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PREVALENCE OF INTERVERTEBRAL DISC HERNIATION AMONG WEIGHTLIFTERS.

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Abstract

Purpose of the Study: This research investigates the prevalence of Intervertebral Disc Herniation among weightlifters. The age criteria range from 18 to 35, including both male and female professional weightlifters. Weightlifters commonly injure their spines by straining their backs while lifting weights. The aim of this study is to assess the prevalence of Intervertebral Disc Herniation among these weightlifters.

Materials and Methods: Conducted as a survey study, 65 weightlifters were assessed using MRI and X-ray scan results. Statistical analysis was done with MS Excel to compare the changes observed in the subjects**.**

Results: Significant vertebral changes were observed in the MRI and X-rays of the subjects. Changes such as a reduction in the thickness of the intervertebral disc, posterior bulging of the disc, and protrusion of the disc were observed in weightlifters.

Conclusion: The prevalence of suggestive diagnoses of intervertebral disc herniation among weightlifters was 46.16%, as indicated by X-ray results. Meanwhile, 43.08% of weightlifters exhibited bulging of the disc, as shown by MRI scans. These findings suggest that weightlifters are more prone to changes in the intervertebral disc as a result of their sport.

Keywords: Intervertebral Disc Herniation, Weightlifters, Physiotherapy, MRI

INTRODUCTION

The intervertebral disc is a critical structure in the human spine, responsible for connecting two adjacent vertebral bodies. Located between the vertebrae, these discs serve as cushions or shock absorbers that help manage the compressive forces exerted on the spine during various activities. The discs are crucial not only for providing flexibility and movement but also for maintaining the overall structural integrity of the spine, allowing humans to perform a wide range of movements from bending to lifting heavy objects (Postacchini F 1999). Each intervertebral disc is composed of three main components: the annulus fibrosus, the nucleus pulposus, and the vertebral endplates. These components work together to ensure the proper functioning and stability of the spine. The nucleus pulposus, which is located at the center of the disc, is a gelatinous core rich in proteoglycans and collagen, primarily type II collagen. This composition allows the nucleus pulposus to retain water and create swelling pressure, enabling it to absorb compressive forces effectively. As the spine is subjected to various stresses and strains, the nucleus pulposus plays a crucial role in adapting to these forces and maintaining spinal health.Surrounding the nucleus pulposus is the annulus fibrosus, a structure composed of concentric layers of collagen fibers, predominantly type I collagen, organized in a lamellar formation. This arrangement provides the annulus fibrosus with substantial tensile strength, essential for resisting the

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stresses that occur during spinal motion. While the nucleus pulposus primarily manages compressive forces, the annulus fibrosus is designed to handle tensile stresses, ensuring that the disc can maintain its integrity even under extreme conditions. The annulus fibrosus helps to contain the nucleus pulposus within its boundaries, preventing it from bulging or herniating outward.The vertebral endplates are cartilaginous layers located above and below the intervertebral disc. They play a vital role in connecting the disc to the vertebrae and act as a gateway for nutrient transport and waste removal. Since the intervertebral disc is largely avascular (lacking its own blood supply), it relies on the endplates to facilitate the diffusion of essential nutrients and the removal of metabolic waste. This process is crucial for maintaining the health of the intervertebral disc, ensuring that it can continue to function optimally throughout an individual's life (Whatley & Wen, 2012). Additionally, the vertebral endplates help distribute loads evenly across the disc, which contributes to the overall mechanical stability of the spine. Together, these components allow the intervertebral disc to function as a highly efficient shock absorber, permitting flexible motion while preventing excessive movement that could compromise spinal integrity.However, under certain conditions, the intervertebral disc can become damaged or displaced, leading to a condition known as disc herniation. A herniated disc occurs when the nucleus pulposus is displaced from its normal position within the intervertebral space. This displacement often results in significant pain, as the herniated disc can compress or irritate nearby nerves, leading to symptoms such as burning or tingling pain that may radiate into the lower extremities.This type of pain is commonly referred to as sciatica when it affects the lumbar region of the spine (Vialle et al. 2015). The herniated intervertebral disc is usually narrowed as a result of herniation or degenerative changes of the disc tissue (Postacchini F 1999).

