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# The Etiologies of Low Back Pain in Patients With Lumbar Disk Herniation

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**Background:** Low back pain (LBP) is a common complaint in population that lowers the quality of life. The main etiology of LBP is recognized in about 20% of patients while it is attributed to lumbar disk herniation (LDH) in 80% of cases and causes some unnecessary lumbar surgeries without realizing the definite cause.

**Objectives:** This study was planned to evaluate the etiologies of LBP in patients who had LDH to clarify whether the disc herniation is the main cause of patients' pain or other diseases were responsible for this kind of pain.

**Materials and Methods:** In this cross-sectional study, we analyzed the medical profiles of the patients with proven LDH in a private clinic in Mashhad City, Iran, between 2005 and 2012, for demographic and the etiologies of LBP with clinical and paraclinical studies. We also calculated the incidence of each etiology by SPSS 13.

**Results:** In our study, among 1250 patients with proven LDH by MRI, 500 patients (40%) had chronic LBP and the most common causes of LBP were heavy constant working (40.2%), osteoporosis (35.6%), and sacroiliac joint pain (34.6%), consecutively. Interestingly, LDH had the ninth rank among the common cause of LBP.

**Conclusions:** In this study, we found that in spite of previous beliefs, discopathies were not common etiologies of LBP. Thus, even in patients with proven LDH by imaging studies, the physician should perform a thorough evaluation for other causes of LBP to avoid unnecessary lumbar surgeries.

**Keywords:** Low Back Pain; Intervertebral Disc; Lumbar Disc Herniation

## 1. Background

Intervertebral disc (ID) is composed of two main structures, namely, annulus fibrosus and nucleus pulposus, which is a gelatinous nucleus of the disc, and the whole disc is placed between two vertebrae. ID is in charge of bearing loads on the spinal column by its elastic property (1, 2). Disc herniation (DH) is a common disease with the most common site of involvement being lumbar region, excessive stress on ID in addition to susceptibility of the patient lead to rupture of annulus fibrosus, which surrounds gelatinous nucleus pulposus. Consequently, the nucleus pulposus is getting out from the posterior or posterolateral margin of ID and compresses the neural elements (3). This disorder is more common in younger patients and middle-aged ones; in contrary, disc degeneration is more common in the elderly (4). The extruded nucleus pulposus compresses its surrounding neural elements such as nerve roots and sometimes spinal cord and other structures such as musculoskeletal tissues. Therefore, it causes an acute and sometimes chronic and recurrent pain in lower extremities and back, which apparently lowers the patients' level of function and the quality of life (5). It should be mentioned that the pain of lumbar DH (LDH) is more prominent in lower extremities rather than the back

region, except in the central ones (6). However, because of the high incidence of LBP in the population, which is experienced at least once by 80% of people in their lifetime, (7) LBP is usually in association with LDH and, hence, is attributed to it. In other words, it is ignored that they might be just an association and not necessarily a cause and effect phenomenon. according to the literature, the main cause of LBP is realized just in 20% of the patients (8) and is attributed to LDH in other cases, which leads to some worse complications (9,10). Since LBP has a wide spectrum of etiologies from simple etiologies including heavy body weight, loss of adequate movement, inappropriate movements, lifting of heavy weights, and strain/sprain to serious ones including sacroiliac joint diseases, osteoarthritis, osteoporosis, compressive fractures of vertebrae, inflammatory causes such as rheumatoid arthritis, infectious diseases such as brucellosis and tuberculosis, malignancies, and congenital disorders such as kyphoscoliosis (9, 11-14). If these etiologies were ignored, the patient would be affected with their horrible complications. Furthermore, if LBP was attributed to LDH without any evaluation, the patient might have to burden an unnecessary operation without any recovery of pain because the main etiology of pain

was remained undiscovered and was not treated properly. Therefore, it is necessary for a physician to evaluate the patients with LBP and LDH thoroughly to discover the other probable causes of LBP according to their age and sex. This strategy will lead to avoid unnecessary surgeries and complications and to determine the main etiology of LBP and treating the patient properly; thus, it will reduce the expenses of the treatment and imposes expenses to governments by decreased patients' level of function.

