magnetic resonance imaging, disc degeneration and low back pain (LBP) are still being discussed. Recent research has revealed SLDD of the lumbar spine. In the context of low back symptoms, patterns of disc degeneration have previously been ignored. A population-based radiographic and clinical assessment of 3099 Southern Chinese patients was conducted. Sagittal T2-weighted magnetic resonance imaging of people with multilevel disc degeneration of the lumbar spine (N = 1457) revealed two groups: SLDD (n = 301; 20.7%) and CMDD (n = 1156; 79.3%). To further categorize SLDD into five kinds, the relative position of the nondegenerate normal disc(s) to degenerated disc levels was considered. The participant's demographics, LBP status, pain level, and functional disability were all evaluated. Compared to SLDD, CMDD increased the chance of prior LBP (OR: 1.39; 95 percent confidence interval [CI]: 1.00-1.93; P = 0.047) and pain severity (OR: 1.83; 95 percent confidence interval [CI]: 1.23-2.73; P = 0.003). The number of levels with disc degeneration, overall disc degeneration severity, and the presence of disc bulges/extrusions significantly increased from SLDD type I (least severe) to SLDD type V (most severe) (P 0.05). Greater LBP prevalence and greater pain intensity were seen in SLDD classification type V. Between SLDD and CMDD, as well as between SLDD categorization classes, there were no variations in functional impairment assessments (P > 0.05). For the first time, new SLDD type mutations and their clinical ramifications have been described by our extensive investigation. More critically, LBP and pain severity were more pronounced in CMDD patients than in SLDD patients. According to our research, participants with multilayer disc degeneration of the same degrees but different patterns experienced different low back symptoms. This finding might provide new information regarding how LBP works [43].

Tarantino et al (2013) study According to the study, recumbent magnetic resonance

imaging (MRI) changes in patients with low back pain are frequently present but aren't always associated with a consistent set of clinical symptoms. The objective of this study was to discover hidden disc disorders and to evaluate and quantify the statistical significance of changes in several anatomical parameters of the lumbosacral spine from a recumbent to an upright posture in patients with acute and chronic low back pain. Using a 0.25-T tilting device, 57 individuals with low back pain (27 women and 30 men) underwent dynamic lumbosacral MRI (G-scan Esaote). The five parameters for which alterations were examined were the lumbosacral angle, lordosis angle, L3-L4 inter-somatic disc height, L3-L4 interspinous processes distance, and widest anteroposterior Dural sac width. Images were taken in both upright and recumbent positions. According to a one-way analysis of variance (ANOVA), $p = 0.0043$, there were statistically significant differences between each pair of parameter values that were obtained in the recumbent and upright positions. Based only on visual qualitative analysis, an increase in disc protrusions and/or spondylolisthesis was seen in 70% of patients in the upright position; in three cases, an interarticular pseudocyst was identified in the upright position. A realistic and promising method for examining degenerative diseases of the spine is dynamic MRI employing a low-field tilting MRI device with an open architecture. Furthermore, tilting MRI enables the detection of hidden spine and disc disorders in individuals with acute or chronic low back pain who have a negative MRI in the recumbent position or who only experience difficulty in the upright position [44].

Allen. Last et al (2009) According to a study, chronic low back pain is a common concern in primary care. Based on their medical history and physical examination, patients should be categorized as having (1) generic low back pain, (2) back pain related to a radiculopathy or spinal stenosis, (3) back pain referred from a non-spinal source, or (4) back pain related to another specific spinal cause. In order to diagnose and treat people with back pain brought on by radiculopathy, spinal stenosis, or another specific spinal reason, magnetic resonance imaging or computed tomography may be employed. Due to a lack of proof that it produces better results, lumbar spine radiography should be delayed in patients with nonspecific pain for at least one to two months. Acetaminophen and nonsteroidal anti-inflammatory drugs are the first-line therapy for chronic low back

pain. Tramadol, opioids, and other adjuvant therapies may be helpful for certain people who do not react to nonsteroidal anti-inflammatory drugs. Acupuncture, exercise therapy, multidisciplinary rehabilitation programs, massage, behavior therapy, and spinal manipulation are all helpful in some therapeutic contexts. Patients with radicular pains may benefit from epidural steroid injections, while studies have produced mixed outcomes. The majority of people with persistent low back pain won't benefit from surgery. A surgical assessment may be beneficial for certain people who have functional restrictions or persistent pain despite trying various nonsurgical treatments [45].

Flicker et al (2010) There are just a few methods for analyzing lumbar muscle activation patterns during exercise in persons with persistent low back pain. In this study, the lumbar muscle usage of five healthy volunteers, five chronic low back pain patients without surgery, and five chronic low back pain patients who received surgery was investigated using magnetic resonance imaging and the Roman chair extension exercise. Gradual training at three lumbar disc levels changed the signal intensities of the psoas, multifidus, and longissimus/iliocostalis. There was a difference in multifidus and longissimus/iliocostalis signal intensity at rest between chronic low back pain patients who did not have surgery ($P = 0.0162$) and chronic low back pain patients who had surgery ($P = 0.0036$), but not between these groups and healthy people. In all groups (normal volunteers, $P = 0.0069$; chronic low back pain patients without surgery, $P = 0.0125$; chronic low back pain patients with surgery, $P = 0.0060$), the multifidus and longissimus/iliocostalis displayed different signal intensities at maximum activity. The exercise response was diminished in people with surgically treated persistent low back pain. Compared to healthy controls, MRI of individuals with chronic low back pain indicates static and dynamic anomalies in the lumbar para spinal musculature [46].

Kader et al (2000) During magnetic resonance imaging (MRI) studies of the lumbar spine, changes in the para-spinal muscles are frequently disregarded. In this study, we aimed to investigate the relationships between lumbar multifidus (MF) muscle atrophy and low back pain (LBP), leg pain, and intervertebral disc degeneration. Retrospective research on 78 LBP patients who complained of back pain with or without accompanying leg discomfort was done (ages 17–72). Visual examination of their MR images indicated indications of disc degeneration, nerve root compression, and lumbar

MF muscle atrophy. Case notes and pain sketching charts were used to gather information on each patient's clinical history. There was evidence of MF muscle atrophy in 80% of LBP patients. The statistical significance of the association between MF muscle atrophy and leg soreness was demonstrated ($P < 0.01$). The statistical significance of the association between MF muscle atrophy and leg soreness was demonstrated ($P < 0.01$). The symptoms of radiculopathy, nerve root compression, herniated nucleus pulposus, and a number of degenerative discs were not statistically associated with muscular atrophy. Check for paraspinal muscle atrophy and look for MF muscle atrophy when analysing MR images of the lumbar spine. This could explain the referred leg soreness if there are no other MR anomalies [47].

Chou et al (2011) conducted a complete analysis to carefully examine and summarise studies that (2) compared surgical and non-surgical treatment options for these degenerative MRI changes and (3) looked at the relationship between degenerative MRI changes and chronic low back pain (CLBP). The benefit of routine MRI in people with CLBP is uncertain. It's also not apparent whether surgical treatment of MRI anomalies caused by degeneration relieves back pain. PubMed was used to conduct comprehensive literature searches for studies that were published up through March 1, 2011. Researchers searched for studies that evaluated the prevalence of MRI abnormalities in patients with and without CLBP to determine whether MRI degenerative alterations are related to CLBP. To assess the likelihood of degenerative MRI abnormalities in CLBP patients vs those without CLBP, the prevalence odds ratio was utilized. Comparative trials were conducted to investigate whether surgical treatment of degenerative MRI abnormalities results in different outcomes than nonsurgical therapies. The GRADE system reflects the overall strength of the evidence. Five studies were conducted to investigate the link between degenerative alterations on MRI and CLBP, with all having a cross-sectional design. All except one of these studies indicated a statistically significant link between disc degeneration and CLBP (odds ratio range: 1.8–2.8). The overall quality of evidence across studies was, however, deemed insufficient. There were no trials that compared surgical and nonsurgical treatments for degenerative MRI abnormalities. The quality of the included studies, the lack of a definitive correlation between degenerative MRI changes and CLBP, and study heterogeneity make it difficult

to determine whether these estimates accurately reflect the association, despite the possibility of a link. As a result, there is a strong recommendation against routinely using an MRI for CLBP testing. It is strongly advised against undertaking surgical therapy for CLBP based purely on degenerative MRI abnormalities because there is no data to demonstrate its efficacy [48].

CHAPTER 3

METHODOLOGY

3.1. Research Design: Descriptive cross-sectional study

3.2. Clinical Settings: Ghurki Trust and Teaching Hospital.

3.3. Sample Size: 245 patients will be included in this study [53].

$$n = z^2 p (1-p) / d^2$$

$$n = (1.96)^2 (0.2) (0.2) / (0.05)^2 = 245$$

n is the minimum sample size=245

z value of standard normal distribution=1.96

p expected or probability of previous similar=0.2

d max allowable deviation or error of the estimate=0.05

3.4. Sampling technique: Convenient sampling technique.

3.5. Duration of study: 6 months

3.6. Selection criteria

3.6.1. Inclusion Criteria

- Radiating or non-radiating pain to any limb
- History of back pain for more than three months

3.6.2. Exclusion Criteria

- Congenital spinal abnormality
- Patients with pacemaker implantation, cochlear implants, or any kind of magnetic susceptible object reside in or on the patient's body.

3.7. Equipment: HITACHI APERTO LUCENT Open MRI 0.4 Tesla

3.8. Scanning Technique: To prepare the patient, all magnetically susceptible items were taken off of their clothing or body. To keep them from becoming alarmed, they were told about the machine's sounds. Positioned between the L1 and L2 levels, the patient was asked to lie supine on the couch. A strap was employed to limit movement in situations including restlessness or uncooperative behavior. The most widely used MRI sequences were T1-weighted and T2-weighted images in the axial and sagittal

planes. Another sequence that was employed was the STIR procedure [55].

3.9. Ethical Consideration

The rules and regulations set by the ethical committee of Superior University Lahore were followed while conducting the research, and the rights of the research participants were respected.

- Written informed consent (attached) was taken from all the participants.
- All information and data collection were kept confidential.
- Participants remained anonymous throughout the study.
- The subjects were informed that there were no disadvantages or risks in the procedure of the study.
- They were also informed that they were free to withdraw at any time during the process of the study.
- We did everything we could to protect their privacy, and their identities were not revealed in any publication resulting from this study.

Participation in this research study was voluntary. Participants could choose not to participate and could withdraw their consent at any time. They were not penalized in any way if they decided not to participate or chose to withdraw from the study.

3.10. Data Collection Procedure

Firstly, informed consent was obtained from each patient, ensuring they were fully informed about the purpose and potential risks of the examination. Patients were instructed to change into a hospital gown and remove any jewelry or metal objects that could interfere with the MRI scan. Once ready, patients were positioned comfortably on the MRI scanner table in a supine position, with their heads securely placed within a specialized lumbar spine coil designed to optimize signal reception and spatial resolution specifically for the lumbar region. Throughout the procedure, patients were closely monitored by the MRI technologist to ensure their comfort and safety. Clear instructions were provided to patients regarding the importance of remaining still during the scan to obtain accurate imaging results. The imaging protocol typically included a combination of T1-weighted, T2-weighted, and sometimes STIR or fat-suppressed sequences. Demographic details, clinical history, and MRI findings were meticulously collected from patients' medical records. A team of seasoned radiologists rigorously

evaluated MRI images, adhering to predefined diagnostic criteria, to discern the presence and severity of lumbar degenerative disease. Data were stored using Excel

3.11. Data Analysis

The data collected from the Radiology Department of Ghurki Trust and Teaching Hospital, Lahore, was evaluated and analyzed using Statistical Package for the Social Sciences (SPSS) version 25 and Microsoft Excel 2016. A detailed descriptive analysis was performed to investigate the distribution, frequency, percentage, and diagnostic accuracy of variables derived from MRI scans. The data was securely stored in Microsoft Office, facilitating organized management and retrieval for subsequent analyses. A comprehensive list of dependent and independent variables was generated to structure the analytical approach.

Statistical analyses, such as the Chi-Square Test, were employed to assess relationships between MRI parameters and clinical symptoms exhibited by patients. This statistical method helped in understanding how specific MRI findings correlated with the presence or severity of clinical symptoms. Furthermore, t-tests or ANOVA were utilized to compare variables across different patient groups, categorized by the severity of their condition or treatment outcomes. These comparative analyses aimed to highlight significant differences or similarities in MRI findings among patient subsets, thereby contributing to the understanding of disease progression and treatment effectiveness.

CHAPTER 4

RESULTS

To assess the lumbar spine on MRI, 245 individuals with a variety of presenting complaints chronic back pain being the most prevalent were examined. 116 (47.3%) of the 245 patients were female, and 129 (52.7%) were male. After data analysis using SPSS, frequency statistics were calculated. Regarding Subjects that were included in the study, all had complaints of pain for a minimum of three months with a characteristic of radiating pain in 206 (84.1%) patients. Patients who suffered from numbness along with pain were 141 (57.6%) and those who had normal bowel/bladder control were 208 (84.9%). Other risk factors like trauma and weightlifting were also included. There were 30 (12.2%) patients with a history of trauma and weight lifting caused pain in 30(12.2%) patients. Regarding MRI findings disc degeneration was seen in 204 (83.3%) patients. Regarding pathological involvement of lumbar discs, it was seen that LV1-LV2 disc level was affected in 21 (8.6%) patients, LV2-LV3 disc in 39 (15.9%) patients, LV3-LV4 disc in 93 (38.0%) patients, LV4-LV5 disc in 207 (84.5%) patients, and LV5-S1 disc in 157 (64.1%) patients.

Regarding the comparison between risk factors responsible for specific spinal pathology radiating pain is caused by disc degeneration in 173 (70.6%) patients. 119 patients (81.2%) of disc degeneration, had complaints of numbness in either leg or both legs. While weight lifting was the cause of disc degeneration in 24 patients (9.7%). Moreover, trauma caused disc degeneration in 26 patients (10.6%). Regarding the comparison relation between lumbar vertebral disc levels responsible for disc degeneration at LV1-LV2 level disc degeneration was seen in 21 (8.5%) patients. At LV2-LV3 level disc degeneration was seen in 39 (15.9%) patients. At LV3-LV4 level disc degeneration was seen in 88 (35.9%) patients. At LV4-LV5 level disc degeneration was seen in 182 (74.2%) patients. At LV5-S1 level disc degeneration was seen in 139 (56.7%) patients.

Table 4.1: Shows the gender frequency for a total of 245 patients.