Disc herniation typically occurs when the nucleus pulposus protrudes through the annulus fibrosus, the fibrous outer ring that normally contains the gelatinous core. Depending on the volume of herniated material, there may be varying degrees of compression and irritation of the lumbar nerve roots. This nerve irritation is often the cause of the severe pain associated with herniated discs (Vialle et al. 2015). Disc herniations can occur at various locations along the spine, but the most common sites for herniation are in the lumbar spine and cervical spine, as these regions experience the highest levels of mechanical stress. Herniations in the thoracic spine are rare due to the more rigid structure of this region.The process of disc herniation can be divided into four stages: bulging, protrusion, extrusion, and sequestration. In the bulging stage, which is the initial stage, the intervertebral disc starts to move, and the outer layer (annulus fibrosus) weakens. The disc pushes outward but stays within the annulus fibrosus. While the bulge may press on nearby nerves, the inner core (nucleus pulposus) hasn’t broken out yet.. During protrusion, the nucleus pulposus begins to impinge on the annulus fibrosus, although the posterior longitudinal ligament that runs along the spine remains intact. In the extrusion stage, the nuclear material breaches the annular fibers, but the posterior longitudinal ligament is still unbroken, preventing the herniated material from fully escaping. Sequestration occurs when the nucleus pulposus escapes through the annulus, disrupting the posterior longitudinal ligament and protruding into the epidural space (Vialle et al. 2015). Each stage of herniation represents a progressively more severe form of disc damage, with sequestration being the most advanced and typically associated with the most severe symptoms (Postacchini F 1999).

Among athletes, weightlifters have been found to have a higher lifetime risk of specific spinal pathologies, including intervertebral disc herniation. Weightlifting is a strength sport that involves lifting maximal loads for a single repetition, often producing some of the greatest power outputs of any human activity. The two primary exercises in competitive weightlifting are the clean and jerk, and the snatch, both of which place immense stress on the spine, particularly in the lumbar region. The nature of these exercises requires weightlifters to lift and stabilize heavy weights overhead, which can result

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in excessive spinal loading and increased risk of injury (Vadalà et al. 2014).Weightlifters commonly damage the discs in their spine by straining their backs while performing these exercises. Improper lifting techniques, such as using back muscles rather than leg muscles to lift the weight, can exacerbate the risk of disc herniation. Disc herniation is more prevalent among weightlifters than in the general population due to the consistent mechanical stress placed on the spine and the microtraumas that occur over time. These microtraumas can accumulate, causing the disc to weaken and eventually herniate if proper recovery and preventive measures are not taken.
Weightlifters who are beginners or are in the early stages of their training are especially prone to intervertebral disc herniation, as they may not yet have developed the proper techniques and conditioning required to safely lift heavy weights. It is crucial for these athletes to learn proper biomechanics and avoid overloading their spines before their bodies are adequately prepared for such stresses. Identifying and addressing any minor pain or discomfort early on can help prevent more serious injuries from developing later.

Understanding the prevalence of intervertebral disc herniation among weightlifters is essential for developing effective preventive strategies and improving long-term spinal health in this population. Weightlifting is a physically demanding sport that places unique stresses on the spine, and without proper precautions, athletes may face a higher risk of chronic spinal conditions. The results of studies focused on the prevalence of disc herniation among weightlifters can help guide training protocols and rehabilitation programs to minimize the risk of injury and ensure that athletes can continue to compete at high levels without compromising their health.

MATERIALS AND METHODS

This was a survey study carried out in which Prevalence of Intervertebral Disc Herniation among Weightlifters was observed.

Participants

In this study,number of total participants were 65. In which 57 male participants and 8 female participants took part. These individuals were chosen based on specified criteria for inclusion and exclusion which is given below.6 subjects aged between 18-20, 33 subjects aged between 21-25, 23 subjects aged between 26-30,3 subjects aged between 31-35. X-ray signs like reduced disc space, traction osteophytes, and compensatory scoliosis often indicate lumbar disc herniation (Al Qaraghli & De Jesus, 2020). X-ray evaluations measure mean, anterior and posterior disc height (Siepe et al. 2012). A focal herniation happens when the damaged part of the disc affects less than half (180°) of the disc's outer edge. In contrast, a disc bulge covers a larger area, between half and the full circumference (180° to 360°). A disc protrusion occurs when the part of the disc that sticks out is smaller in width than the base of the herniation, meaning it’s more like a small bump than a broad bulge (Suthar et al. 2015).
The participating subjects were informed about the study protocol, their rights, and the associated risks of participation before providing written informed consent. This observation was conducted on humans. The observational study was accepted by Institutional Human Ethics Committee of Krishna Institute of Medical Sciences, “Deemed to be University,” Karad.The study was carried out in accordance with the recommendations of the Declaration of Helsinki.Additional precautions were taken by the investigator(s) to protect the volunteers in this study. The selected subjects were asked to undergo MRI and X-ray scan for lateral view.

