



(RESEARCH ARTICLE)



Prevalence of asymptomatic lumbar disc herniation in heavy weight- lifters

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Abstract

Introduction: Lumbar disc herniation (LDH) is a prevalent spinal condition, especially among weightlifters, due to the mechanical load placed on the lumbar spine. This study aims to investigate the prevalence of lumbar disc herniation, pain patterns, and the influence of gender, age, and weight on pain outcomes in heavy weightlifters.

Methods: A cross-sectional study was conducted with 90 weightlifters aged 25-50 years, including 62 males and 28 females. Participants were assessed for lumbar disc herniation using the Slump Test and pain severity was evaluated with the Visual Analogue Scale (VAS) for both the left and right legs. Statistical analyses, including Chi-Square, ANOVA, and Logistic Regression, were employed to determine the associations between gender, age, weight, and pain distribution.

Results: The results showed that 68.25% of male participants and 72.41% of female participants exhibited lumbar disc herniation. A notable 44.44% of participants had bilateral disc herniation. Pain assessment indicated that 32 participants experienced mild pain in the left leg, while 33 reported moderate to severe pain in the right leg. The Chi-Square test revealed a significant association between gender and pain distribution ($p = 0.0455$), with males more likely to report right leg pain. ANOVA showed no significant impact of body weight on pain outcomes ($p = 0.5154$). Logistic regression analyses confirmed that weight did not significantly affect pain in the right, left, or both legs.

Conclusion: The study found that lumbar disc herniation is common in weightlifters, with gender influencing pain distribution. However, body weight and age were not significant predictors of pain outcomes. These findings suggest that occupational factors and biomechanical stress are major contributors to lumbar disc herniation, emphasizing the importance of proper lifting techniques, core strength, and physical conditioning in preventing injury.

Keywords: Degenerative disc herniation; Slump Test; Visual Analogue Scale; Weightlifters; Prevalence

1. Introduction

The reliance of the rural population in India on construction work, which often involves heavy lifting, poses significant health risks. This work is characterized by manual material handling (MMH) tasks that can lead to musculoskeletal disorders and cardiovascular strain (Maiti & ray 2004; Petersen et al., 2012). Construction workers frequently experience musculoskeletal disorders due to improper lifting techniques and non-neutral postures (Gupta & Pupalla, 2018; Parida et al., 2016). Lumbar disc herniation (LDH) is a common spinal degenerative disorder characterized by the outpouching of the nucleus pulposus through a tear in the annulus fibrosus, leading to nerve root compression. It predominantly affects middle-aged males, particularly at the L4-L5 and L5-S1 levels (Amir et al., 2018). It is a prevalent medical condition affecting 2 to 3% of the population, primarily causing lumbalgia and progressive sciatica. Symptoms typically resolve within four to six weeks with conservative treatment, including medication and

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physiotherapy (Vialle et al., 2010). Lumbar disc herniation is a common neurosurgical condition characterized by the posterior migration of the nucleus pulposus through protective connective tissue, leading to symptoms such as leg pain and paraesthesia. The severity of these symptoms correlates with the extent of the herniation. Magnetic resonance imaging is the gold standard for diagnosis, while treatment options include open lumbar microdiscectomy and endoscopic lumbar discectomy. Postoperative complications are rare and manageable in current neurosurgical practice (Toader et al, 2024). Occupation is closely associated with lumbar disc herniation and long-distance drivers were the most affected, accounting for 31% of the cases. Laborers, who engage in moderate to heavy weightlifting, represented 20% of the patients. Carpenters made up 13% of the cases. Barbers accounted for 11%, while office workers comprised 9% of the patients (Amir et al., 2018). For heavy lifters, lumbar disc herniation frequently manifests as lower back discomfort, sciatica, tingling in the legs, and numbness. Preventive interventions and risk factors are essential for reducing the likelihood of lumbar disc herniation in heavy lifters. Sciatica or low back pain combined with leg pain may be caused by pressure from a herniated intervertebral disc on the nerve root (Fares et al.,2020). The primary goal of weightlifting exercises is to increase muscle growth in the human body and encourage an active, healthy lifestyle (Van et al., 2006). A lower back discomfort is among the most typical symptoms. complaints in the weightlifting community because improper form and heavy weight usage are common causes of lower back ailments. Physical therapy is one of the most crucial non-operative therapeutic elements (Danazumi et al., 2019). Weightlifting exposes athletes to the danger of lower back pain because it uses heavy weights to work the body's muscles (Van et al., 2006). Lifting too much weight or using the wrong form puts them in danger and increases the chance of damage (Van et al., 2006) sciatica is a prevalent diagnosis in the general population. Lumbar disc herniation is the most frequent cause of sciatica when LDH is being treated. Different surgical techniques and treatment modalities exist (Gadjradj et al., 2017). Conservative therapies, such as bed rest, physical therapy, and pain medication, may be suggested in the event of lumbar disc herniation. To relieve pressure on the impacted nerve roots and replace the injured disc, surgery may be required in a few of these situations. Physiotherapy is always recommended as a kind of treatment for patients exhibiting symptoms related to a herniated lumbar disc. Various physiotherapy methods are advantageous in clinical situations (Cho et al., 2023). During the acute phase, mobilization therapy and the McKenzie concept are administered in randomized control trials with a blind assessor (Cho et al., 2023). Active physiotherapies, such as strengthening the back and abdominal muscles for local strength and endurance, have been shown to be effective for patients in the chronic stage (Cho et al., 2023). Damage to the outer annulus fibrosus around the nucleus pulposus (NP) can result in lumbar disc herniation, which causes the NP to prolapse or migrate. Herniated NP presses on or irritates the posterior nerve root, resulting in radiculopathy.