Gender	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Female	115	46.9	46.9	46.9
Male	130	53.1	53.1	100.0
Total	245	100.0	100.0	100.0

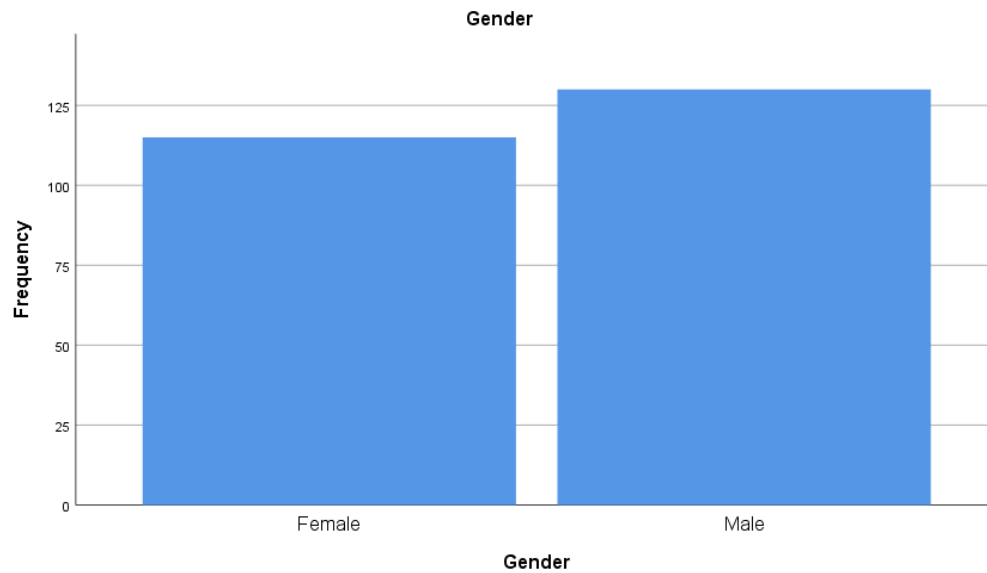


Figure 4.1: This bar chart displays the gender breakdown of a sample population, which includes 115 females and 130 males. Males have slightly higher frequencies than females.

Table 4.2: Shows the disc degeneration frequency for a total of 245 patients.

Disc Degeneration	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
No	41	16.7	16.7	16.7
Yes	204	83.3	83.3	100.0
Total	245	100.0	100.0	100.0

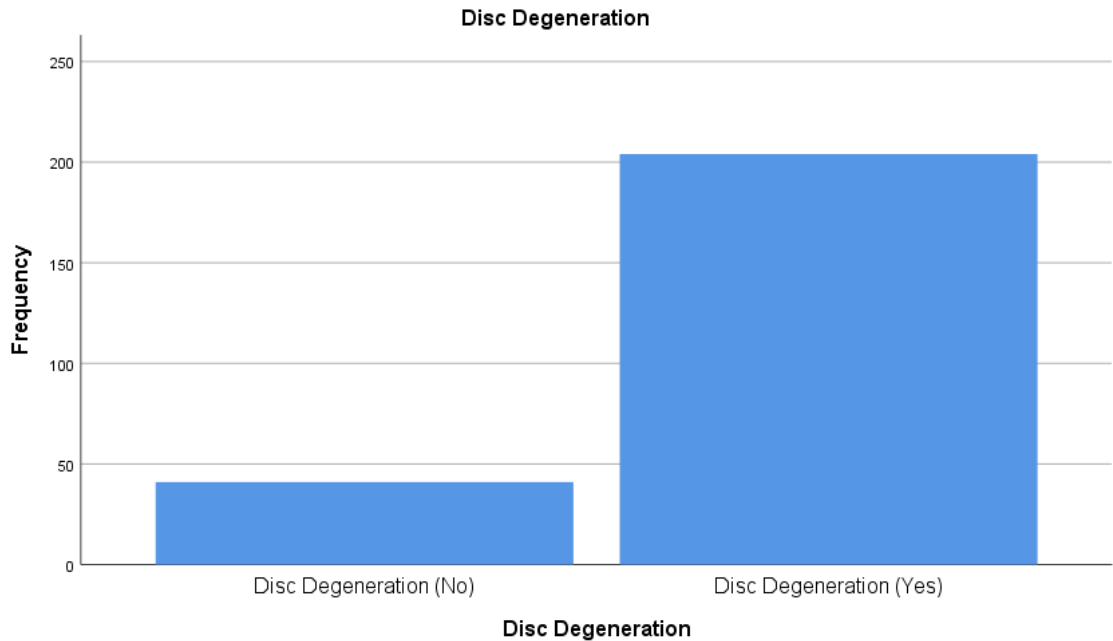


Figure 4.2: This bar chart indicates the occurrence of disc degeneration (Yes), in 204 people (83.3%) and disc degeneration (No) in 41 people (16.7%). The majority of people are impacted by disc degeneration.

Table 4.3: Shows the radiating/non-radiating pain frequency for a total of 245 patients.

Radiating/Non-Radiating Pain	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
No	39	15.9	15.9	15.9
Yes	206	84.1	84.1	100.0
Total	245	100.0	100.0	100.0

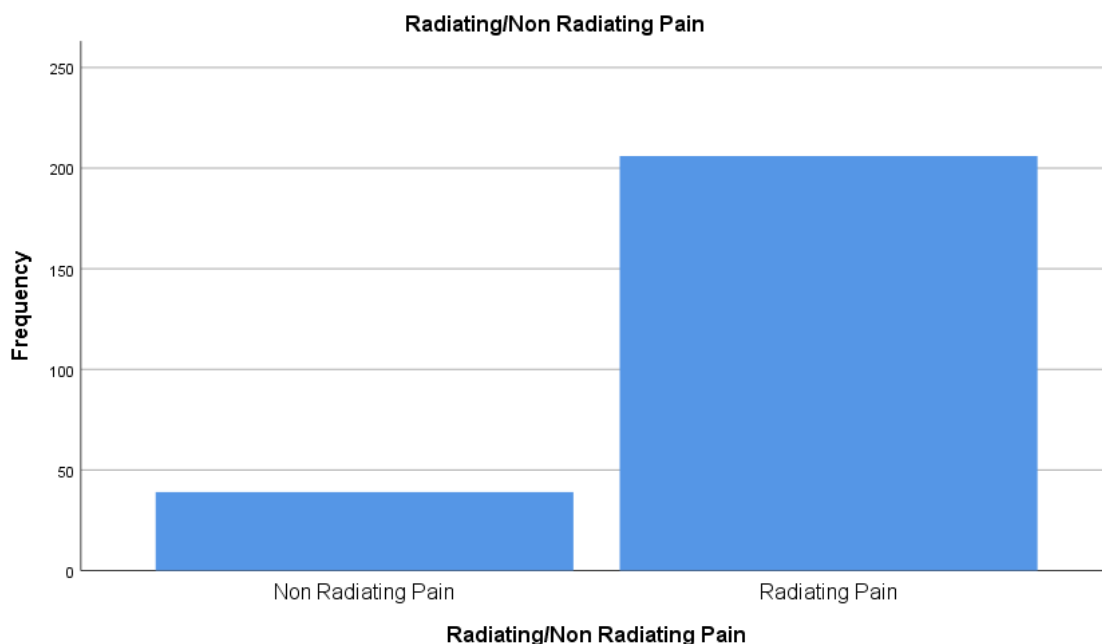


Figure 4.3: With 206 people (84.1%) reporting radiating pain and 39 people (15.9%) not reporting it, this bar graph shows the prevalence of radiating and non-radiating pain. Radiating pain is experienced by most people.

Table 4.4: Shows the bowl and bladder control frequency for a total of 245 patients.

Bowl and Bladder Control	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
No	37	15.1	15.1	15.1
Yes	208	84.9	84.9	100.0
Total	245	100.0	100.0	100.0

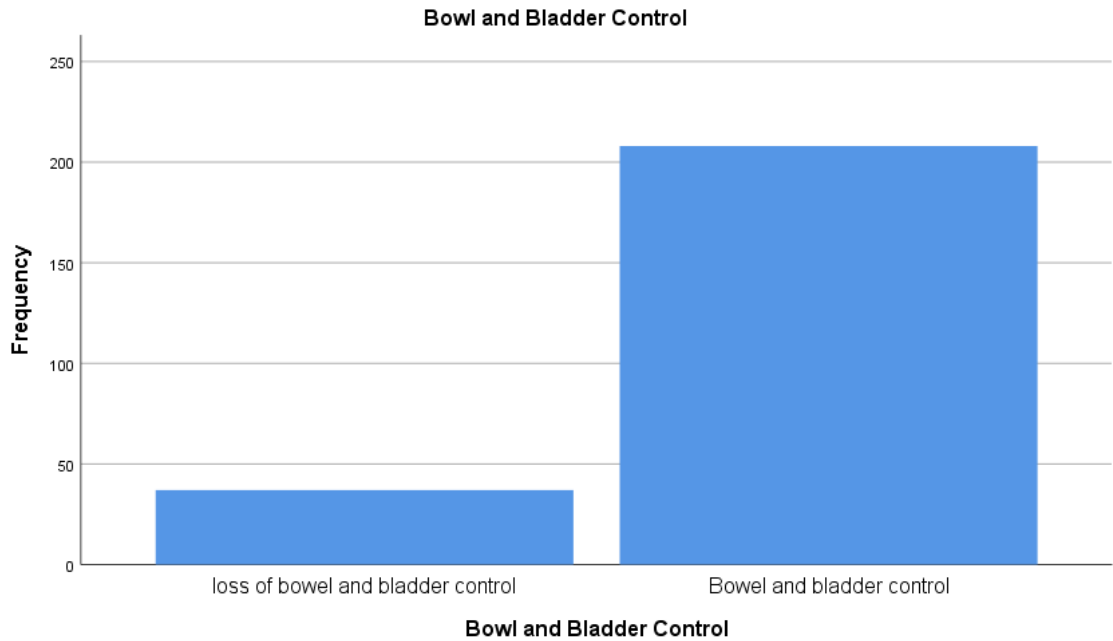


Figure 4.4: The "Bowl and Bladder Control" bar graph depicts the frequency. The bowl and bladder control category has a substantially higher frequency (about 200) than loss bowl and bladder control (less than 50).

Table 4.5: Shows the numbness frequency for a total of 245 patients.

Numbness	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
No	104	42.4	42.4	42.4
Yes	141	57.6	57.6	100.0
Total	245	100.0	100.0	100.0

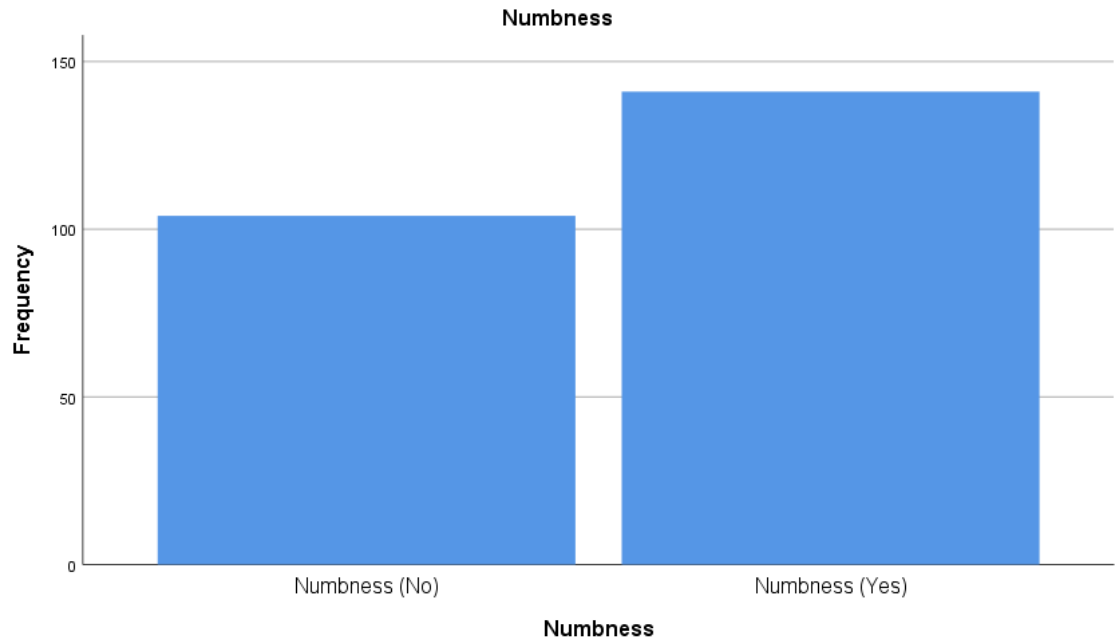


Figure 4.5: The bar chart shows the frequency of numbing responses, with numbness (Yes) having a greater count (about 150) than numbness (No) (approx. 110). This shows that more people reported feeling numb than those who didn't.

Table 4.6: Shows the history of trauma frequency for a total of 245 patients.

H/O Trauma	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
No	215	87.8	87.8	87.8
Yes	30	12.2	12.2	100.0
Total	245	100.0	100.0	100.0

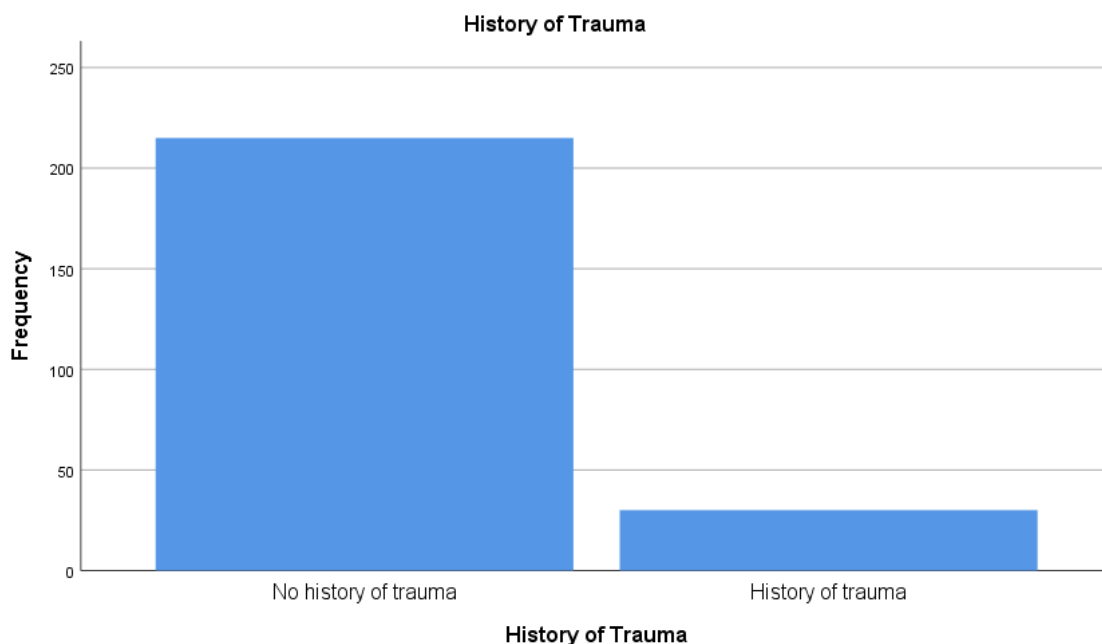


Figure 4.6: It shows the distribution for "History of Trauma." With a frequency of over 200, the no history of trauma category is in the lead, whereas the history of trauma group has a count of less than 50.