## 2. Objectives

This study was planned to evaluate the etiologies of LBP in patients who had LDH to clarify whether the disc herniation is the main cause of patients' pain or other diseases were responsible for this kind of pain.

## 3. Materials and Methods

This cross-sectional study was performed in one of the private clinics of Mashhad City, Iran, between 2005 and 2012. We evaluated the medical profiles of patients with LBP and proven LDH with magnetic resonance imaging (MRI) and a self-reported demographic questionnaire. Each patients was asked about experiencing chronic LBP. A thorough history was taken and all physical examinations, which were related to different causes of LBP, were performed at the time of admission and were recorded in their medical profile. The physical examinations included the examination of the patients in different positions

(sitting, recumbent, and standing) plus radiologic evaluations such as plain X-ray, computed tomography (CT), and MRI. Moreover, samples were obtained for laboratory tests including complete blood count, urine analysis, and urine culture. The height and the weight of the patients were recorded. When it was necessary, we consulted with gynecologists and psychiatrists about the revealed signs in some patients. Then we evaluated our data about the incidence of each causes of LBP and their association with demographic properties of each patient with proven LDH through MRI. SPSS 13 (SPSS Inc. Chicago, IL, USA) was used for statistical analysis and a P value  $\leq 0.05$  was considered as statistically significant.

## 4. Results

We evaluated 1250 patients with LBP and proven LDH by MRI. Among them, 500 patients (40%) including 293 females and 207 males (age range, 16-76 year) had chronic LBP. The mean age of these patients was  $38.2 \pm 15.4$  years and they were divided to four age groups, < 30, 30 to 44, 45 to 59, and  $\geq 60$  year old. The etiologies of LBP in these patients with LDH are listed in Table 1. The most common causes of LBP were consecutively persistent heavy working (40.2%), osteoporosis (35.6%), sacroiliac joint diseases (34.6%), and LDH (13.4%). Interestingly, LDH had the ninth rank amongst the most common etiologies of LBP. It is very important to mention that in most cases, different causes were diagnosed for their LBP.

**Table 1.** The Etiologies of LBP in These Patients With LDH<sup>a</sup>

Diagnosis	General Evaluation	Evaluation According to Sex		Evaluation According to Age Group			
		Female	Male	< 30 y/o	30-44 y/o	45-59 y/o	$\geq 60$ y/o
Heavy Persistent Working	201 (2.40)	84 (6.28)	117 (5.56)	59 (7.45)	93 (2.63)	35 (9.28)	14 (5.13)
Osteoporosis	178 (6.35)	136 (4.46)	42 (2.20)	1 (7.0)	5 (4.3)	76 (8.62)	96 (2.93)
Sacroiliac Joint Pain	173 (6.34)	82 (9.27)	91 (9.43)	51 (5.39)	65 (2.44)	43 (5.35)	14 (5.13)
Strain/Sprain	147 (4.29)	64 (8.21)	83 (0.40)	63 (8.48)	44 (9.29)	31 (6.25)	9 (7.8)
Knee And Facet Joint Arthrosis	139 (8.27)	74 (2.25)	65 (4.31)	5 (8.3)	21 (2.14)	38 (4.31)	75 (8.72)
Heavy Body Weight	121 (2.24)	65 (1.22)	56 (0.27)	39 (2.30)	41 (8.27)	30 (7.24)	11 (6.10)
Psychogenic Pain	91 (2.18)	64 (8.21)	27 (0.13)	24 (6.18)	20 (6.13)	22 (1.18)	25 (2.24)
Axial Spine Malfunction	68 (6.13)	37 (6.12)	31 (9.14)	43 (3.33)	20 (6.13)	4 (3.3)	1 (9.0)
Central Disc Herniation	67 (4.13)	30 (2.10)	37 (7.17)	18 (9.13)	34 (1.23)	13 (7.10)	2 (9.1)
New Trauma	42 (4.8)	14 (7.4)	28 (3.13)	13 (0.10)	12 (1.8)	12 (9.9)	5 (8.4)
Inflammatory Diseases	28 (6.5)	12 (0.4)	16 (7.7)	17 (1.13)	10 (8.6)	0 (0)	1 (9.0)
Tumors	22 (4.4)	9 (0.3)	13 (2.6)	1 (7.0)	4 (7.2)	5 (1.4)	12 (6.11)
Urinary Tract and Pelvic Infection	12 (4.2)	10 (4.3)	2 (9.0)	5 (8.3)	6 (0.4)	1 (8.0)	0 (0)
Visceral Pain	7 (4.1)	2 (6.0)	5 (4.2)	0 (0)	1 (6.0)	4 (3.3)	2 (9.1)
Facet Joint Syndrome	3 (6.0)	1 (3.0)	2 (9.0)	1 (7.0)	1 (6.0)	0 (0)	1 (9.0)
Pelvic Diseases	2 (4.0)	2 (6.0)	0 (0)	0 (0)	1 (6.0)	1 (8.0)	0 (0)
Undetermined	11 (2.2)	6 (0.2)	5 (4.2)	3 (3.2)	4 (7.2)	3 (4.2)	1 (9.0)
<b>Total</b>	<b>500</b>	<b>293</b>	<b>207</b>	<b>129</b>	<b>147</b>	<b>121</b>	<b>103</b>