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Inclusion criteria
Weightlifters in & around karad
Weightlifters with age group between 18 to 35.

Exclusion criteria
Recreational Weightlifters
Weightlifters who are below 18 years of Age.

RESULTS

Table 1. Gender categories

GENDER	COUNT	PERCENTAGE
MALE	57	87.70
FEMALE	8	12.30

Interpretation- Total 65 subjects were taken, from that 57(87.70%) were male and 8(12.30%) were female.

Table 2. Age group

AGE	COUNT	PERCNTAGE
18 - 20	6	9.23
21 - 25	33	50.77
26 – 30	23	35.39
31 - 35	3	4.61

Interpretation- 4 age groups. In that 6 subjects in 18-20 age group. 33 subjects in 21-25 age group. 23 subjects in 26-30 age group. 3 subjects in 31-35 age group. (See Fig.1)

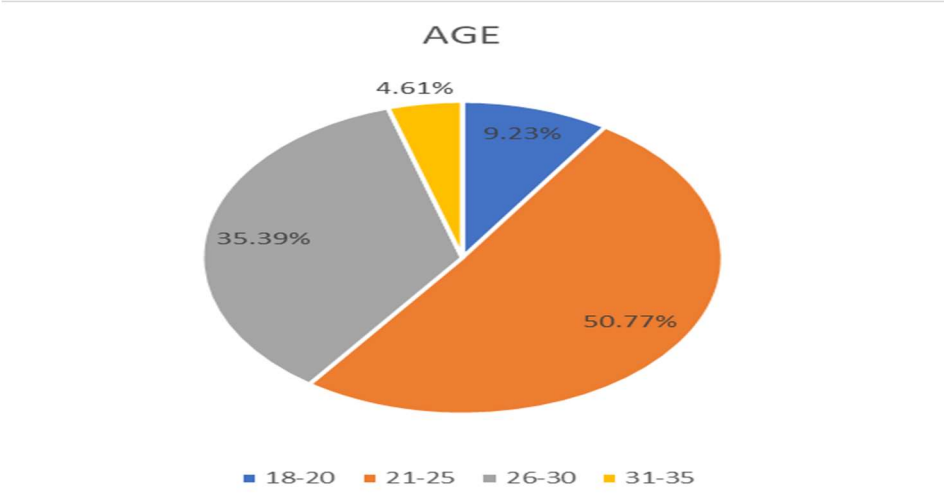

Figure 1. Percentage of Age Groups

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Table 3. MRI changes

MRI CHANGES	COUNT	PERCENTAGE
BULGING	28	43.08
PROTRUSION	12	18.46
NO CHANGES	25	38.46

Interpretation- In MRI changes, 3 criteria are given. Bulging, Protrusion, No changes. There are 28(43.08%) subjects with bulging seen on the MRI. 12(18.46%) subjects with protrusion seen on the MRI. 25(38.46%) subjects seen on the MRI.

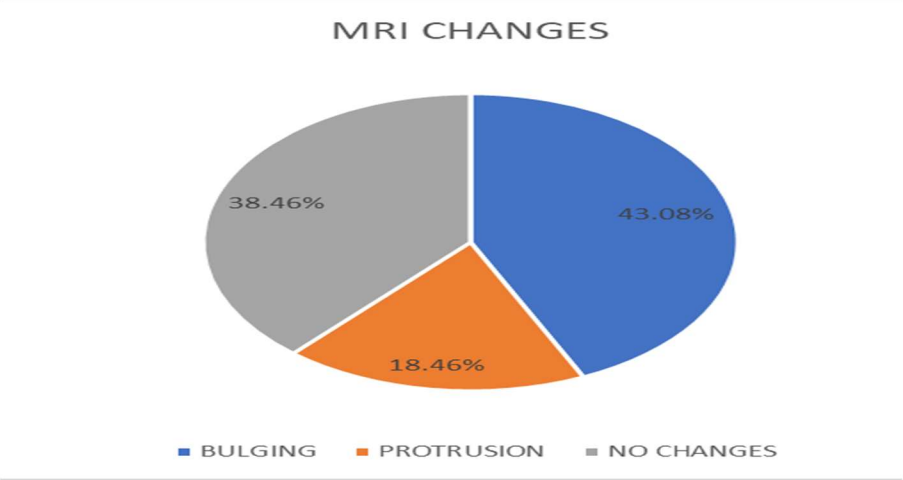

Figure 2. MRI changes

Table 4. MRI changes according to gender.