Table 4.7: Shows the weight lifting frequency for a total of 245 patients.

Weight Lifting	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
No	215	87.8	87.8	87.8
Yes	30	12.2	12.2	100.0
Total	245	100.0	100.0	100.0

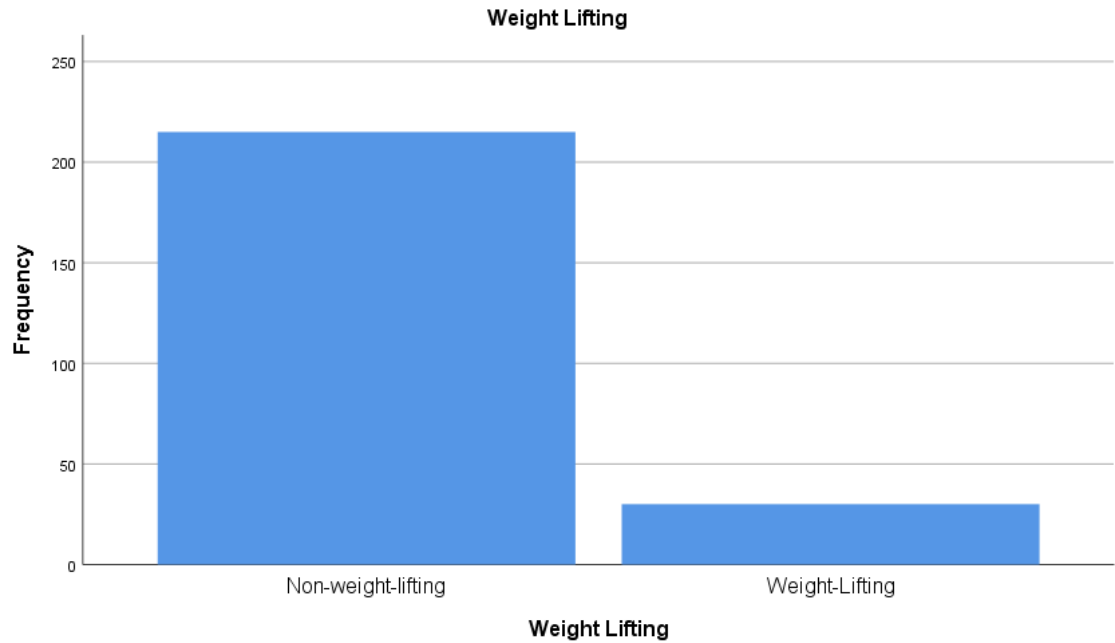


Figure 4.7: The bar chart depicts the frequency of weight lifting, with fewer persons lifting weights than those who do. Non-weightlifting has a frequency greater than 200, whereas the weightlifting category is less than 50.

Table 4.8: Shows the L1-L2 vertebral level frequency for a total of 245 patients.

L1 – L2	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Absence of L1 - L2	224	91.4	91.4	91.4
Presence of L1 - L2	21	8.6	8.6	100.0
Total	245	100.0	100.0	100.0

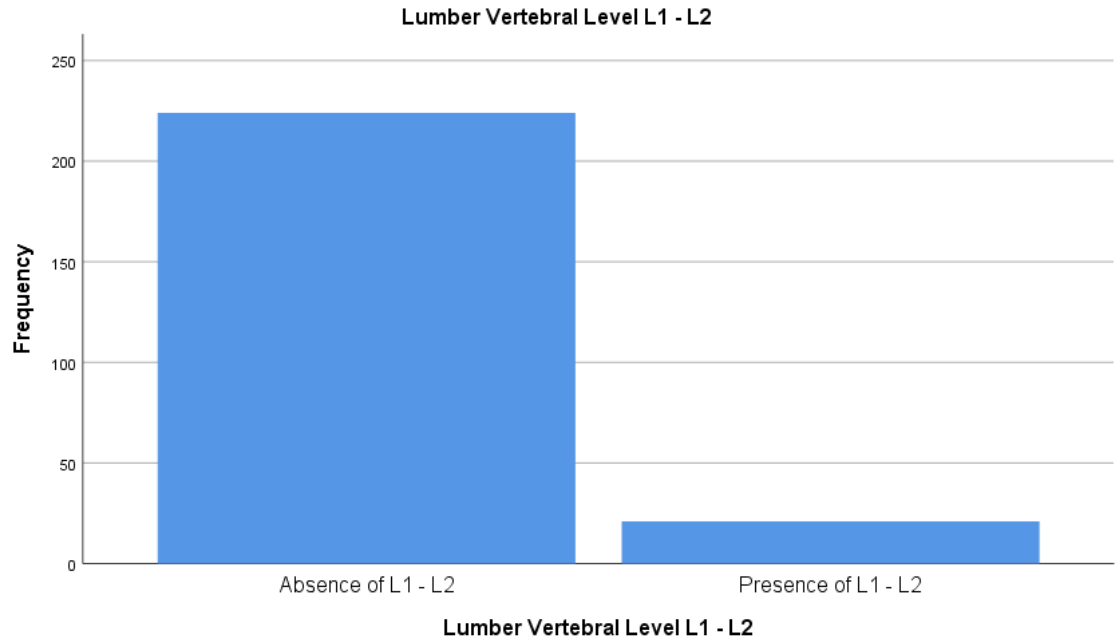


Figure 4.8: The bar chart depicts the frequency distribution for the "L1_L2" category, with the Absence of L1 – L2 having a substantially higher count (over 200), and the Presence of L1 – L2 having a much lower frequency (less than 50). This suggests that the majority of people answer "No".

Table 4.9: Shows the L2-L3 vertebral level frequency for a total of 245 patients.

L2 – L3	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Absence of L2 – L3	206	84.1	84.1	84.1
Presence of L2 – L3	39	15.9	15.9	100.0
Total	245	100.0	100.0	100.0

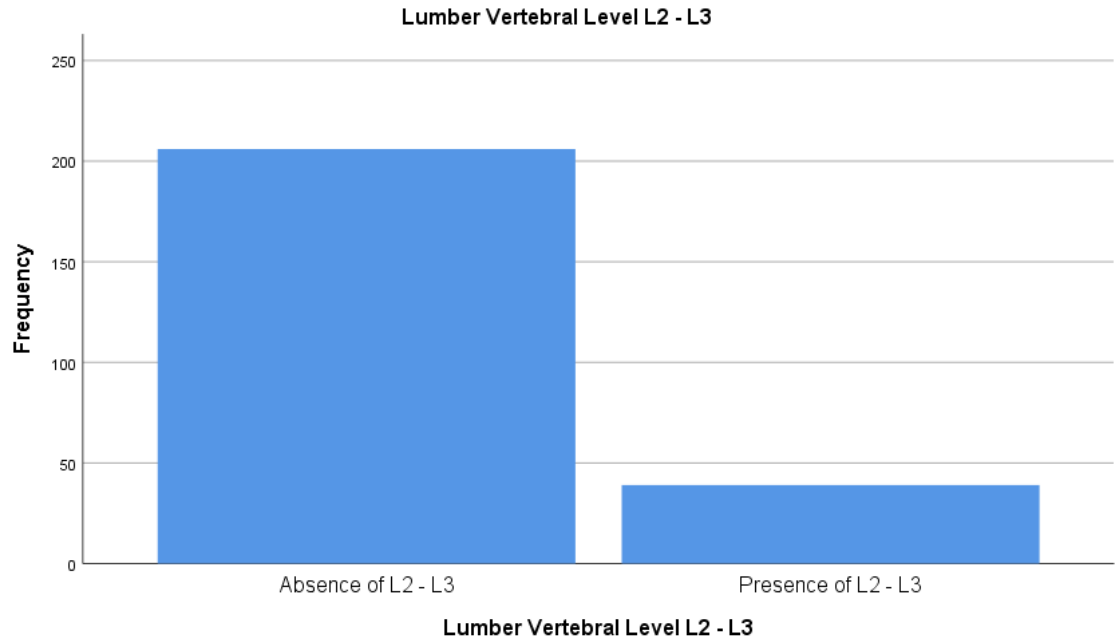


Figure 4.9: The bar chart displays the frequency of L2_L3 responses, with the Absence of L2 – L3 having a significantly higher count (about 210) than the Presence of L2 – L3 (around 40). This implies that the majority of people did not disclose L2_L3 involvement.

Table 4.10: Shows the L3-L4 vertebral level frequency for a total of 245 patients.

L3 – L4	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Absence of L3 – L4	152	62.0	62.0	62.0
Presence of L3 – L4	93	38.0	38.0	100.0
Total	245	100.0	100.0	100.0

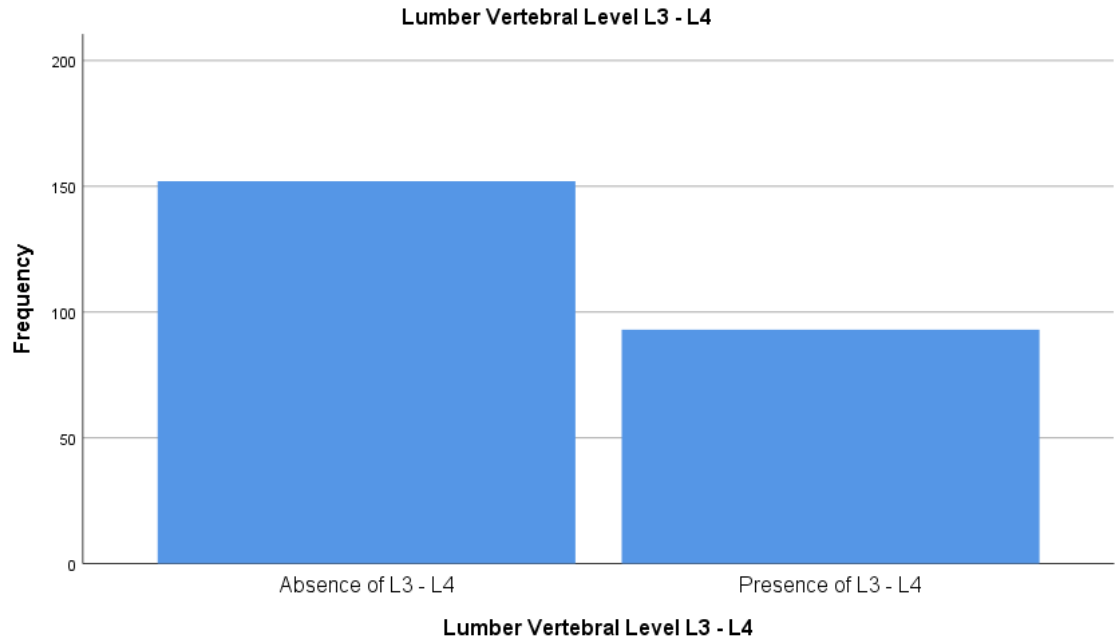


Figure 4.10: The bar chart shows the frequency of L3-L4 responses, with the Absence of L3 – L4 having a count of around 150 and the presence of L3 – L4 having a count of about 90. This means that fewer people reported L3-L4 engagement than those who did.

Table4.11: Shows the L4-L5 vertebral level frequency for a total of 245 patients.

L4 – L5	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Absence of L4 – L5	38	15.5	15.5	15.5
Presence of L4 – L5	207	84.5	84.5	100.0
Total	245	100.0	100.0	100.0

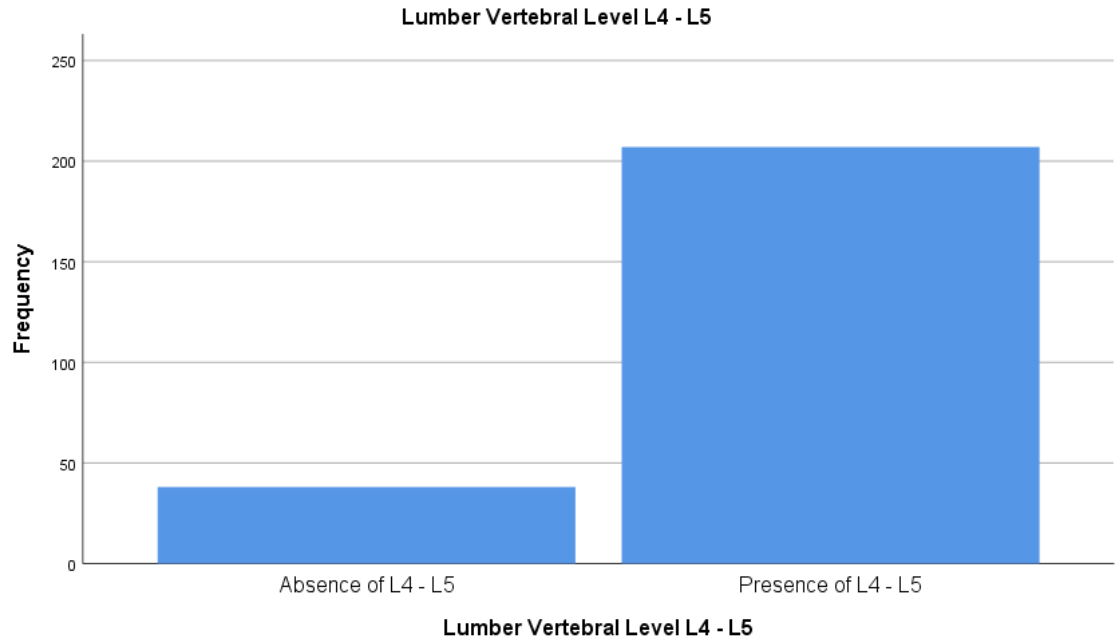


Figure 4.11: This bar graph illustrates how frequently responses were given to the variable "L4_L5." Compared to the Absence of L4 – L5, which has a count of less than 50, the Presence of L4 – L5 has a substantially greater count (over 200).

Table 4.12: Shows the L5-S1 vertebral level frequency for a total of 245 patients.