<sup>a</sup> Data are presented as No. (%).

Then we evaluate the patients according to their sex and age groups. We concluded that the most common cause of LBP in women were osteoporosis (46.4%), heavy working (28.6%), and sacroiliac joint disorders (27.9%), consecutively, whereas in men the most common causes were heavy working (56.5%), sacroiliac joint disorders (43.9%), and sprain/strain (40.4%), consecutively.

the most common cause of LBP was sprain/strain (48.8%) in age group of < 30 years, heavy working (63.2%) in those between 30 to 44 years of age, and osteoporosis (62.8%) in those  $\geq$  45 years of age.

## 5. Discussion

In this study, the most common cause of LBP in patients with proven LDH, especially in men, were consecutively heavy working, osteoporosis, and sacroiliac joint malfunctions. This result was similar to the result of a study on Irish farmers in which the main cause of LBP was some heavy workings such as lifting, pushing, or pulling the heavy objects (15). Moreover, in another study on Chinese workers, the forward flexion of the neck for a long time, bending of trunk for lifting heavy objects, and the relentless working without resting were common causes of LBP (16). Therefore, different studies have presented heavy working as the cause of LBP and they name this kind of LBP as nonspecific LBP (17).

Our result about sacroiliac joint disorders, as another important cause of chronic LBP, was in agreement with other studies, especially in LBP without radicular pain. they mention this etiology as 15% to 30% of causes of LBPs. Risk factors for these kinds of disorders include the difference in height of legs, old age, inflammatory arthritis, the history of previous spine surgeries, pregnancy, and trauma (7, 18).

However, some studies showed the disorders of the ID, with the prevalence of 40% to 56% of all cases, as the most common cause of LBP. Nonetheless, in most discopathy pains, LBP has been attributed to the disc degeneration without herniation (7, 19, 20). In these cases, the diffusion of proteoglycans of nucleus pulposus and therefore, chemical irritation of the annulus fibrosis nerves (21) and release of interleukins 1, 6, and 8 are responsible for this chronic pain (22). In general, LBP due to LDH is less common than LBP due to disc degeneration (23-25). In our study, LDH was the ninth cause of LBP and hence, evaluating other causes of LBP in a patient with proven LDH should not be ignored. epiphyseal joints dysfunction is another relatively common etiology of LBP, which should not be missed (7).

Rather than the causes of LBP, which mentioned before, one should not forget the serious but rare causes of LBP such as vertebral fracture, which was responsible for 0.7-4.5% of the etiologies of LBP in primary care centers and 6.5-11% of all causes of LBP in emergency centers. Risk factors for vertebral fracture are old age, severe trauma and consuming corticosteroids (26).