MRI CHANGES	MALE	FEMALE
BULGING	23	5
PROTRUSION	11	1
NO CHNAGES	23	2

Interpretation-There are 23 male subjects with bulging, 11 male subjects with protrusion, 23 male subjects with no changes. Similarly, 5 females with bulging, 1 female with protrusion, 2 females with no changes.

Table 5. X-ray changes

X-RAY	COUNT	PERCENTAGE
MILD	30	46.16
MODERATE	13	20
NO CHANGES	22	33.84

Interpretation- 3 criteria are given in X-Ray changes. Mild, Moderate, No changes. There are 22(33.84%) subjects with Mild x-ray changes, 30(46.16%) subjects with Moderate changes, 13(20%) subjects with No changes.

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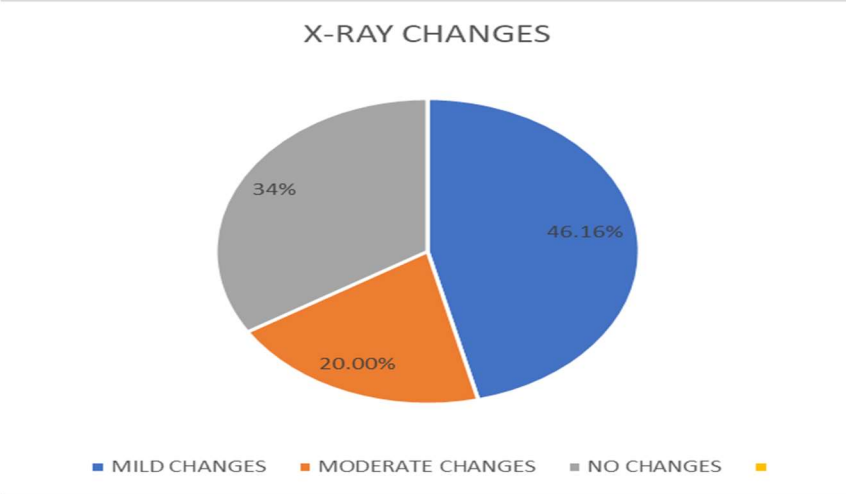

Figure 3. X-Ray changes

Table 6. X-Ray changes according to gender.

X-RAY CHANGES	MALE	FEMALE
MILD CHANGES	26	4
MODERATE CHANGES	12	1
NO CHANGES	19	3

Interpretation- There are 26 male subjects with Mild changes, 12 male subjects with Moderate subjects, 19 male subjects with No changes. Similarly, 4 females with Mild changes, 1 female with Moderate changes, 3 females with No changes.

Figure 4. MRI of 23 yr old male with L5-S1 posterior disc bulge

DISCUSSION

Weightlifting, also referred to as Olympic weightlifting, is a highly competitive strength sport that involves athletes lifting a barbell from the ground to overhead. This discipline primarily includes two main lifts: the snatch and the clean and jerk. In the snatch, the lifter employs a wide grip to raise the

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barbell in one fluid motion, ultimately ending in a deep squat position with arms fully extended overhead. The clean and jerk consists of two distinct phases; the first phase involves lifting the barbell to the front of the shoulders (the clean), while the second phase requires lifting it overhead (the jerk), often using a split stance. These movements are characterized by high-intensity, multijoint actions, resulting in some of the highest peak power outputs seen in sports. Although training philosophies differ around the globe, more research is necessary to determine the most effective training programs tailored to various demographics.A combination of bending, flexing, and rotating movements, along with vibration, can cause tears starting from the center of the disc and extending to the outer layers. This mechanical stress is a key factor in disc herniation, leading to instability in the spine(Sasi et al.2017).
The prevalence of intervertebral disc herniationamong professional weightlifters warrants significant attention due to the considerable stress placed on the spine during high-load exercises like snatches and clean and jerks. The mechanical demands of weightlifting increase the likelihood of disc injuries, particularly for beginners. The risk of injury heightens when proper techniques are not employed, underscoring the importance of early identification and treatment of minor discomfort to prevent serious long-term consequences. Elite athletes experience a notably higher prevalence of symptomatic disc degeneration—75% compared to 31% in nonathletes—due to the extreme physical demands associated with their sport. Lumbar disc herniation presents a distinct clinical challenge among these individuals, as they consistently subject their bodies to intense strain. The prevalence of symptomatic disc degeneration in elite athletes highlights the need for targeted preventive measures and management strategies (Sedrak et al., 2021).Intervertebral disc herniation is a well-documented cause of neck and back pain, especially prevalent among weightlifters due to the mechanical stresses exerted on their spines. While disc herniation is common in the general population, it is particularly pronounced in weightlifters due to the repetitive nature of heavy lifting. This practice can lead to acute injuries and long-term degenerative changes in the intervertebral discs.Disc damage in sports like weightlifting, where there is a huge axial loading on the spine, can be present, and as the time passes it can lead to disc degeneration(Granhed & Morelli 1988).During exercises such as deadlifts, squats, and overhead presses, significant compressive and shear forces are applied to the spine. These actions necessitate effective trunk stabilization, relying heavily on the vertebral column for support.Improper lifting techniques exacerbate the risk of disc herniation. Excessive spinal flexion or inadequate core support during lifting can dramatically increase susceptibility to injury.

