

# Impact of Obesity on Lumbar Disc Herniation

Murtaza Ahmed Khan<sup>1</sup>, Abdul Hameed<sup>2</sup>, Abdul Qadeer Khan<sup>3</sup>, Muhammad Danish Shafiq<sup>4</sup>, Talha Abbas<sup>5</sup>

<sup>1,5</sup>Post Graduate Trainee, Department of Neurosurgery, Sir Ganga Ram Hospital, Lahore

<sup>2</sup>Head of Department, Neurosurgery, Sir Ganga Ram Hospital, Lahore

<sup>3</sup>Post Graduate Trainee, Department of Radiology, PAF Hospital, Islamabad

<sup>4</sup>Assistant Professor, Department of Neurosurgery, Sir Ganga Ram Hospital, Lahore

## ABSTRACT

**Background:** Prevalence of obesity is increasing worldwide and obese patients constitute a major portion of the spinal surgeon's practice. The patients with lumbar disc herniation present the most in the outpatient department of neurosurgery. Obesity not only leads to the disc herniation but also causes a surgeon a difficult ordeal while operating as it leads to more peri-operative complications than normal weight patients. This cross-sectional study was planned to see the impact of obesity on lumbar disc herniation and its association with disease outcome.

**Methodology** This study was conducted in the department of neurosurgery at Sir Ganga Ram Hospital/ Fatima Jinnah Medical University ( $N=604$ ; Males:  $n=368$  Females:  $n=236$ ) from December 15<sup>th</sup> 2021 to July 31<sup>st</sup> 2022. From the prospective registry, patients undergoing unilateral fenestration and discectomy, bilateral partial laminectomy and discectomy, and endoscopic discectomy were identified with complete BMI data.

**Results:** In total 604 patients, 368 were males and 236 were females, with age range 25-55 years with  $\pm 4.9$  SD. Among these 187 (30.9%) were managed surgically while 417 (69.1%) patients were managed conservatively, which were assessed on VAS (Visual Analogue Score) and Sciatica Bothersomeness Index (SBI). Among them 87 patients (20.8%) patients were of normal weight, 145 (34.77%) were overweight and 185 (44.36%) were obese. Among 187 patients who underwent surgery; 74 (39.5%) underwent unilateral fenestration and discectomy, 113 (60.4%) underwent bilateral partial laminectomy and discectomy whereas 16 patients (8.5%) underwent endoscopic discectomy. Lumbar Disc Herniation (LDH) was more frequent in obese and overweight individuals than in normal-weight patients.

**Conclusion** It was observed that in obese and overweight patients, the severity of pain was more as compared to normal patients. Higher the BMI more the excruciating pain and more neurological were seen with increasing trend of numbness and radiculopathy. Hence, obesity may have a robust impact on lumbar disc herniation apart from other pathologies involved.

**Key words:** Discectomy, Disc herniation, Laminectomy, Lumbar region, Obesity.

### Authors' Contribution:

<sup>1,2</sup>Conception; Literature research; manuscript design and drafting; <sup>2,3</sup> Critical analysis and manuscript review; <sup>4,5</sup> Data analysis; Manuscript Editing.

### Correspondence:

Murtaza Ahmad Khan  
Email: ma40236344@gmail.com

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## Introduction

The prevalence of obesity in adults is increasing and is now considered as pandemic. Overweight, commonly defined as BMI ranging from 25 to 30

kg/m<sup>2</sup> while BMI more than 30 kg/m<sup>2</sup> is considered as obese. According to World Health Organization, the incidence of obesity has almost tripled since 1975 globally. It is now considered as a serious health issue as it affects quality of life and it

increases mortality and morbidity. According to the world health organization, there is an emerging epidemic of obesity currently in Pakistan and 26% of women and 19% of men are obese with highest prevalence in urban.<sup>1</sup>

Among the spinal degenerative diseases, lumbar disc herniation is the most common pathology and is considered as the principal cause of spinal surgery in adult population.<sup>2</sup> It is now considered as a worldwide health problem because of the debility it causes. They mostly occur in the fourth and fifth decades of life, although being described in all age groups.<sup>3</sup> Lumbar disc herniation is mostly the result of gradual age-related wear and tear phenomenon known as disc degeneration. Multiple risk factors are identified in the pathogenesis like obesity, weight lifting, smoking, genetics, frequent driving, sedentary life style, incorrect posturing while working for prolonged hours, sudden straining or twisting and trauma. The most common presentation of patients with lumbar disc herniation is lumbalgia and sciatica, apart from cauda equine syndrome and focal neurological deficit.<sup>4</sup>

The link between obesity and LDH has been given a very little attention despite a strong recognized impact of obesity on multiple musculoskeletal conditions. In numerous previous studies, the impact of obesity on lumbar spinal disorders like low back pain, protruded intervertebral disc, facet joint degeneration has been reported.<sup>5,6</sup> The patients with lumbar disc herniations are routinely encountered in outpatient department. Some of them have single level herniation and some come with multiple level herniations. The management of lumbar disc herniation; whether surgical or conservative is challenging in young adults since surgical indications are restricted, even though the surgical outcome shows good result. The most frequent indications of spinal surgery are excruciating pain that hampers the daily life activities, unresponsiveness to conservative management, presenting with a neurological deficit and cauda equina syndrome.<sup>7</sup> The impact of obesity

on musculoskeletal system has significant importance, the present study was thus planned to observe the link between lumbar disc herniation and obesity.