L5 – S1	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Absence of L5 – S1	88	35.9	35.9	35.9
Presence of L5 – S1	157	64.1	64.1	100.0
Total	245	100.0	100.0	100.0

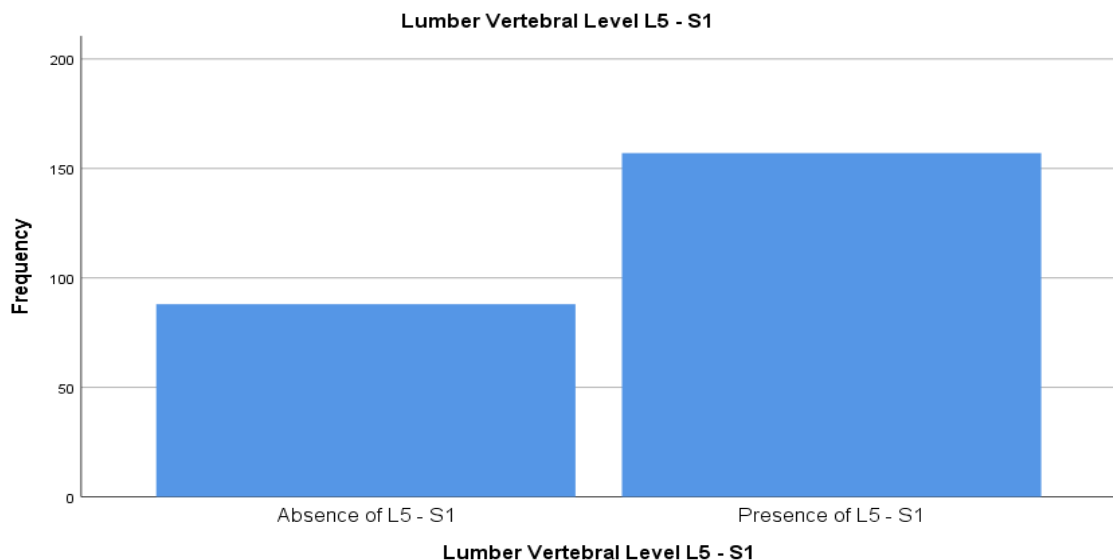


Figure 4.12: This bar graph shows the frequency distribution of "L5_S1." The Absence of L5 – S1 has a count of about 100, whereas the Presence of L5 – S1 has a count of about 150.

Table 4.13: Shows the relationship between disc degeneration and radiating/non-radiating pain in a sample of 245 patients, along with their relative percentages.

Disc Degeneration	Radiating/ Non-Radiating Pain	Count	% within disc degeneration	% within Radiating/ Non-Radiating Pain	% of Total
No	No	7	17.1%	17.9%	2.9%
	Yes	34	82.9%	16.5%	13.9%
Total (No)		41	100.0%		16.7%
Yes	No	32	15.7%	82.1%	13.1%
	Yes	172	84.3%	83.5%	70.2%
Total (Yes)		204	100.0%		83.3%

Total	No	39	15.9%	100.0%	15.9%
	Yes	206	84.1%	100.0%	84.1%
Grand Total		245	100.0%	100.0%	100.0%

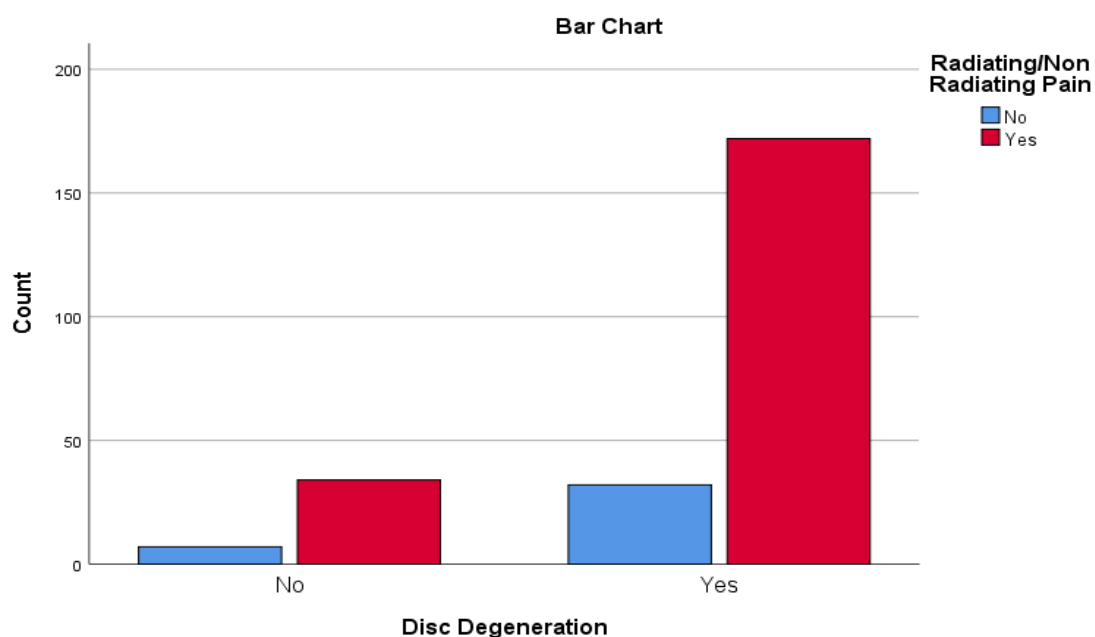


Figure 4.13: This bar graph compares "Disc Degeneration" and "Radiating/Non-Radiating Pain." The "Yes" category for disc degeneration and radiating pain has the largest count (about 150), whereas other combinations had smaller counts, with "No" for both being minimum.

Table 4.14: Shows the relationship between disc degeneration and Bowl and bladder control in a sample of 245 patients, along with their relative percentages.

Disc Degeneration	Bowl and Bladder Control	Count	%within Disc Degeneration	% Bowl and Bladder Control	% of Total
No	No	3	7.3%	8.1%	1.2%
	Yes	38	92.7%	18.3%	15.5%
Total (No)			100.0%	16.7%	16.7%

Yes	No	34	16.7%	91.9%	13.9%
	Yes	170	83.3%	81.7%	69.4%
Total (Yes)			100.0%	83.3	83.3%
Total	No	37	15.1%	100.0%	15.1%
	Yes	208	84.9%	100.0%	84.9%
Grand Total		245	100.0%	100.0%	100.0%

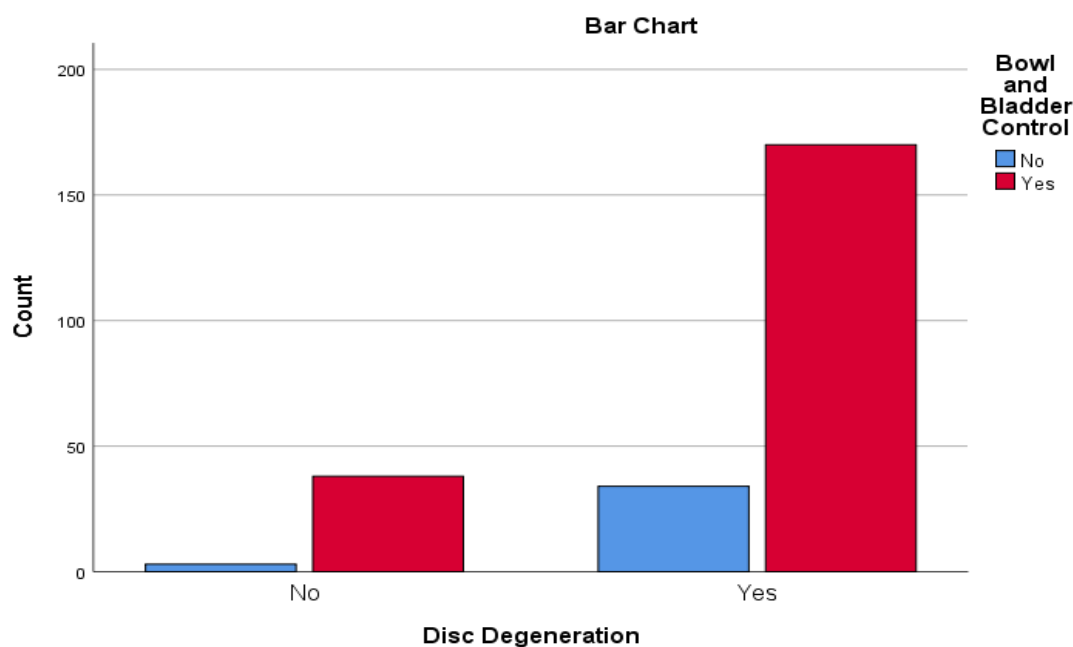


Figure 4.14: This bar chart shows that people who have "Disc Degeneration" and "Yes" for "Bowel and Bladder Control" have the highest count (about 150). Other categories, including "No" in each category, had substantially lower counts, with "No" having the smallest count in both.

Table 4.15: Shows the relationship between disc degeneration and numbness pain in a sample of 245 patients, along with their relative percentages.

Disc Degeneration	Numbness	Count	% within Disc Degeneration	% Numbness	% of Total
No	No	19	46.3%	18.3%	7.8%
	Yes	22	53.7%	15.6%	9.0%

Total (No)			100.0%	16.7%	16.7%
Yes	No	85	41.7%	81.7%	34.7%
	Yes	119	58.3%	84.4%	48.6%
Total (Yes)			100.0%	83.3%	83.3%
Total	No	104	42.4%	57.6%	42.4%
	Yes	141	100.0%	100.0%	57.6%
Grand Total		245	100.0%	100.0%	100.0%

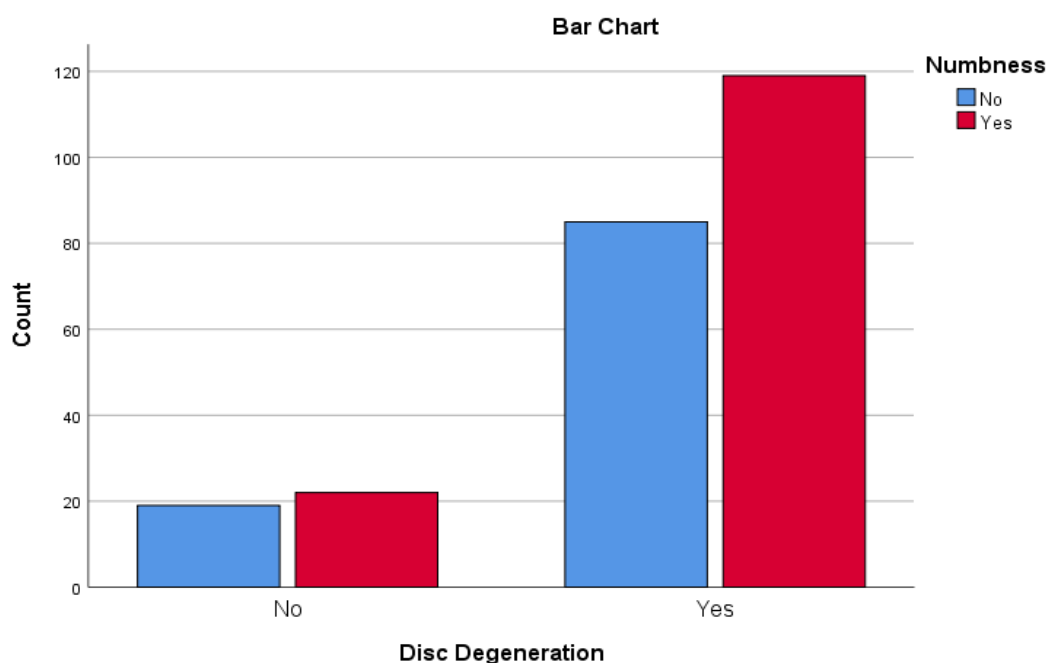


Figure 4.15: This bar graph shows the relationship between "Disc Degeneration" and "Numbness." Approximately 120 is the highest count for those who have disc degeneration ("Yes") and numbness ("Yes"). "No" has the lowest count for both categories, and its counts are much lower in both.

Table 4.16: Shows the relationship between disc degeneration and history of trauma in a sample of 245 patients, along with their relative percentages.

Disc Degeneration	H/O Trauma	Count	% within Disc Degeneration	% H/O Trauma	% of Total
No	No	37	90.2%	17.2%	15.1%

	Yes	4	9.8%	13.3%	1.6%
Total (No)		41	100.0%	16.7%	16.7%
Yes	No	178	87.3%	12.7%	72.7%
	Yes	26	82.8%	86.7%	10.6%
Total (Yes)			100.0%	83.3%	83.3%
Total	No	215	87.8%	12.2%	87.8%
	Yes	30	100.0%	100.0%	12.2%
Grand Total		245	100.0%	100.0%	100.0%

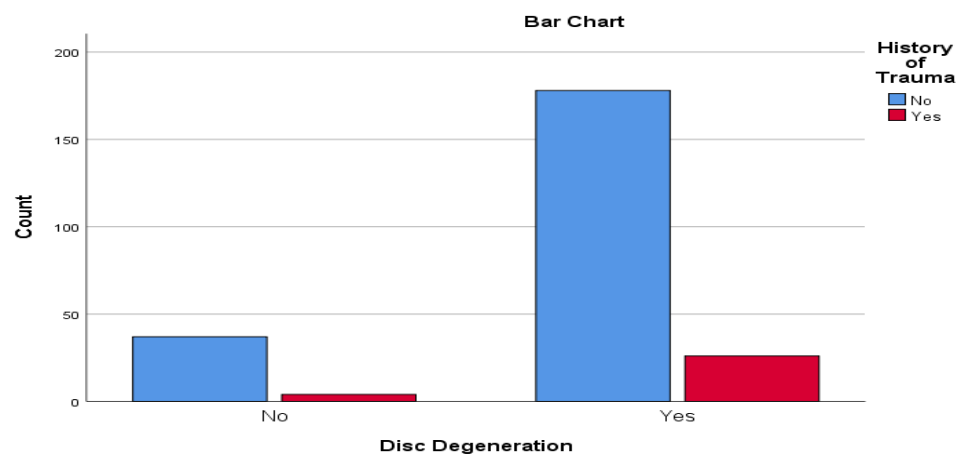


Figure 4.16: This bar chart shows the association between "Disc Degeneration" and "History of Trauma." Individuals with disc degeneration ("Yes") and no history of trauma ("No") have the greatest count (more than 200), while the other combinations have much lower numbers.

Table 4.17: Shows the relationship between disc degeneration and weight lifting in a sample of 245 patients, along with their relative percentages.