Tingling, anxiety, and numbness in the dermatome surrounding the affected nerve roots are common radiation therapy symptoms. In particular, patients with lumbar radiculopathy are more likely to experience postoperative consequences, such as increased pain and functional impairment, which might worsen the prognosis following surgery (Stoll & Hagmann., 2001). Lumbar disc herniation usually causes pain in the legs and back. Although initial non-operative treatment is frequently advised, some patients eventually need a lumbar discectomy if their condition does not improve (Dandurand et al., 2023). One possible cause of sciatica, or low back pain accompanied by leg pain, is pressure on the nerve root resulting from a herniated intervertebral disc. Most patients will benefit from conservative therapy; however, a surgical discectomy may be necessary for a small percentage of carefully selected patients. Most patients will benefit from conservative management; however, for some carefully chosen individuals, a surgical discectomy may result in quicker symptom resolution (Fares et al.,2020).

After surgery, the lumbar spine has been evaluated using a range of methods. Currently, Gd-enhanced MR imaging is the recommended neuroimaging method for examining post-symptoms following recurrent discectomy. The annulus is usually hyperring-tense, whereas the nucleus is hypointense. The disc space's height has been lost. Moreover, changes could occur in the marrow and endplates; these could reveal If T1-weighted imaging shows a low signal and T2-weighted imaging shows a significant signal, inflammation may be present (Swartz et al., 2003).

This study investigated the prevalence of asymptomatic lumbar disc herniation in heavy weightlifters with an aim to analyze the relationship between various factors, including age, gender, and weight, with the pain status of construction workers by the Slump Test. The total number of participants, along with the distribution of male and female participants, was determined. Participants were classified into distinct age groups to examine age-related patterns in pain status. Additionally, the presence or absence of pain was assessed across gender groups, and the severity of pain was evaluated using the Visual Analogue Scale (VAS).

2. Methodology

Ethical approval for this study was obtained from the Institutional Ethics Committee of the Krishna Institute of Medical Sciences, Deemed to Be University, Karad Maharashtra, India. The study adhered strictly to ethical guidelines, and

informed consent was obtained from all participants. This observational cross-sectional study aimed to examine the physical effects of weightlifting on construction workers in Karad, focusing particularly on the impact of weightlifting on the lower back and spinal health.

The study was conducted over a 13-week period and included 91 participants. The sample was selected using simple random sampling, ensuring that every individual had an equal chance of being included, which helped minimize selection bias. The participants met the following inclusion criteria: they were construction workers who also engaged in weightlifting, aged between 25 and 60 years, and had voluntarily given their informed consent to participate. Exclusion criteria were individuals outside the specified age range, non-construction workers, or those who did not consent to participate.

The study primarily used the Slump Test to assess spinal flexibility and mobility (Maitland 1985; White & Pape 1992;). The Slump Test was utilized to evaluate the impact of weightlifting on the lower back and spine, with a focus on potential herniation (Al-Sharaa et al.,2021). This test is a commonly used diagnostic tool to identify issues such as nerve root irritation, which can be common in weightlifters (Majlesi et al., 2008). Additionally, demographic and physical characteristics such as weight, height, and age were recorded as part of the baseline assessment.