Weightlifters are especially prone to herniation in the lumbar and cervical regions, which are more mobile and subject to greater loads during lifting. The intervertebral discs, particularly in the lumbar spine, play a crucial role in absorbing these forces. However, continuous repetitive loading, coupled with poor lifting mechanics, can lead to microtrauma in the discs, ultimately resulting in degeneration or acute herniation(Yamaguchi & Hsu 2019).Beginner weightlifters are particularly vulnerable to disc herniation due to their limited experience and understanding of proper techniques. Many beginners mistakenly use their back muscles more than their leg muscles when performing deadlifts, inadvertently increasing the load on the spine and heightening their risk of injury. Furthermore, the desire to lift heavy weights quickly often leads to poor form, resulting in microtraumas to the discs that fail to heal adequately before the next training session. Despite the risks associated with weightlifting, intervertebral disc herniation is not an inevitable outcome. Education on proper lifting techniques, the importance of core stabilization, and strength training exercises designed to protect the spine are vital preventative strategies. Weightlifters must prioritize using their leg muscles for support during exercises like deadlifts and squats, rather than placing excessive strain on the lumbar spine. Additionally, ensuring adequate recovery time between training sessions is essential for healing microtraumas and preventing long-term degenerative changes in the discs.In cases where disc herniation does occur, rehabilitation

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typically involves a combination of physical therapy, core strengthening exercises, and sometimes non-invasive medical interventions such as spinal decompression therapy or epidural steroid injections to manage pain and inflammation.
A well-rounded rehabilitation program can significantly enhance recovery outcomes and allow athletes to return to their sport more safely.Physical therapists and trainers play an essential role in the rehabilitation process, helping athletes understand their biomechanics and emphasizing the importance of maintaining proper form during training.Additionally, weightlifters typically possess shorter statures and limb lengths, which provide them with mechanical advantages for efficiently lifting heavy loads (Storey & Smith, 2012). Furthermore, specialized programs that incorporate mobility work, strength training, and education on lifting techniques can reduce the likelihood of future injuries.Intervertebral Disc Herniation is a prevalent injury among weightlifters due to the intense and repetitive stress placed on the spine during training. Weightlifters are at higher risk for disc herniation compared to the general population because of the biomechanical demands of their sport, particularly when lifting heavy loads with improper form. By focusing on proper technique, preventative strategies, and early treatment of any symptoms, weightlifters can reduce their risk of developing herniated discs and maintain long-term spinal health. This study emphasizes the susceptibility of the lumbar spine in athletes, with work specifically focusing on the prevalence of disc herniation in weightlifters (Fares et al.2020).

CONCLUSION

The relationship between weightlifting and intervertebral disc herniation emphasizes the critical need for greater awareness and preventive strategies within the sport. Weightlifters, particularly elite athletes and beginners, are at increased risk due to the significant mechanical stresses placed on the spine during high-load exercises. Improper lifting techniques, inadequate core stabilization, and insufficient recovery time can all contribute to the development of disc injuries, especially in the lumbar and cervical regions. To mitigate the risk of intervertebral disc herniation, it is essential to prioritize education on proper biomechanics, correct training techniques, and the importance of recovery.Weightlifters should focus on using their leg muscles rather than overloading the spine, particularly in exercises like deadlifts and squats. Additionally, allowing for sufficient recovery time is crucial to prevent microtrauma from escalating into more severe injuries. Rehabilitation programs tailored to strengthening core stability and improving spinal mechanics can significantly enhance recovery and prevent recurrence.
Continued research into effective training methods and rehabilitation protocols will further reduce the prevalence of disc herniation and promote a safer environment for athletes. By adopting these preventive measures, weightlifters can maintain long-term spinal health and reduce the risk of debilitating disc injuries.

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CONFLICT OF İNTEREST

Authors declare no conflict of interest.

ETHICS STATEMENT

The interventional study was accepted by Institutional Human Ethics Committee of Krishna Institute of Medical Sciences, “Deemed to be University,” Karad (Protocol Number 128/2023-2024)

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