Disc Degeneration	Weight Lifting	Count	% within Disc Degeneration	% Weight Lifting	% of Total
No	No	35	85.4%	16.3%	14.3%
	Yes	6	14.6%	20.0%	2.4%

Total (No)		41	100.0%	16.7%	16.7%
Yes	No	180	88.2%	83.7%	73.5%
	Yes	24	11.8%	80.0%	9.8%
Total (Yes)		204	100.0%	83.3%	83.3%
Total	No	215	87.8%	100.0%	87.8%
	Yes	30	12.2%	100.0%	12.2%
Grand Total		245	100.0%	100.0%	100.0%

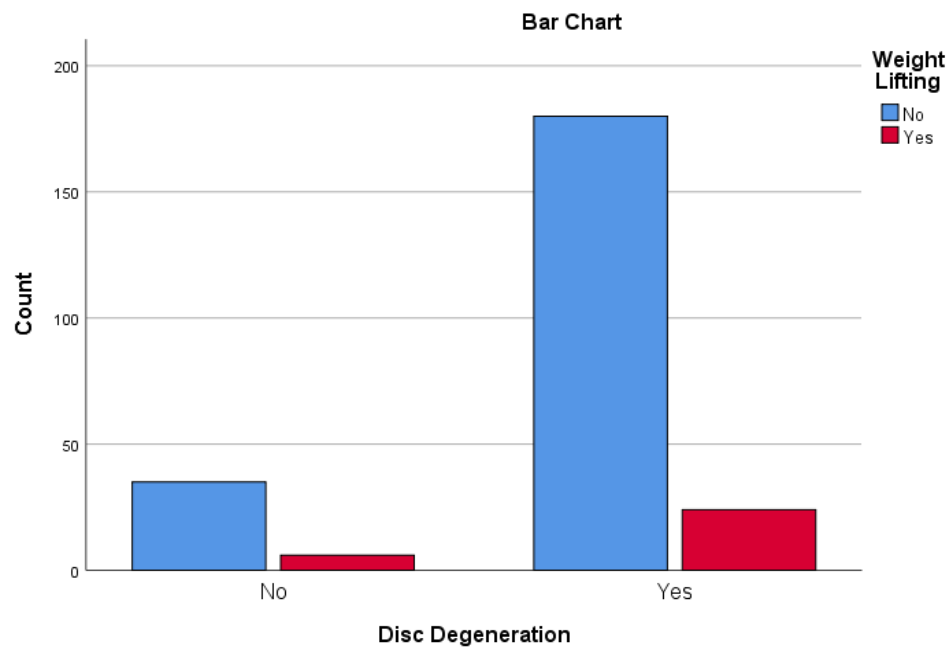


Figure 4.17: This bar graph displays the relationship between "Disc Degeneration" and "Weight Lifting." A lower percentage of those with disc degeneration ("Yes") have a history of lifting weights, whereas the majority of those with disc degeneration ("No") have no such history.

Table 4.18: Shows the relationship between disc degeneration and L1-L2 vertebral level in a sample of 245 patients, as well as their relative percentages.

Disc Degeneration	L1_L2: No	L1_L2: Yes	Total
No			
Count	41	0	41
% within Disc Degeneration	100.0%	0.0%	100.0%
% within L1_L2	18.3%	0.0%	16.7%
% of Total	16.7%	0.0%	16.7%
Yes			
Count	183a	21b	204
% within Disc Degeneration	89.7%	10.3%	100.0%
% within L1_L2	81.7%	100.0%	83.3%
% of Total	74.7%	8.6%	83.3%
Total			
Count	224	21	245
% within Disc Degeneration	91.4%	8.6%	100.0%
% within L1_L2	100.0%	100.0%	100.0%
% of Total	91.4%	8.6%	100.0%

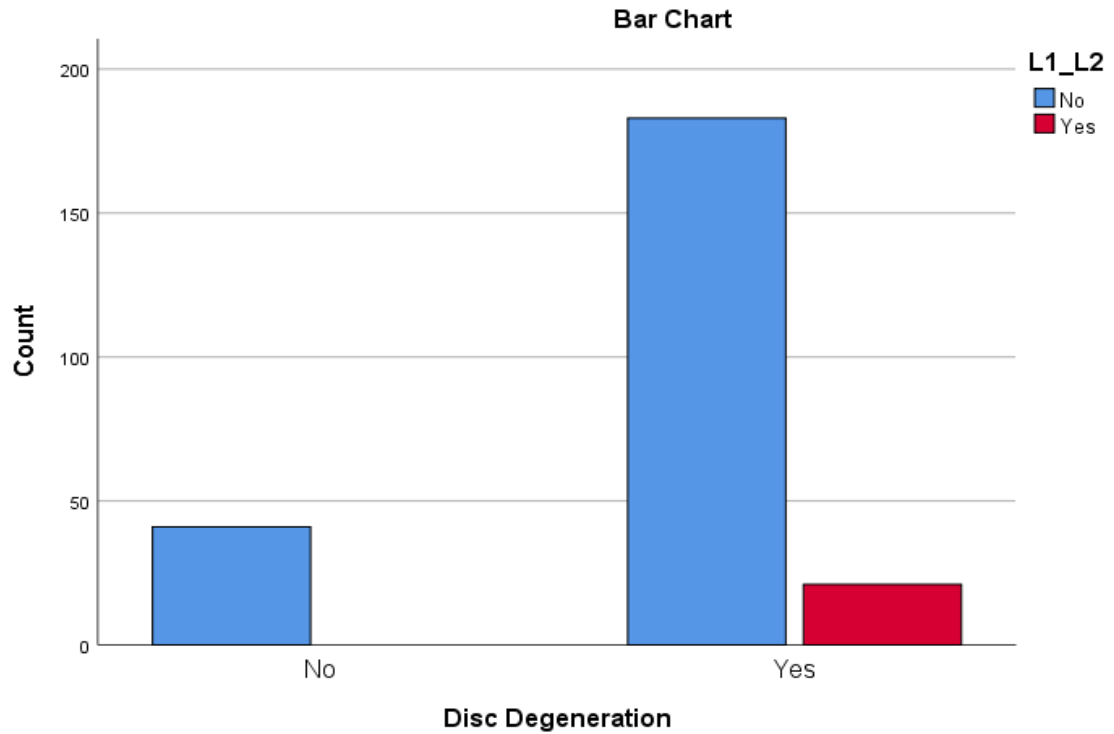


Figure 4.18: The association between "Disc Degeneration" and the existence of "L1_L2" problems is seen in this bar chart. Only a tiny percentage of people with disc degeneration ("Yes") exhibit L1_L2 problems, while the majority do not ("No").

Table 4.19: Shows the relationship between disc degeneration and L2-L3 vertebral level in a sample of 245 patients, as well as their relative percentages.

Disc Degeneration	L2_L3: No	L2_L3: Yes	Total
No			
Count	41	0	41
% within Disc Degeneration	100.0%	0.0%	100.0%
% within L2_L3	19.9%	0.0%	16.7%
% of Total	16.7%	0.0%	16.7%
Yes			
Count	165a	39b	204
% within Disc Degeneration	80.9%	19.1%	100.0%
% within L2_L3	80.1%	100.0%	83.3%

% of Total	67.3%	15.9%	83.3%
Total			
Count	206	39	245
% within Disc Degeneration	84.1%	15.9%	100.0%
% within L2_L3	100.0%	100.0%	100.0%
% of Total	84.1%	15.9%	100.0%

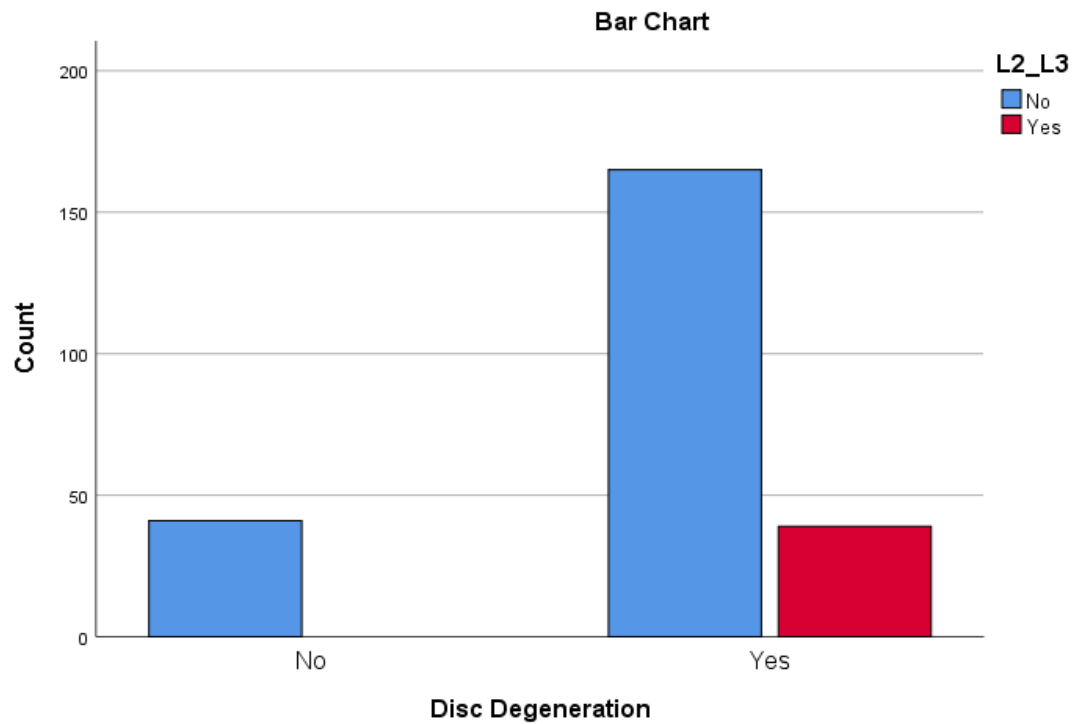


Figure 4.19: This bar chart depicts the link between "Disc Degeneration" and "L2_L3" problems. The majority of people who have disc degeneration ("Yes") do not have L2_L3 difficulties ("No"), but a smaller proportion do.

Table 4.20: Shows the relationship between disc degeneration and L3-L4 vertebral level in a sample of 245 patients, as well as their relative percentages.

Disc Degeneration	L3_L4: No	L3_L4: Yes	Total
No			
Count:	36	5	41
% within Disc Degeneration:	87.8%	12.2%	100.0%

% within L3_L4:	23.7%	5.4%	16.7%
% of Total:	14.7%	2.0%	16.7%
Yes			
Count:	116	88	204
% within Disc Degeneration:	56.9%	43.1%	100.0%
% within L3_L4:	76.3%	94.6%	83.3%
% of Total:	47.3%	35.9%	83.3%
Total			
Count:	152	93	245
% within Disc Degeneration:	62.0%	38.0%	100.0%
% within L3_L4:	100.0%	100.0%	100.0%
% of Total:	62.0%	38.0%	100.0%

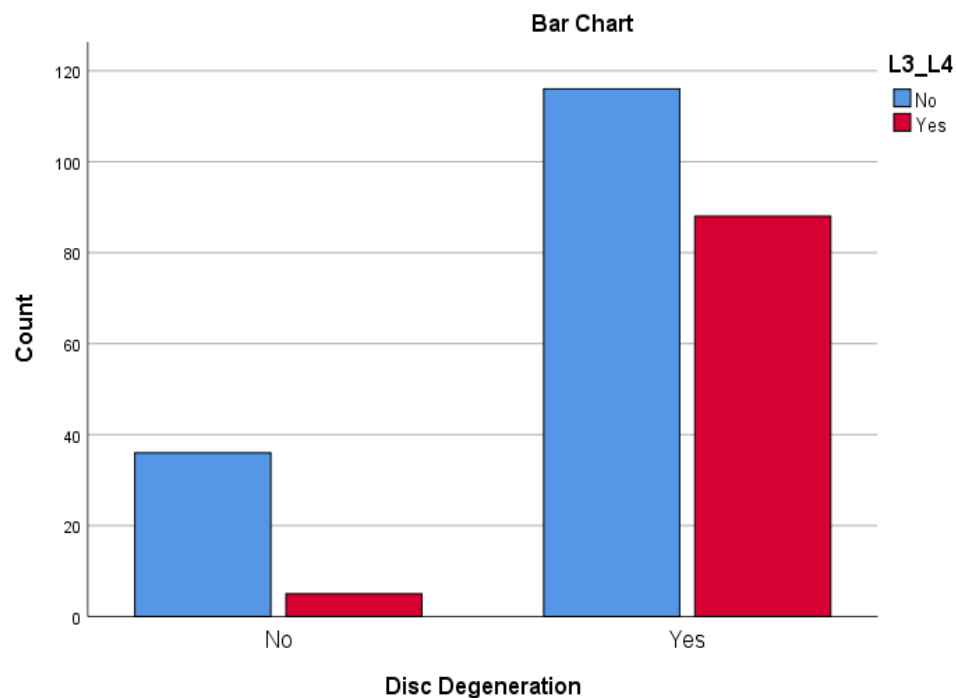


Figure 4.20: The association between "Disc Degeneration" and "L3_L4" difficulties is displayed in this bar chart. While people without disc degeneration ("No") mainly do not have L3_L4 problems, individuals with disc degeneration ("Yes") are more evenly distributed between having ("Yes") and not having ("No") L3_L4 problems.

Table 4.21: Shows the relationship between disc degeneration and L4-L5 vertebral level in a sample of 245 patients, as well as their relative percentages.

Disc Degeneration	L4_L5: No	L4_L5: Yes	Total
No			
Count:	16	25	41
% within Disc Degeneration:	39.0%	61.0%	100.0%
% within L4_L5:	42.1%	12.1%	16.7%
% of Total:	6.5%	10.2%	16.7%
Yes			
Count:	22	182	204
% within Disc Degeneration:	10.8%	89.2%	100.0%
% within L4_L5:	57.9%	87.9%	83.3%
% of Total:	9.0%	74.3%	83.3%
Total			
Count:	38	207	245
% within Disc Degeneration:	15.5%	84.5%	100.0%
% within L4_L5:	100.0%	100.0%	100.0%
% of Total:	15.5%	84.5%	100.0%

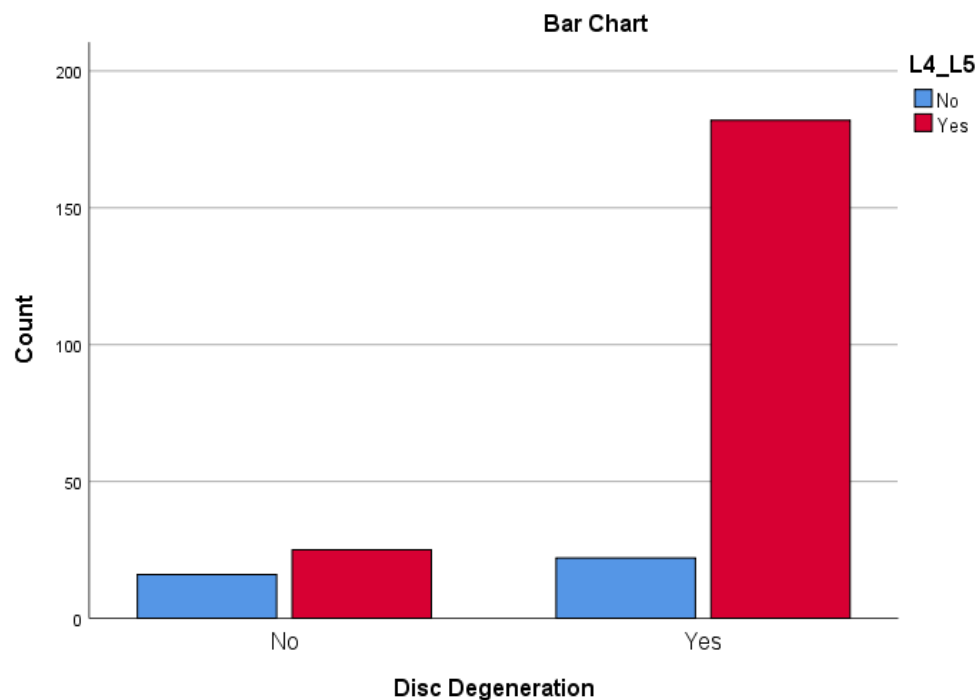


Figure 4.21: The "Disc Degeneration" and "L4_L5" problems are strongly correlated, as this bar chart illustrates. Most people who have disc degeneration ("Yes") have "L4_L5" problems, but people without degeneration are split equally between "Yes" and "No."