For those participants showing signs of radicular symptoms (e.g., radiating pain to their legs), further examination was carried out. To assess radicular symptoms, the Visual Analogue Scale (VAS) and Straight Leg Raise (SLR) tests were utilized as primary outcome measures (Majlesi et al., 2008; M'kumbuzi et al., 2012; Giraudeau et al., 2004). These measures were essential in evaluating the severity of pain in the lower back and legs. In cases where radicular symptoms recurred, participants underwent further examination, which involved flexion of the cervical, thoracic, and lumbar spines followed by passive knee extension and dorsiflexion of the foot. A positive test result, indicated by lower back pain during these movements, confirmed the presence of nerve root irritation.

The data collected was subjected to statistical analysis to identify relationships and trends, ensuring the validity and reliability of the study results. The final analysis aimed to evaluate the physical impact of weightlifting on construction workers, with a particular focus on lower back pain and related symptoms, such as leg pain and herniation.

2.1. Data analysis

The data met the necessary assumptions for parametric testing, including normal distribution and homogeneity of variance (with p-values > 0.05 in Levene's Test), ensuring the validity of the parametric methods used in the analysis. To investigate the associations between different variables, several statistical analyses were conducted. First, a Chi-Square Test was performed to examine the relationship between Gender and Pain Status, as well as between Age Group and Pain Status. This allowed for an understanding of whether the distribution of pain status was significantly associated with gender or age group. Followed by Logistic Regression was employed to assess the effect of Weight on the probability of experiencing Right Pain, Left Pain, and Both Side Pain. This regression analysis helped to determine whether weight could be a significant predictor of pain on either side or both. Additionally, an ANOVA test was applied to evaluate differences in Weight across the different Pain Status Groups (i.e., No Pain, Right Pain, Left Pain, and Both Pain), providing insights into how weight distribution varies depending on the presence of pain. All the statistical analyses were conducted using Python software (version 3.11.4, available at <https://www.python.org>).

3. Result

The sample comprised 29 females and 62 males, yielding a female-to-male ratio of approximately 0.47:1, meaning that for every female participant, there were about 2.1 male participants. The participants were classified into four distinct age groups: 25-35, 36-40, 41-50, and 51 and above. Among these groups, the highest number of participants were in the 41-50 age range, followed by the 36-40 group, 25-35 group, and finally the 51 and above group. This distribution highlights a higher concentration of participants in the middle-aged categories. The distribution of participants across these age groups is visualized in Figure 1.

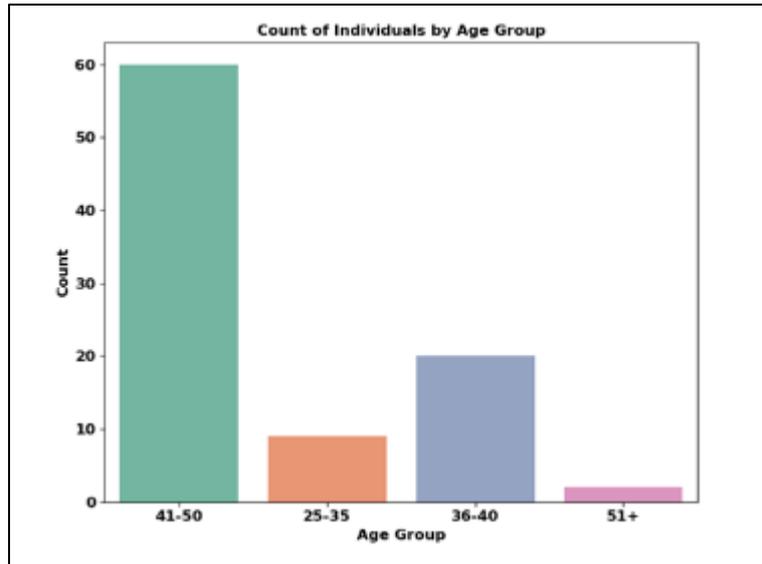


Figure 1 Number of participants in four distinct age groups: 25-35, 36-40, 41-50, and 51 and above

3.1. Slump Test

The prevalence of asymptomatic lumbar disc herniation in heavy weightlifters, as determined by the Slump Test results, indicated that out of the 63 male participants, 43 (68.25%) had lumbar disc herniation, and out of the 29 female participants, 21 (72.41%) exhibited the condition (Figure 2a). Additionally, 40 individuals (44.44%) had lumbar disc herniation on both legs, whereas 13 individuals (14.44%) had it on the left leg only, and 11 individuals (12.22%) on the right leg only. These findings suggest a slightly higher prevalence of lumbar disc herniation in females (72.41%) compared to males (68.25%) within the weightlifting population, with a notable proportion of individuals affected bilaterally (Figure 2b).