## Methodology

This cross-sectional study was conducted in the department of neurosurgery, Sir Ganga Ram Hospital/ Fatima Jinnah Medical University (SGRH/ FJMU) from 15<sup>th</sup> December, 2021 to 31<sup>st</sup> July, 2022. The study has considered all the ethical requirements and was approved by the institutional ethical review board. The data were collected from all the patients who were managed conservatively and from patients undergoing unilateral fenestration and discectomy, bilateral partial laminectomy and discectomy, and endoscopic discectomy.

BMI from 18- 25 was normal while BMI>25 was defined over weight, BMI>30 as obese.

The diagnosis was made on clinical evaluation and MRI. All the adult patients of either gender presenting with lower back pain which were diagnosed as lumbar disc herniation after clinical evaluation and radiological investigation (MRI) done. Extreme of ages and other all spinal pathologies were excluded. The patients that were managed conservatively were categorized as normal, overweight and obese. Backache whether radiating to the lower limb or non-radiating was used in the study to assess the rate of the symptom severity in lumbosacral radiculopathy. Sciatica Bothersomeness Index (SBI) and Sciatica Frequency Index were used in this study for clinical and research purpose. The score of bothersomeness and frequency of the radiating symptoms of both indices consist of 4 radiating symptoms each.<sup>8</sup> The severity and intensity of backache and leg pain were assessed through visual analogue scale (VAS). VAS has a fixed straight horizontal line usually 100mm and its ends are defined as the extreme limits of the

symptoms (pain) with the right end as “maximum pain” and the left end as “no disability.”<sup>9</sup> The patients were evaluated with a comprehensive history and physical examination. The severity of disability and pain were assessed by Visual analogue scale (VAS) and Sciatica Bothersomeness Index (SBI). The patients undergoing surgical management were based on (1) if the patient is unresponsive for the conservative management for 6 weeks, (2) excruciating pain hampering daily life activities, (3) cauda equina syndrome, (4) neurological deficit (MRS grade≤3) The patients who underwent surgery were also categorized as normal, overweight and obese.

SPSS, version 23.0 was utilized to analyze data. Descriptive statistics were used to summarize the demographics and clinical parameters of the participants. The Shapiro-Wilk test was used to assess the normality of the data, while the Levene test was used to assess the homogeneity of variances among groups. Internal consistency was measured using Cronbach’s alpha. An independent t-test was used to compare measurable outcomes at baseline. P value of <0.05 was taken as statistically significant.

## Results

In total 604 patients, 368 were males and 236 were females, with age range 25-55 years with ± 4.9 SD. Among these 187 (30.9%) were managed surgically while 417 (69.1%) patients were managed conservatively.

Table one shows baseline characteristics of patients. Figure I show that the prevalence of surgery is more in overweight and obese patients in comparison to normal weight patients. Figure II shows that the prevalence of LDH is more in overweight and obese patients in comparison to normal weight patients although they were managed conservatively. Table II demonstrates the association between the outcomes of variables used in the study that were

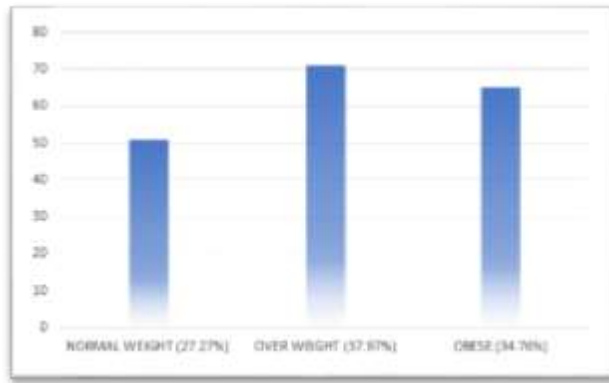
the severity of pain when compared between obese and normal patients with VAS and SBI. The patient who were overweight and obese they had significantly higher values of VAS and SBI