Table 4.22: Shows the relationship between disc degeneration and L-5-S1 vertebral level in a sample of 245 patients, as well as their relative percentages.

Disc Degeneration	L5_S1: No	L5_S1: Yes	Total
No			
Count:	23	18	41
% within Disc Degeneration:	56.1%	43.9%	100.0%
% within L5_S1:	26.1%	11.5%	16.7%
% of Total:	9.4%	7.3%	16.7%
Yes			
Count:	65	139	204
% within Disc Degeneration:	31.9%	68.1%	100.0%

% within L5_S1:	73.9%	88.5%	83.3%
% of Total:	26.5%	56.7%	83.3%
Total			
Count:	88	157	245
% within Disc Degeneration:	35.9%	64.1%	100.0%
% within L5_S1:	100.0%	100.0%	100.0%
% of Total:	35.9%	64.1%	100.0%

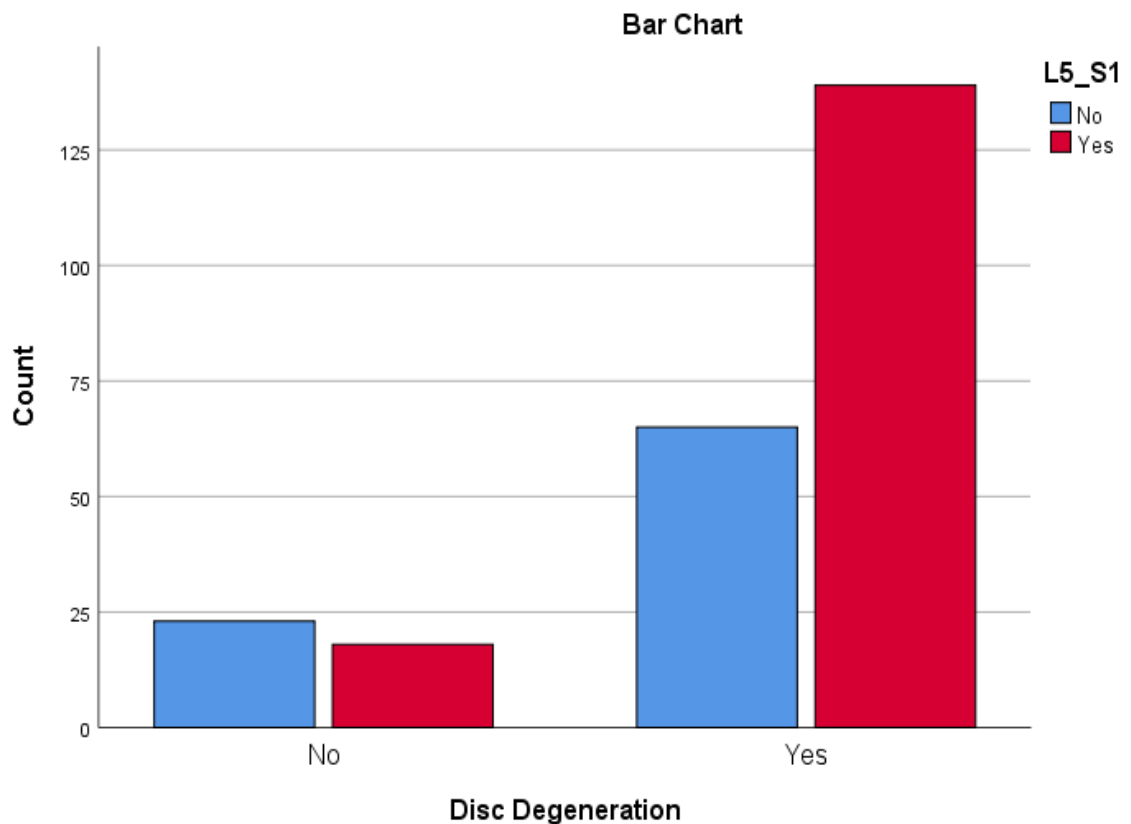


Figure 4.22: The graph indicates that the majority of people with disc degeneration are linked to "L5_S1: Yes," whereas people without degeneration are equally divided between "L5_S1: No" and "Yes," however they are less common overall.

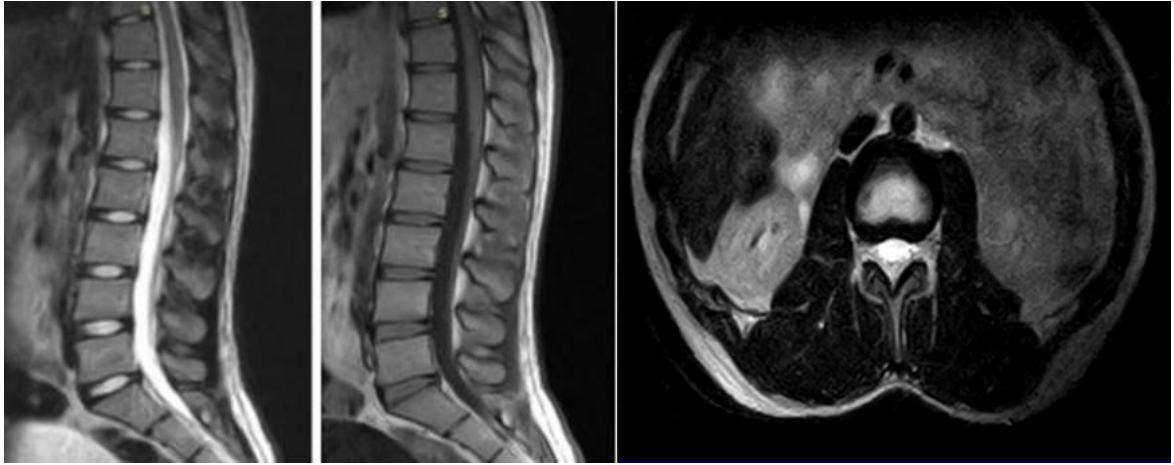


Figure 4.23: T2, T1 sagittal, and T2 axial weighted MRI images. Normal capacious MRI examination of lumbosacral spine



Figure 4.24: T2, T1 sagittal, and STIR weighted MRI images: Degenerative changes are noted posteriorly in adjacent end plates and facet joints at the L5-S1 level.



Figure 4.25: T2, T1 sagittal, and T2 axial weighted MRI images: Degenerative changes are noted posteriorly in adjacent end plates and facet joints in the whole of the visualized spine, especially at the L4-L5 level.

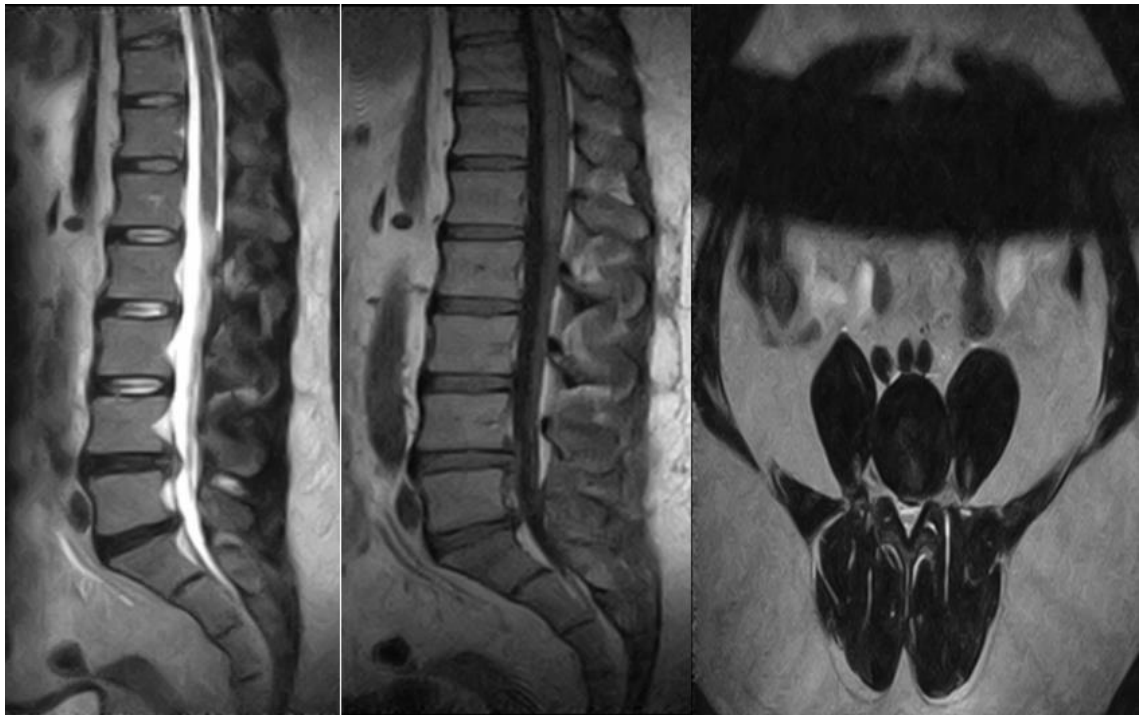


Figure 4.26: T2, T1 sagittal, and T2 axial weighted MRI images: Degenerative changes are noted posteriorly in adjacent end plates and facet joints at the L4-L5 and L5-S1 levels.

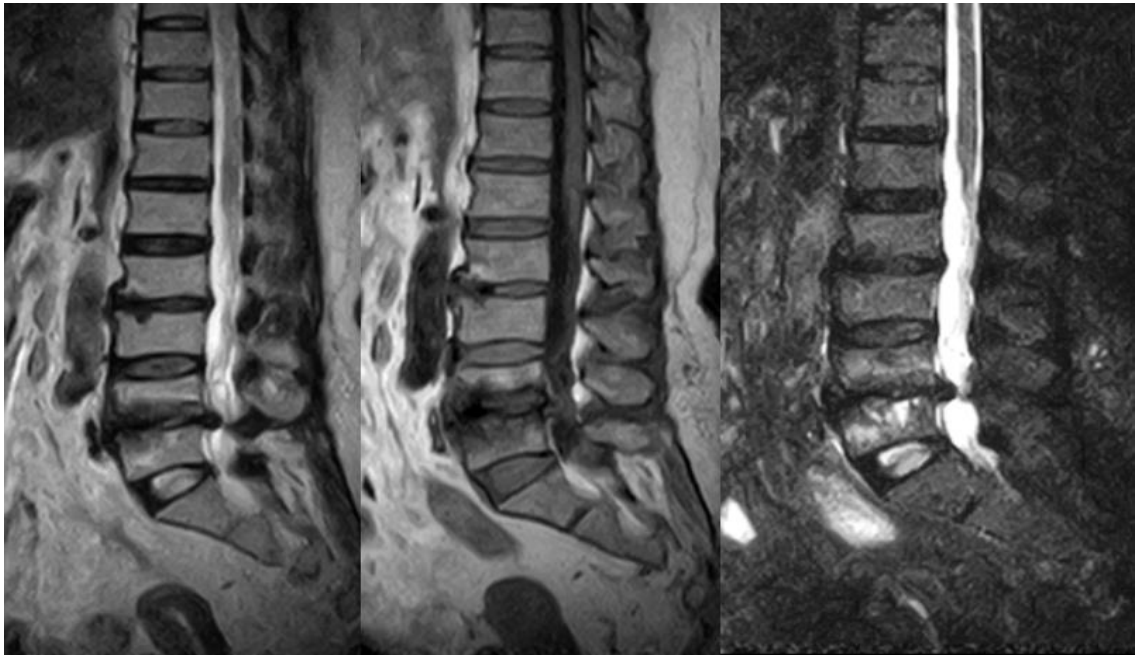


Figure 4.27: T2, T1 sagittal and STIR weighted MRI images: Degenerative changes are noted posteriorly in adjacent end plates and facet joints at the L2-L3 and L4-L5 levels.

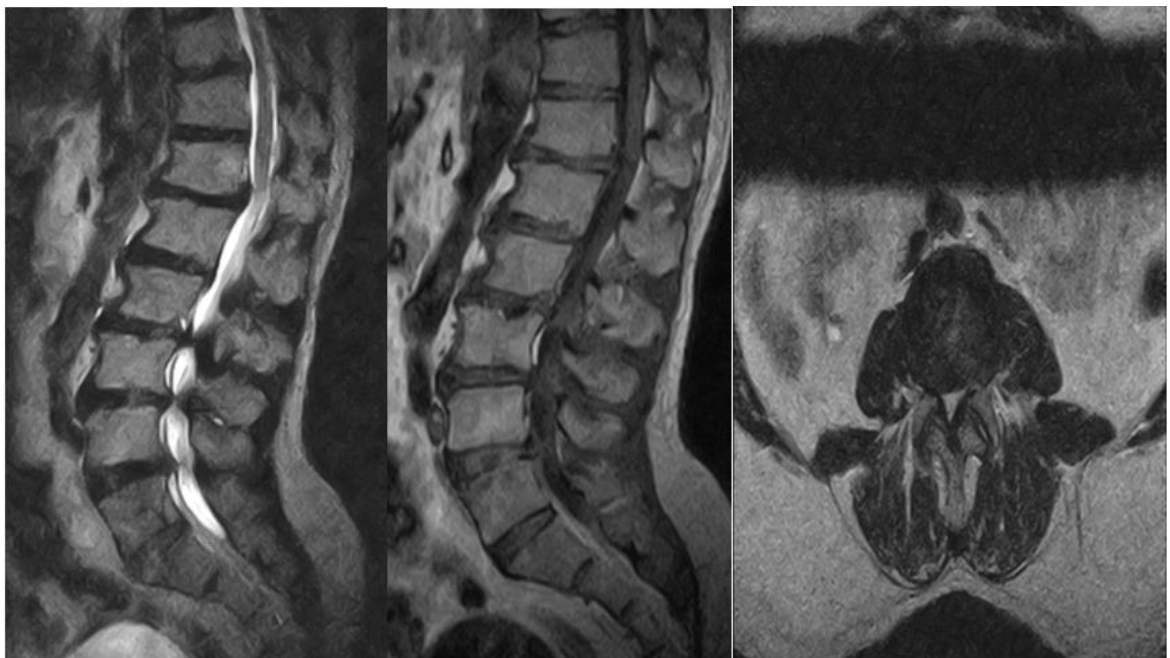


Figure 4.28: T2, T1 sagittal, and T2 axial weighted MRI images: Degenerative changes are noted posteriorly in adjacent end plates and facet joints in the whole of the visualized dorsolumbar spine, especially at the L2-L3, L3-L4, and L4-L5 levels.