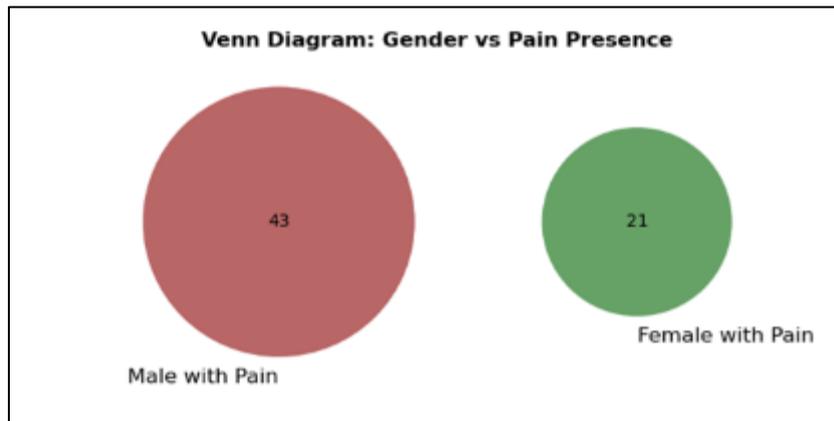


Figure 2a Number of participants according to the gender

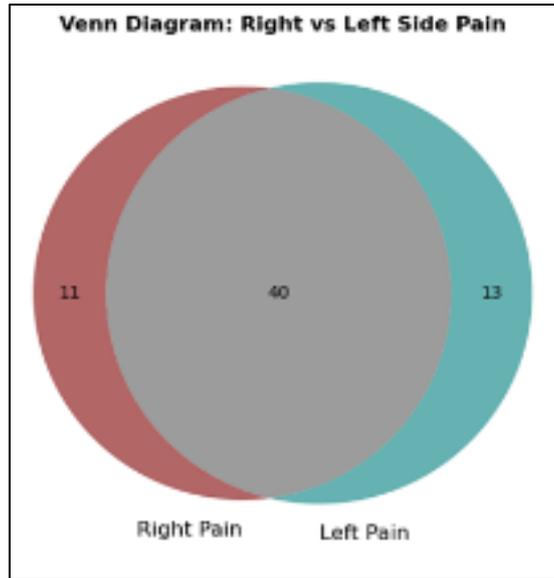


Figure 2b Venn diagram on the number of participants experience pain in both legs, left leg or right leg

3.2. Visual Analogue Test

The Visual Analogue Scale (VAS) was utilized to assess the severity of pain in the left leg and right leg. The scale ranged from 1 to 10, where a score of 1–5 represented mild pain and a score of 6–10 represented moderate to severe pain. For the mild pain category (VAS score 1-5), 32 participants reported pain in the left leg, and 18 participants reported pain in the right leg. In contrast, for the moderate to severe pain category (VAS score 6-10), 21 participants reported pain in the left leg, while 33 participants reported pain in the right leg (Figure 3). These findings highlight a higher prevalence of moderate to severe pain in the right leg compared to the left leg, indicating a notable asymmetry in pain distribution.

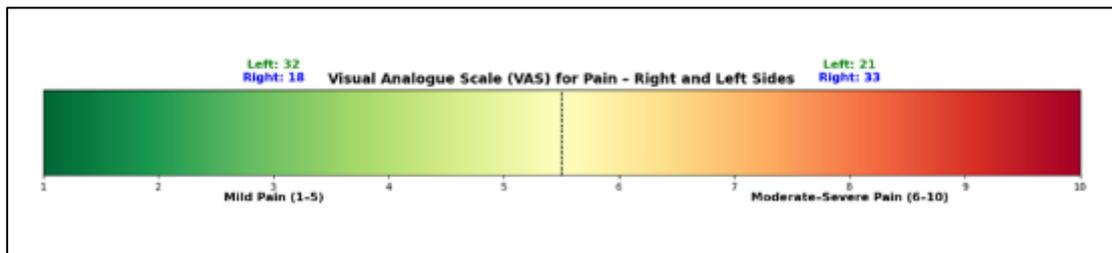


Figure 3 Visual Analogue Scale of pain of left and right leg range from 1-10

3.3. Effect of gender and Age on lumbar disc herniation

The Chi-Square test for the association between gender and pain status revealed a χ^2 statistic of 8.026 and a p-value of 0.0455 ($P < 0.05$), indicating a significant association between the two variables. Specifically, males were more likely to report both pain and right leg pain, while females reported higher instances of left leg pain and no pain. These results suggest that gender influences the distribution of pain among weightlifters, potentially due to biomechanical differences or other factors (Figure 4a).