**Table I: Baseline Characteristics of study patients (n= 604)**

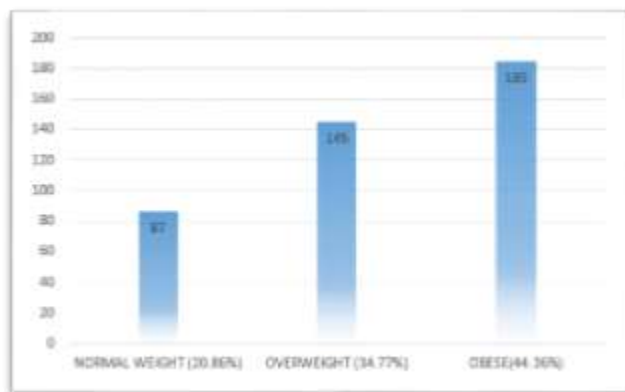
Age (years)	25-55 (± 4.9)
Gender	
Males	368
Females	236
BMI of patients managed surgically	
18-25	51
25-30	71
>30	65
Surgery done	187
Unilateral fenestration and discectomy	
Bilateral partial laminectomy and discectomy	
Endoscopic discectomy	
Level of herniations in surgical patients	
Single level herniation	
L1 / L2	01
L2 / L3	0
L3 / L4	03
L4 / L5	96
L5 / S1	87
2 or more level herniations	06
Treatment Plan	
Conservative Management	417
Single level herniation	261
L1 / L2	00
L2 / L3	03
L3 / L4	01
L4 / L5	121
L5 / S1	136
2 or more level herniations	156

**Table II: Comparison of LDH with respect to VAS, SBI, & BMI (n=604)**

	A	Normal Weight	Overweight	Obese
VAS Scores	.95	4.81 ± 1.23 (p<.05)	6.21 ± 1.53 (p<.05)	7.49 ± 1.42 (p<.05)
SBI Scores	.87	8.63 ± 3.42 (p<.05)	10.59 ± 3.59 (p<.05)	12.51 ± 4.25 (p<.05)



**Figure 1: Patients who underwent surgery for LDH with their BMI ranges**



**Figure 2: Patients Conservatively Managed and their BMI Ranges**

. Obese and overweight patients had more severity of pain as compared to normal patients. Higher the BMI more the excruciating pain and more the neurology was affected and there was seen increasing trend of numbness and radiculopathy.

## Discussion

Lumbar disc herniation is the important cause of radiculopathy, sometimes associated with neurological deficits. Literature review has shown a positive relationship between increased BMI and lower back pain.<sup>10</sup> The etiology of sciatica has multiple factors but the strong factors involved are the direct compression of the nerve root by mechanical stimulation caused by the protruded

disc and the cascade of inflammatory phenomenon induced by extruded nucleus.<sup>11</sup> The patients being assessed in our study on SBI and VAS demonstrated that higher the weight more prone to the lumbalgia and sciatica. In our study, the patients were either managed surgically or conservatively; overweight and obese patients were more prone to the lumbar disc herniation. Current literature also demonstrated a strong association between obesity and LDH. The person who has higher BMI is two folds more prone to low back pain as compared to the person with normal BMI and there is a proposed mechanism also suggested in different studies.<sup>12-14</sup> Higher the BMI, there would be increased mechanical load on spine and the higher compressive force during various different physical activities. Secondly obesity makes the person vulnerable to chronic systemic inflammation and injuries that lead to the elevation of systemic pro-inflammatory cytokines like IL-6, TNF- $\alpha$  etc. leading to increased pain.

The results of current study also demonstrated that the patients who underwent surgical management were falling more into the category of BMI  $\geq$  25. In the literature review, some studies have shown the a between obesity and increased surgical management for lumbar disc herniation.<sup>15,16</sup> Higher the BMI, more neurological effects and deterioration of symptoms, that leads the management from conservative to surgery. Apart from this patient who were obese mostly had multilevel issues rather than a single level herniation. The results of this study also demonstrated that overweight and obese patients had considerably higher values of VAS and SBI compared to normal-weight patients. Moreover, individuals with higher BMI experienced more severe pain. These findings align with previous research that has established a link between obesity and increased pain intensity in various musculoskeletal conditions, including lumbosacral radiculopathy. It was found that higher BMI was associated with greater low back pain and sciatica

symptoms.<sup>17</sup> Similarly, systematic reviews showed obesity was a risk factor for the development and progression of sciatica.<sup>18</sup>

The association between BMI and neurologic symptoms, such as numbness and radiculopathy, further supports the notion that obesity can have detrimental effects on nerve function. As the BMI increases, the potential for nerve compression and irritation also rises, leading to a higher likelihood of sensory disturbances and radicular pain.<sup>19</sup> The current study underscores the significance of weight management and addressing obesity as part of the treatment approach for patients with radicular pain. By reducing excess weight, it may be possible to alleviate the burden on the spine, mitigate nerve compression, and potentially improve symptom severity and quality of life for individuals with lumbosacral radiculopathy.

## Conclusion

- Obesity is a significant risk factor for Lumbar disc herniation, it is thus important to reduce weight so that the chances of lumbar disc herniation are minimized.
- Obese patients have more tendency to undergo surgical intervention than normal weight patients.
- Future research in this field should examine measures to minimize the complication rates in the obese patients as well as the effect of controlled weight loss before surgery on complications and outcomes.

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