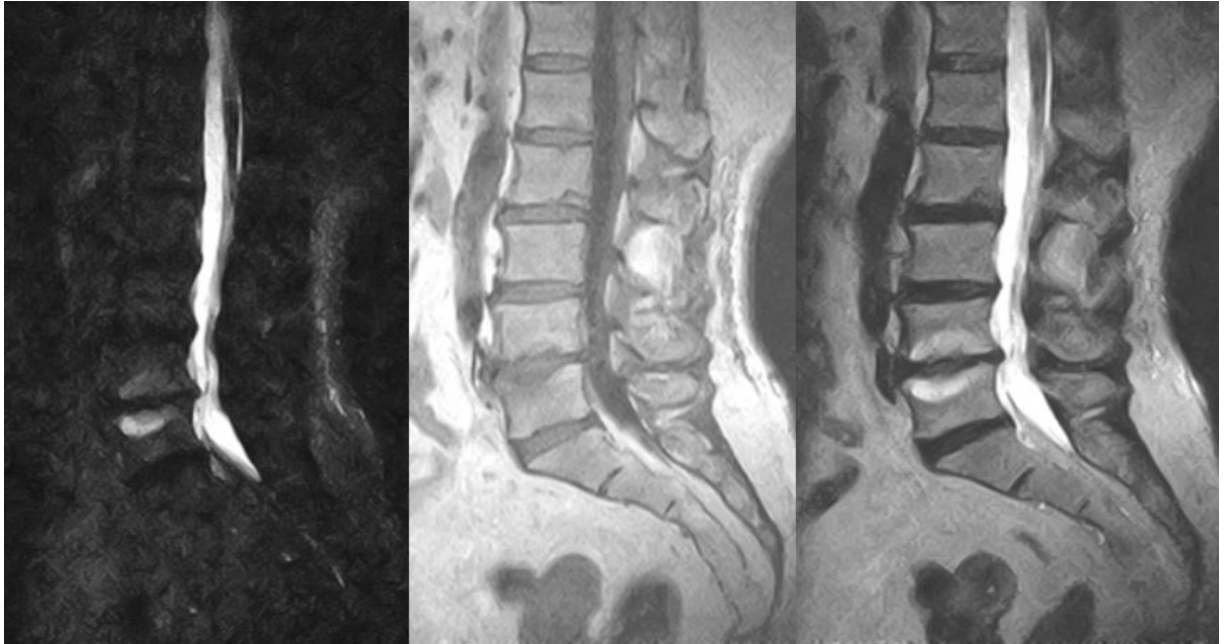


Figure 4.29: STIR, T1 sagittal, and T2 weighted MRI images: Degenerative changes are noted posteriorly in adjacent end plates and facet joints in the whole of the visualized spine, especially at the L5-S1 level.

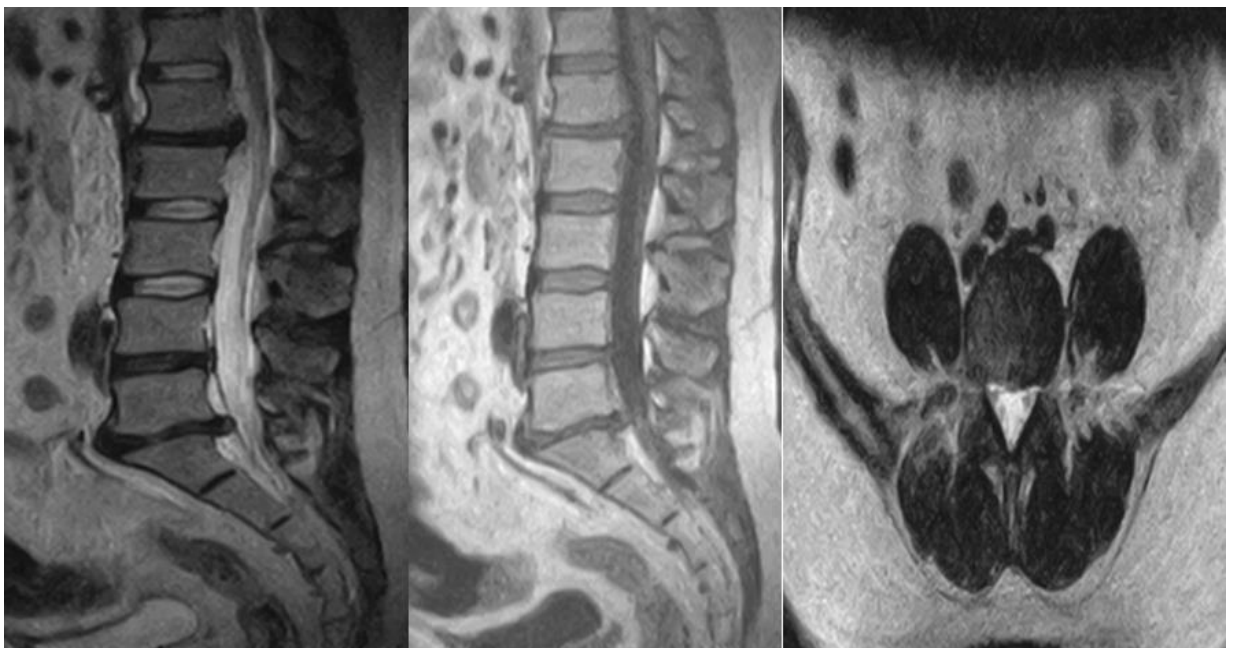


Figure 4.30: T2, T1 sagittal, and T2 axial weighted MRI images: Degenerative changes are noted posteriorly in adjacent end plates and facet joints at the L5-S1 level.

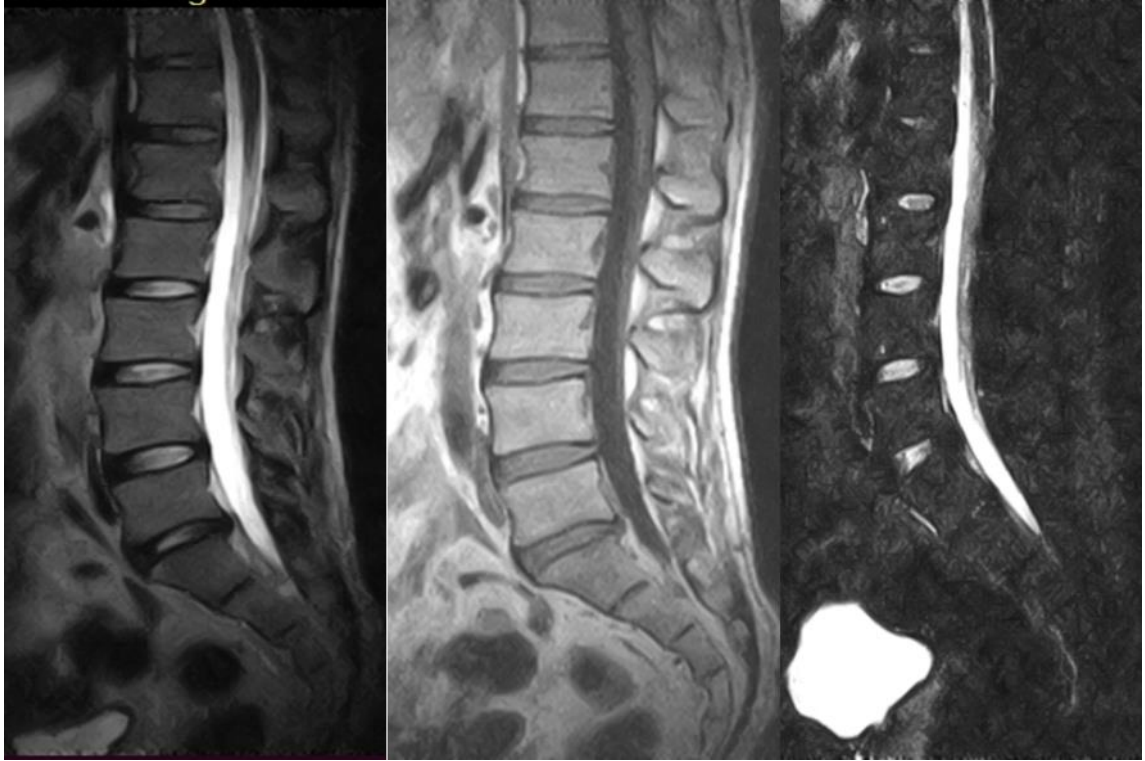


Figure 4.31: T2, T1 sagittal and STIR weighted MRI images: Early degenerative changes are noted in the intervening disc and facet joint posteriorly at L5-S1 level.



Figure 4.32: T2, T1 sagittal, and T2 axial weighted MRI images: Early degenerative changes are noted in the adjacent end plate and facet joint posteriorly at the L4-L5 level.



Figure 4.33: T2, T1 sagittal and STIR weighted MRI images: Early degenerative changes are noted in the intervening disc and facet joint posteriorly at the lower three lumbar disc levels, especially at L3-L4 level.

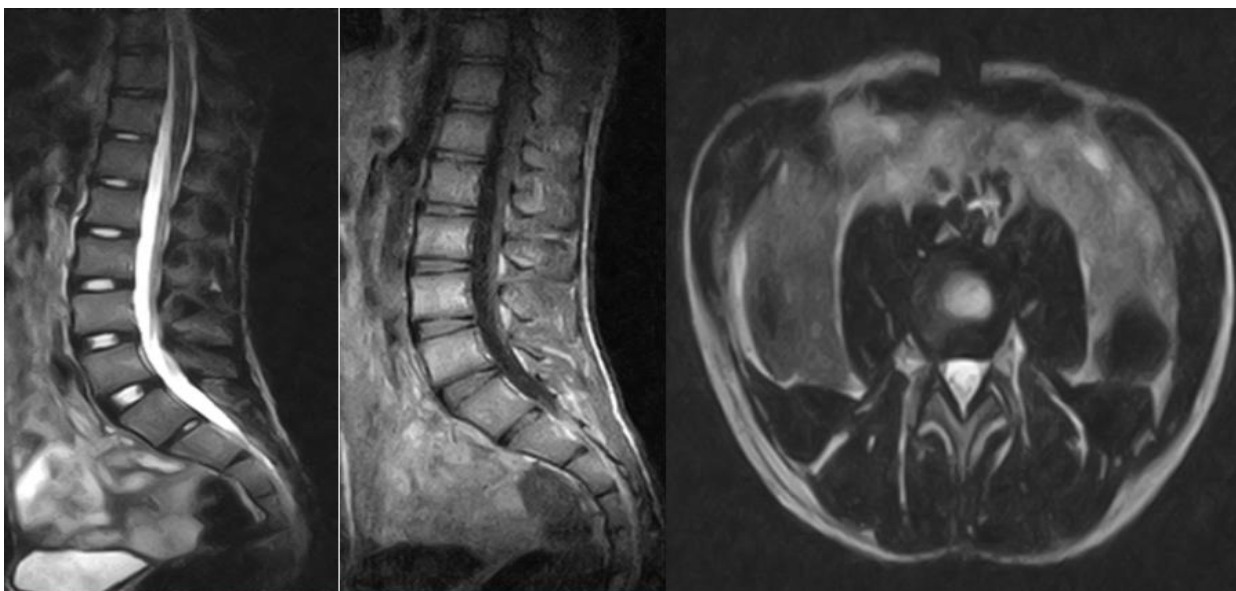


Figure 4.34: T2, T1 sagittal, and T2 Axial weighted MRI images: Early degenerative changes are noted in the intervening disc at the L3-L4 level.

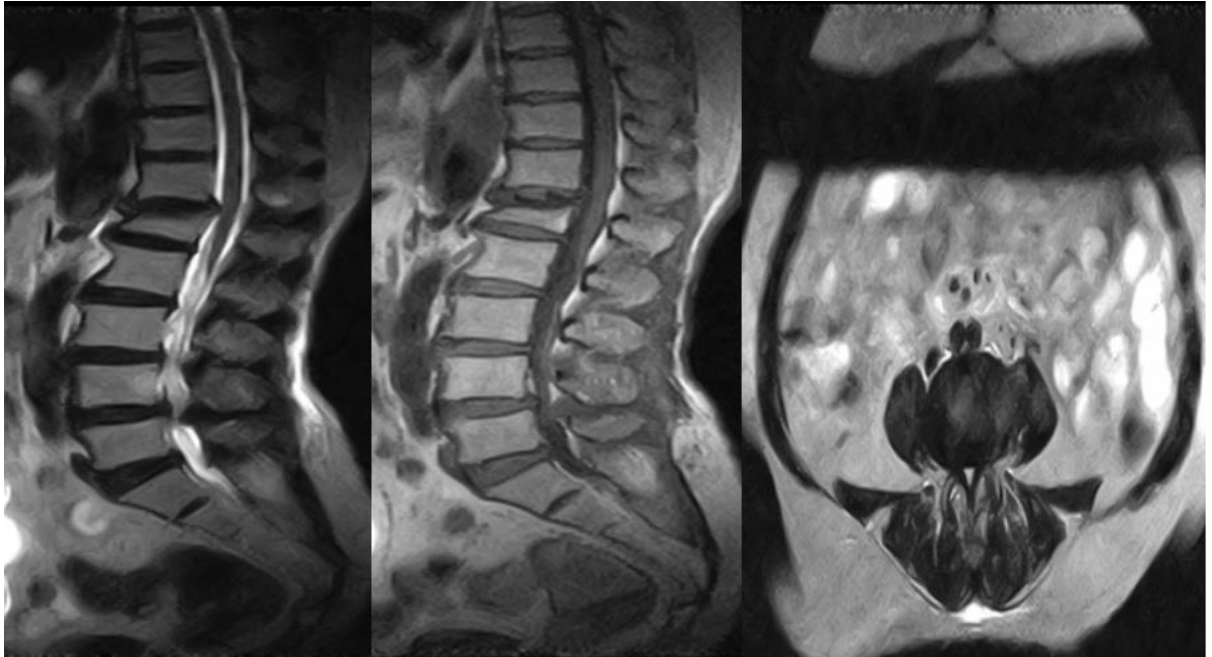


Figure 4.35: T2, T1 sagittal, and T2 Axial weighted MRI images: Degenerative changes are noted in the adjacent end plates and facet joint posteriorly in the whole of the visualized lumbosacral spine and especially at the L4-L5 level.