In contrast, the Chi-Square test for the relationship between age group and pain status yielded a χ^2 statistic of 5.505 and a p-value of 0.7882 ($P > 0.05$), indicating no significant association (Figure 4b). The absence of age-related differences in pain perception may be attributed to the homogeneous nature of the study population, all of whom were construction workers. This profession, characterized by physically demanding tasks, may outweigh the potential impact of age on pain status, suggesting that occupational factors play a more significant role than age in this context.

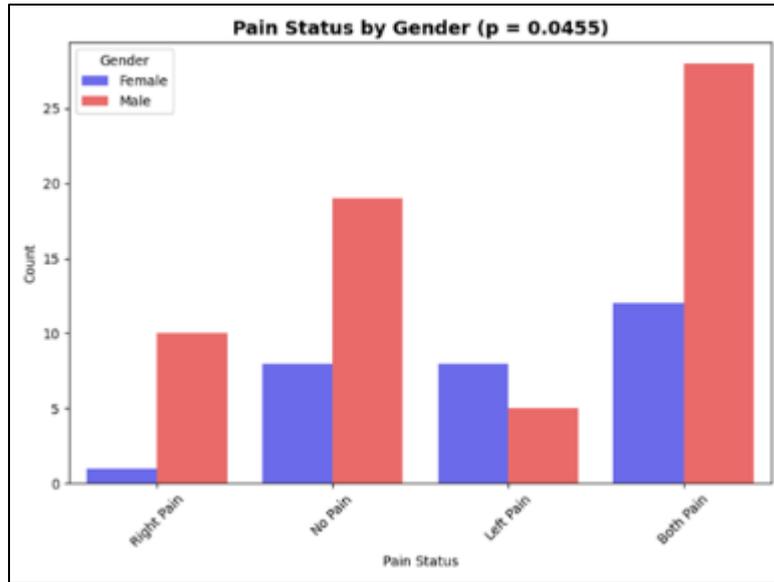


Figure 4a Effect of gender on the pain status

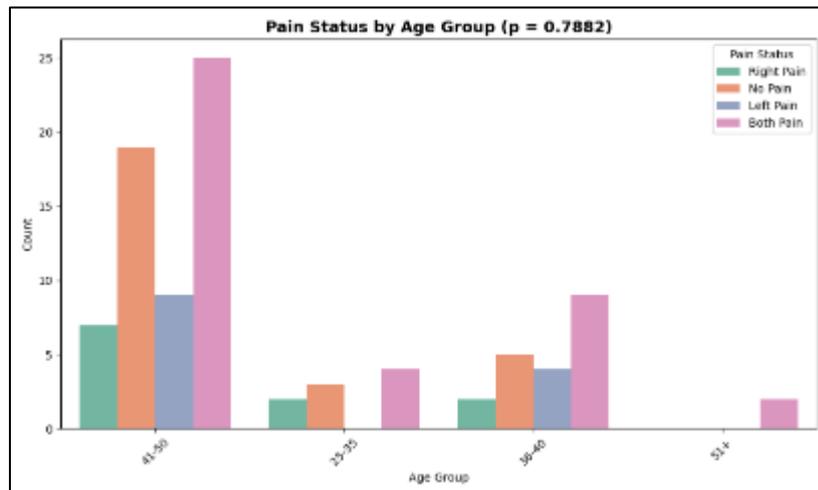


Figure 4b Effect of age (4 different age class) on the pain status

3.4. Effect of weight on lumbar disc herniation Pain Status Groups

An analysis of variance (ANOVA) was conducted to assess whether there is a significant difference in weight across different pain status groups (Right leg Pain, Left leg Pain, No Pain, and Both legs Pain). The resulting F-statistics were 0.767, with a p-value of 0.5154 ($P < 0.05$). Since the p-value exceeds the standard significance threshold of 0.05, we conclude that there is no significant difference in weight among the different pain status groups (figure 5). These findings suggest that weight does not play a significant role in differentiating between the pain status groups. In other words, individuals across all categories of pain status (Right Pain, Left Pain, No Pain, and Both Pain) do not exhibit substantially different weight distributions.