CHAPTER 5

DISCUSSION

In this study, lumbar disc degenerative disease (DDD) in patients with persistent back pain is assessed using magnetic resonance imaging (MRI), and the results are correlated with the patients' clinical history. Our findings show that disc degeneration was seen at the LV4-LV5 & LV5-S1 levels in 245 cases. These findings are consistent with previous studies by Suthar et al. (2015), who found that degenerative spinal illnesses at the L4-L5 disc level preferentially afflict men was the most often impacted [56].

MRI results revealed disc degeneration in 204 (83.3%) individuals. In terms of lumbar disc pathology, 21 (8.6%) individuals had LV1-LV2 disc involvement, 39 (15.9%) had LV2-LV3 disc involvement, 93 had LV3-LV4 disc involvement, 207 had LV4-LV5 disc involvement, and 157 had LV5-S1 disc involvement. Patel et al (2015) investigated A total of 109 patients with lumbar disc degeneration were diagnosed and investigated using a 1.5 Tesla magnetic resonance imaging system. Males were more likely to have Degenerative Spinal Disease, with the L4 - L5 disc being the most usually implicated [57].

This discussion synthesizes the results, highlights their implications, and addresses potential limitations of the study. Radiating pain was reported by a vast majority of patients (84.1%), indicating a strong connection with lumbar spine diseases. 57.6% of patients experienced numbness, demonstrating the sensory impact of spinal disorders. Despite these symptoms, 84.9% of patients had normal bowel/bladder control, implying that significant nerve compression impairing autonomic functioning was uncommon. The use of magnetic resonance imaging (MRI) to assess lumbar disc degenerative disease (LDDD) in patients with chronic back pain provides significant insights into the link between imaging findings and clinical history. According to Singh et al (2018), the study found a strong relationship between MRI findings and the clinical history of chronic back pain. Patients with chronic complaints were more likely to have disc degeneration, as shown by decreased disc height, loss of signal intensity on T2-weighted imaging, and Modic alterations. These findings correspond with previous studies demonstrating that structural abnormalities in the intervertebral discs are connected with

pain production processes, such as mechanical instability and inflammatory responses [58].

Disc degeneration was extremely common, affecting 83.3% of patients. The most usually impacted level was LV4-LV5 (84.5%), followed by LV5-S1 (64.1%) and LV3-LV4 (38.0%). These findings are consistent with the biomechanical stress distribution in the lumbar spine, highlighting the necessity for focused therapies at these levels. Suthar et al (2015) studied 109 patients with lumbar disc degeneration, ranging in age from 17 to 80 years, using a 1.5 Tesla magnetic resonance imaging scanner. Males were more likely to have Degenerative Spinal Disease, with the L4-L5 discs being the most commonly implicated [59].

Cross-sectionally, those with CBP had a slightly greater prevalence of MRI results, as well as pain severity. We discovered that the majority of MRI findings were associated with future CBP severity, regardless of baseline pain. Kasch et al (2022). Participants (n = 3369) in a population-based cohort study were scanned upon admission, and their LBP status was assessed at baseline and 6 years later. At baseline, MRI results were visible in both participants with and without back discomfort. The proportions were higher in older age groups. 76.4% of the participants had at least one MRI discovery, with 8.3% having five or more [60].

We used MR techniques, such as T1, T2, and T2 Axial, and STIR may help us better understand the link between clinical complaints and radiological findings in DDDs. The study found a high correlation between structure and diagnosis. Podolak-Dawidziak et al (2014) investigated Lumbar degeneration is a complex process, with those in the later stages having worse clinical outcomes. This provides a systematic classification for evaluating lumbar degeneration using the techniques T1, T2, and Aixel. It is simple to use in clinical practice and offers information about the intervertebral discs, vertebral body endplate, bone marrow, facet, and paravertebral muscle mass, making it easy for patients to understand [61].

MRI of lumbar disc degenerative disease (DDD) in individuals with persistent back pain and compare the results to the patient's medical history. The study's findings highlight the intricate connection between the symptomatology of chronic back pain and radiological evidence of DDD. Nguyen et al (2022) One of the most common diagnoses

made while calculating the number of months spent in discomfort is chronic low back pain (CLBP). The lumbar spine's degenerative changes include a variety of morphological changes that can be seen on imaging, some of which are asymptomatic or do not show symptoms. Better management of CLBP can be achieved through phenotyping, which considers both clinical and imaging indications.[62]

The most frequent cause of chronic back pain, according to this study, is disc degeneration at LV4-LV5. Magnetic resonance imaging (MRI) has made it feasible to non-aggressively evaluate soft tissue (disc, spinal column, and vertebral alterations). Another finding from our survey is that men (52.7%) have more back pain than women (47.3%) because of their more restricted lifestyle. Gardner et al. (2021) The L5/S1 spinal disc exhibited the highest rate of significant degeneration across all age groups. The most common multi-level degeneration combinations for two levels were L4/5 and L5/S1, and for three levels, L3/4, L4/5, and L5/S1. The most prevalent pairings in multi-level degeneration are contiguous ones, such L5/S1. Young men were more likely to show signs of deterioration than young women [63].

According to MRI results, 204 (83.3%) of the patients in the current research had disc degeneration. LV1-LV2 disc level was impacted in 21 (8.6%) patients, LV2-LV3 disc in 39 (15.9%) patients, LV3-LV4 disc in 93 (38.0%) patients, LV4-LV5 disc in 207 (84.5%) patients, and LV5-S1 disc in 157 (64.1%) patients, according to the findings on the pathological involvement of lumbar discs. According to a study by Cheung et al (2009) 40% of individuals under 30 had lumbar intervertebral disc degeneration (LDD), and by the time they were 50 to 55, the frequency had progressively risen to over 90%. There was a favorable correlation between low back discomfort and the DDD score. L5–S1 and L4–L5 were the ones most commonly affected. People with isolated upper or mid-lumbar degeneration and skip-level lesions (intervening normal levels) were among the uncommon patterns of degeneration discovered in addition to the usual ones. LDD is common and becomes more common as people age. In a population setting, there is a substantial correlation between back pain and LDD on MRI [64].

Our research emphasizes the necessity of managing persistent back pain using a multimodal strategy. Clinical decision-making should incorporate the patient's history, physical examination, and biopsychosocial variables, even though MRI is a useful

diagnostic technique. Although MRI-based assessment of lumbar disc degeneration offers important information, treatment plans shouldn't be decided solely based on this information. The management of chronic back pain linked to lumbar DDD requires a comprehensive strategy that incorporates lifestyle changes, clinical history, and multimodal therapies. Modic et al. (2007) Disc degeneration is a major cause of long-term impairment during working life and one of the leading causes of functional incapacity in both sexes. Tissue degeneration consists of both cell-mediated compositional changes and structural disruptions. Mechanical, traumatic, nutritional, and genetic factors may all have an impact on the tissue degradation cascade in some persons. Pain as a symptom of degenerative disease has a complex etiology that appears to involve inflammatory mediators and mechanical deformation. Imaging's function is to influence treatment decisions and provide precise morphologic information. Accurate natural history data is vital for connecting these two goals [65].

According to the MRI findings, 204 (83.3%) of the patients in the current study had disc degeneration. According to the data on the pathogenic involvement of lumbar discs, 207 (84.5%) patients had LV4-LV5 discs, whereas 157 (64.1%) had LV5-S1 discs. Takatalo, et al (2009) investigated 325 women and 233 men (n = 558) who underwent MR imaging. Men were significantly more likely to have DD (54%), as well as multiple DD (21%). The prevalence of all degenerative disc findings was highest at the L5-S1 level and most probable at the L4-L5 level [66].

Magnetic Resonance Imaging (MRI) has made it possible to non-aggressively assess soft tissue (disc/spinal column/vertebral changes), which is the most common cause of chronic back pain, although our study target indicates that chronic backache is caused by multiple pathologies. Men (52.7%) have more back discomfort than women (47.3%) because of their more rigid lifestyles, according to another finding from our study. According to research by Patel et al. (2015), men were more likely than women to suffer from degenerative spinal disease. Every participant had multiple disk involvements. Most often, the L4-L5 discs were affected. The most common cause of low back pain is deterioration of the lumbar disc. Gross anatomic changes in the intervertebral disc can be detected using plain radiography. However, because of its radiation-free nature, multiplanar imaging capability, excellent spinal soft-tissue contrast, and accurate

localization of intervertebral disc changes, magnetic resonance imaging (MRI) is the recommended imaging technique for identifying disc pathology [67].

Keeping in mind the results of previously conducted studies the goal of this study was to find results in coherence with previous ones to reduce the time of investigation and to provide the right pathway for diagnosis which can lead to timely treatment. Chronic back pain is the most common problem of today due to strenuous activities and it affects the lifestyle hindering daily life dealings. We have compared our study with past studies which show that most patients have a history of numbness, radiating pain, and weight lifting which causes disc degeneration at L4-L5, and L5-S1 Disc levels.

CHAPTER 6

CONCLUSIONS

As per the results of this study, the most important cause of chronic back pain was disc degeneration (83.3%), and this pathology is common at LV4-LV5 disc levels. Magnetic Resonance Imaging (MRI) is a well-known imaging system for detecting disc pathology due to its multi-planar imaging capability, excellent contrast of soft tissue of the spinal cord, the exact localization of intervertebral disc changes, and lack of radiation. However, it is a time-consuming procedure and not cost-effective as well. So, by looking at the patient's presenting complaints and physical examination the most possible cause of the pain can be deduced and it can be managed timely without any delays to prevent severe outcomes.

Limitation

The study gives important information about the prevalence and features of lumbar spine diseases in patients with chronic back pain. However, there are certain limits to consider. First, while 245 patients is an acceptable sample size, it may not be representative of the larger population, limiting the generalizability of the findings. Furthermore, the study relied on self-reported symptoms like pain and numbness, which could bring subjectivity and bias. Another drawback is the lack of longitudinal follow-up to determine the course of disc degeneration or the long-term effects of risk variables such as trauma and weight lifting. Furthermore, the study did not take into account other potential contributory factors, such as work stress, lifestyle behaviors, or genetic susceptibility, which could all influence the development of lumbar spine pathology.

Recommendations

Recommendations for future studies should include increasing the sample size to cover more varied populations and using a longitudinal strategy to track changes over time. It is also necessary to investigate the involvement of other risk factors and their interactions with spinal disorders. Advanced imaging techniques and functional assessments could help researchers better understand disease causes. Finally, preventive techniques such as ergonomic interventions and public health education should be studied to lower the prevalence of lumbar spine illnesses in high-risk populations.

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APPENDICES

ENGLISH CONSENT FORM

The study you are about to participate is a randomized control trial survey titled as;

“Evaluation of lumber disc degenerative disease on MRI in patients with chronic back pain correlated with history”

The study has no potential harm to participants. All data collected from you will be coded in order to protect your identity, and should not be disclosed to anyone. Following the study there will be no way to connect your name with your data. Your answers to the questions will not affect the quality of education given to you. Any additional information about the study results will be provided to you at its conclusion, upon your request.

You are free to withdraw from the study at any time. You agree to participate, indicating that you have read and understood the nature of the study, and that all your inquiries concerning the activities have been answered to your satisfaction.

NAME _____

SIGNATURE_____

DATE_____

URDU CONSENT FORM

نے اپنی اس تحقیق **تنزیلہ ارباب ارشد محترمہ** تصدیق کرتا/ کرتی ہوں کہ _____ میں

کمر درد کے مریضوں میں میگنیٹک ریزوننس امیجنگ پر لمبر ڈسک ڈیجنریٹو بیماری کا جائزہ تاریخ کے ساتھ تعلق

کے متعلق بتا دیا ہے۔ مجھے اس تحقیق کی نوعیت، مقاصد، احداث، توقعات، فوائد **بتول طاہرہ ڈاکٹر** زیر نگرانی اور خطرات کے متعلق، ساری معلومات فراہم کر دی گئی ہیں اس تحقیق کے دوران ساری معلومات صیغہ راز میں رہیں گی اور مریض کا نام اور دیگر معلومات صرف تحقیق کے لیے استعمال ہوں گی۔ مجھے یہ بھی بتا دیا گیا ہے کہ میں اس تحقیق سے متعلق ہر قسم کے سوال پوچھنے کا مجاز ہوں اور یہ تحقیق صرف ایک شخص ک مفاد میں نہیں ہے بلکہ بحیثیت مجموعی انسانیت کا مفاد اس سے وابستہ ہے۔ تمام تفصیلات جاننے کے بعد یس تحقیق میں شامل ہونے یا نہ ہونے پر کسی کا قائل نہیں ہوں۔ اس تحقیق سے کسی بھی وقت علیحدہ ہونے پر مجھ پر کوئی پابندی نہیں ہو گی۔ میں بذات خود بقائمی حوش و حواس اور رضا مندی سے اس تحقیقاتی عمل میں شامل ہوتی/ ہوتا ہوں

_____ دستخط محقق

_____ دستخط شرکت کار

_____ تاریخ

DEMOGRAPHICS FORM & QUESTIONNAIRES

MR.NO: _____

Name: _____

Gender: _____

Age: _____

Patient history:

Back pain history: _____

Medication history: _____ YES/NO

Radiating/ non-radiating pain		
Bowl and Bladder Control		
Numbness		
H/O Trauma		
Weight lifting		

MRI Findings:

Findings	T 1	T 2	Axial	STAIR	Final Diagnosis
Disc Degeneration					

Findings	Disc Degeneration
L1-L2	
L2-L3	
L3-L4	
L4-L5	
L5-S1	

ETHICS COMMITTEE LETTER



OFFICE OF THE DEAN-FAHS

SUPERIOR UNIVERSITY

Ref.: IRB /FAHS/Allied-HS/10/24/MS/RS-3508

Date: 29th October 2024

Name: Tanzila Arbab Arshad (MS Allied Health Sciences)

Registration: SU91-MSAHW-S23-015

Subject: Ethical Approval Letter

The Research Ethical Committee convened on Dated: **17th October, 2024** to discuss your protocol titled **"Evaluation of lumbar disc degenerative disease on MRI in patients with chronic back pain correlated with history"**

No further corrections and recommendations were suggested. The above-mentioned protocol has been approved after considering various research issues including ethical concerns with condition that the researcher will submit completion report at the end of his/her research.

Prof. Dr. Muhammad Naveed Babur
Dean/Convener REC
Faculty of Allied Health Sciences
Superior University, Lahore

Plagiarism Report