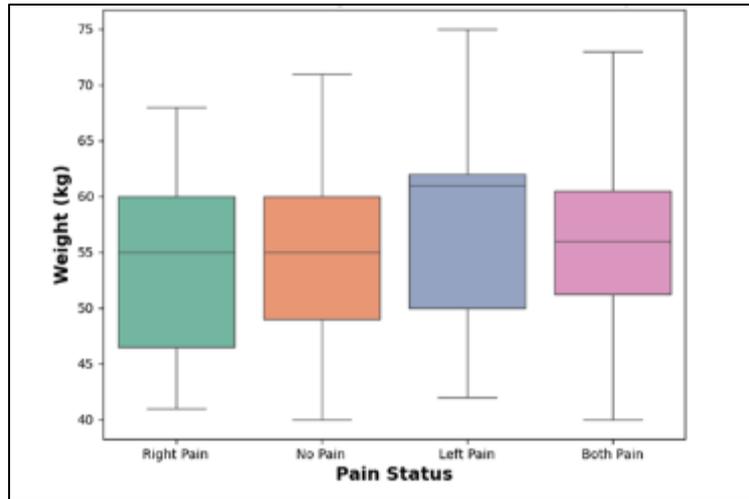


Figure 5 Effect of body weight on the leg pain

3.5. Logistic Regression: Weight vs Right Pain

The logistic regression analysis investigating the relationship between weight and right- side pain yielded a p-value of 0.6795, which is well above the commonly accepted significance threshold of 0.05. This indicates that weight does not have a statistically significant effect on the occurrence of right-side pain. The R-squared value of 0.0014 is notably low, suggesting that weight explains a minimal portion of the variability in right side pain. The negative coefficient for weight (-0.0103) further supports this conclusion, as it suggests a slight inverse association, but the lack of statistical significance indicates that the relationship is weak (Figure 6a). These findings imply that other factors, such as occupational factors, biomechanics, or training history, are more likely to be influential in the onset of right-side pain than weight alone.

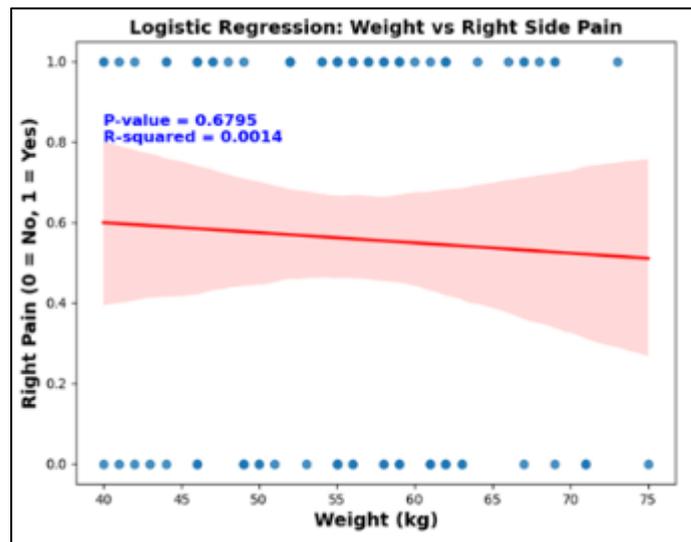


Figure 6a Effect of body weight on the right leg pain

3.6. Logistic Regression: Weight vs Left Pain

The logistic regression analysis examining the association between weight and left side pain produced a p-value of 0.3064, which exceeds the threshold for statistical significance (0.05). This indicates that weight does not significantly influence the likelihood of experiencing left side pain. The very low R-squared value of 0.0086 further emphasizes that weight accounts for very little variability in left side pain. Although the coefficient for weight is positive (0.0260), its lack of statistical significance (p-value = 0.3064) suggests that the relationship between weight and left side pain is weak and inconclusive (Figure 6b). These results point to the possibility that other factors, such as individual differences in lifting techniques or physical conditioning, may have a more substantial impact on left side pain than weight alone.

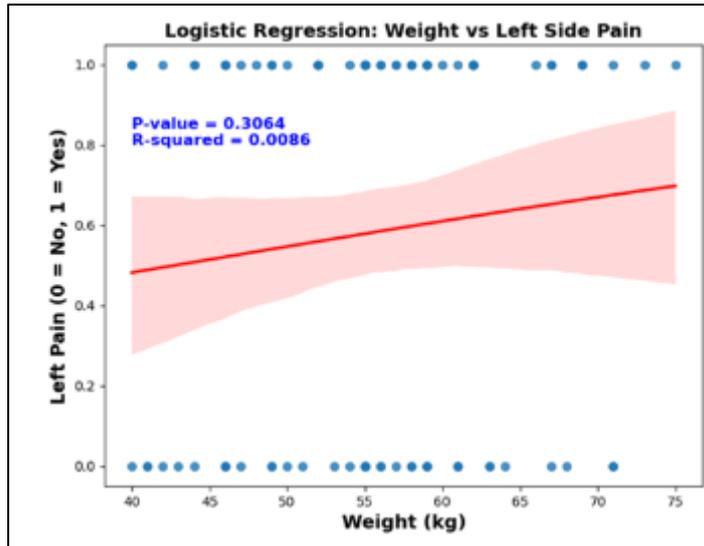


Figure 6b Effect of body weight on the left leg pain

3.7. Logistic Regression: Weight vs Both Side Pain

The logistic regression model exploring the effect of weight on pain affecting both sides (right and left) showed a p-value of 0.9677, which is substantially higher than the 0.05 threshold for statistical significance. This finding confirms that weight does not have a significant effect on the likelihood of experiencing bilateral pain. The R-squared value of 0.0000 indicates that weight explains virtually none of the variation in pain affecting both sides. Additionally, the coefficient for weight (0.0010) is extremely close to zero, and its corresponding p-value is exceptionally high, further reinforcing the conclusion that weight is not a significant predictor of bilateral pain (Figure 6c). These results suggest that other factors, potentially related to work-related physical demands or biomechanical stresses, are more likely to influence the presence of pain on both sides.

Overall, logistic regression analyses weight and right-side pain, left side pain, and both side pain all reveal that weight does not have a statistically significant impact on the likelihood of experiencing pain on either side or both sides. The very low R-squared values across all models further support the conclusion that weight explains very little of the variation in pain outcomes. These findings highlight the need for further investigation into other factors, such as work-related physical demands, biomechanics, or individual physical conditioning, which may play a more substantial role in the development of pain.

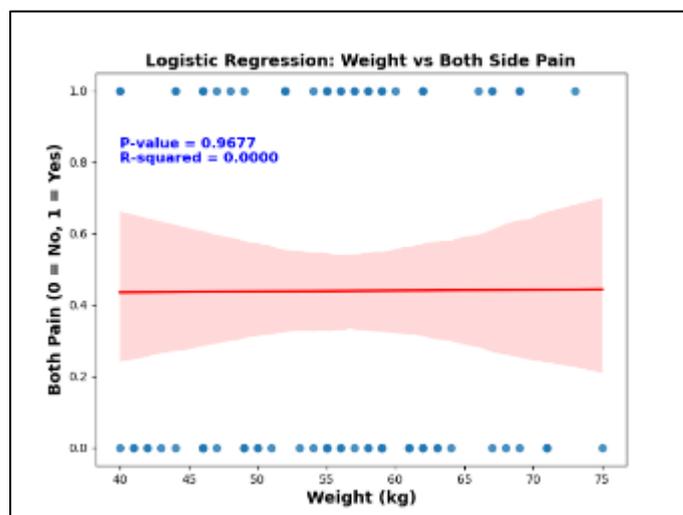


Figure 6c Effect of body weight on both leg pain

4. Discussion

Occupational factors such as long-distance driving, heavy lifting, and physically demanding jobs are strongly associated with LDH. Diagnosis is typically confirmed through MRI, which provides better visualization of soft tissue compared to CT scans (Amir et al., 2018). While Lower Back Pain (LBP) is quite common among weightlifters and can affect people of any age or gender, young adults are the ones that experience it the most frequently. Each patient in our study was from the age group to 25- 50 and above with demonstrated lower back pain (LBP) who also exercised weight (construction workers). Work increased physical activity and growth spurts are associated with lower back discomfort in this age range. This exercise makes extensive use of the back muscles through a range of precise movements and techniques with heavy weights. Elevated joint moments are affected, resulting in increased shearing forces and compressive stresses on the spine and joints. Consequently, improper technique or excessive weight could result in harm (Kuai et al., 2017). Frequently, patients with multi-segmental disc degeneration or herniation experience sciatica and low back discomfort. However, not all disc ruptures are followed by problems. Simple mechanical pressure, changes in the circulatory system, and inflammatory stimulation from a herniated object were all involved in this study. The exact mechanism underlying acute and recurrent radicular pain associated with lumbar disc degeneration is unknown (Swartz et al., 2003). Contradictory data exist regarding the impact of medicine on individuals with lumbar IDD and radiculopathy, despite its widespread use. This could be due to the unclear motivation behind these 2 treatments. When compared to the nerve block for radiculopathy, this study shows a notable increase in the use of perineural approaches to the spinal nerve plexus and dorsal root (Van et al., 2006). The primary finding of this study indicated that lower-extremity radicular pain recurrence was rather common. To date, recurrence is an important but often disregarded endpoint in most prospective trials conducted on nonsurgical LDH. There must be more research on LDH recurrence. Apart from disc herniation, several back anomalies identified by MRI may not elicit any symptoms. This study aimed to determine the frequency of asymptomatic herniated discs in a prospective cohort of patients with unilateral lumbosacral radicular syndrome.

According to Amir et al., 2018., Laborers, who engage in moderate heavy weightlifting, represented 20% of the patients of Lumbar disc herniation, and our study also suggest that the occupation could be a reason for the medical condition apart from the gender. In our finding the age and weight of the labor does not have significant effect of the Lumbar disc herniation, which is supported by Qi et al., 2023 and he postulate that the age were not specifically analyzed as risk factors, but a (Body Mass Index) BMI of more than 30 was identified as a significant risk factor for lumbar disc herniation in adolescents and young adults. But the same research suggested that gender might not be a reason. In our research work the middle-aged group 41-50 having highest pain status and that result is supported by Zhang et al., 2024 in which he Gender-specific factors were not addressed, focusing solely on women in this study, especially middle-aged and older women, age and body mass index (BMI) significantly influence lumbar disc herniation (LDH) risk. Th age and sex significantly influence lumbar disc degeneration, with male discs showing more degeneration than female discs (Miller, et al., 1988). Pediatric lumbar disc herniation is uncommon in children and adolescents. Surgery for lumbar disc herniation in pediatric patients has excellent short-term outcomes and does not lead to chronic back pain or interfere with physical activity (Abd Elsamea et al., 2018).

5. Conclusion

This study provides valuable insights into the prevalence of asymptomatic lumbar disc herniation and its relationship with pain among heavyweight lifters. The results confirm that lumbar disc herniation is relatively common in this population, with gender differences observed in the distribution of pain. Specifically, males were more likely to experience right leg pain, while females tended to report left leg pain or experience no pain at all. These differences indicate that gender plays a significant role in how pain from lumbar disc herniation is experienced among heavyweight lifters. While factors such as age and weight had limited influence on pain outcomes, the study suggests that occupational demands and biomechanical stresses, associated with the high-intensity nature of weightlifting, are more substantial contributors to the onset of pain. The strain placed on the lumbar spine through repetitive mechanical stress and improper lifting techniques poses a significant risk for injury.

The initial treatment for lumbar disc herniation typically involves a conservative approach, including rest, anti-inflammatory medications, and physical therapy to alleviate symptoms. Targeted stretches and strengthening exercises can improve flexibility and stability in the muscles supporting the spine, reducing the risk of further injury. Heat and cold therapy can also help manage inflammation and pain.

Although weight did not show a significant effect on pain outcomes, factors such as lifting techniques, core strength, and overall physical conditioning are crucial for reducing the risk of lumbar disc herniation. Preventing such injuries requires a proactive approach to spine health, emphasizing gradual strength-building and proper lifting form.

For injured weightlifters, a comprehensive rehabilitation program, which may include conservative care and, if necessary, surgery, can facilitate a safe return to lifting. A well-structured rehabilitation process will not only address current injuries but also reinforce the importance of proper movement mechanics to prevent future occurrences.

To reduce the risk of lumbar disc herniation and promote long-term athletic success, heavyweight lifters must take an informed and proactive approach to their training. This includes maintaining a strong core, adhering to proper lifting techniques, and making necessary adjustments during recovery. Understanding the complex relationship between biomechanics, training history, and work-related physical demands is essential for developing effective prevention and treatment strategies tailored to the needs of heavyweight lifters.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors report no conflicts of interest.

Authors' contributions

Conceptualization; Betsy biju, Varadharajulu Govindha Mandiri, Data curation; Betsy biju, Formal analysis; Betsy biju, Funding acquisition; Varadharajulu Govindha Mandiri, Investigation; Betsy biju, Methodology; Betsy biju, Project administration; Varadharajulu Govindha Mandiri Resources; Software; Betsy biju, Supervision; Varadharajulu Govindha Mandiri Validation; Varadharajulu Govindha Mandiri, Visualization; Betsy biju, Roles/Writing - original draft; Betsy biju, and Writing - review & editing; Varadharajulu Govindha Mandiri

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