One of other rare causes of LBP is malignancy, especially primary tumors. According to some studies the inci-

dence of this issue as the cause of LBP is about 0 to 0.66% (13, 27, 28). However in our study 4.4% of patients had malignancy, which is higher than what reported before, it highlights this fact that we have to be more sensitive about this diagnosis as the cause of LBP even in patients who have proven LDH. According to the previous studies the most important risk factor of the existence of malignancy as the cause of LBP is the history of cancer in the patient, but other risk factors like age more than 50 year old, insidious progression of LBP and not responding to treatment after one month medication are not reliable enough and have a high rate of false positive (28).

The most difficult issue in finding the main cause of LBP is diagnosis of a malignancy, while attributing LBP to LDH is the most common pitfall in these kinds of patients. For instance, one patient with LBP who had 2 levels of pathologic fracture according to his MRI, was operated because of his LDH, and during surgery, the surgeon found a tumoral lesion which finally diagnosed as non-Hodgkin's Lymphoma (29). Although it should be mentioned that there are lots of reports about the patients who were operated with initial diagnosis of spinal tumor but during surgery it was realized that the patient had another pathology, for example, in a patient who had an extradural lesion in his MRI which seemed to be a tumoral lesion, the surgeon during surgery confronted with a huge DH, which was spread from right half of L1-L2 disc to L3-L4 level (30). Finally, the malignancy was a difficult differential diagnosis of LBP.

Moreover, some causes of LBP are extremely rare. One of this causes is attachment of transverse processes of lumbar vertebrae together, which is often seen in middle-aged persons and can be due to trauma and congenital disorders (31). In another study, lumbar muscular triangle herniation in four patients was introduced as the cause of LBP (32). In addition, pelvic hydatid cyst with compression on sciatic nerve was reported as the cause of LBP in a 54-year-old woman, which did not respond to routine treatments; in this case, the pain was completely relieved after surgery and prescribing albendazole (33). In another case report, a 32-year-old woman with LBP for two months without any neurological deficit was reported; after adequate imaging and biopsy, she was treated conservatively with the diagnosis of eosinophilic granuloma (34).

Vertebral osteomyelitis is another scarce etiology of LBP, which commonly occur in vertebral body; however, it has been reported in posterior elements of lumbar vertebrae of a 14-year-old boy with back pain, fever, gait difficulty, and motor weakness (35). In another case report, facet joint septic arthritis was determined as the cause of LBP (19). Interestingly, in another case report, a patient presented with acute LBP and a DH-like lesion in his imaging; however, it was realized that the cause of his LBP was iliac vein thrombosis (due to Inferior vena cava anomaly) during surgery. In this patient, the disease was in the background of coagulopathy (factor V laden) and the symptoms and signs of this patient improved with anticoagulant and anti-inflammatory drugs (36).

In most cases of LBP, especially in the youth, clinical and paraclinical studies often reveal lumbosacral malformations such as occult spina bifida and traditionally, these malformations are considered as the cause of LBP. On the other hand, in a large study on 5000 soldiers with mean age of 19 years old, it was realized that the incidence of these malformations in patients with LBP was about 17.5% and they did not find any significant association between these malformations and LBP (37).

Some studies have focused on risk factors of LBP rather than evaluating a wide variety of its etiologies. According to these studies, risk factors that affect LBP are genetic susceptibility (38), height (16), job (16), the extent of farmland in farmers (15), low PH in ID (39), general medical condition (15), and neuropsychologic status of the patient (40). In one of these studies, three mechanisms were described for the association between low PH of ID and LBP: 1) LBP due to increasing of Lactate in muscles; 2) LBP due to nerve root irritation following low PH; and 3) LBP because of neuronal death in low PH (39).

In another study, it was shown that 65% of the patients with chronic LBP had significant disability, and three causes of their disability, which were modifiable, were occupation status, self-confidence, and depression. Obviously, if therapeutic treat these disorders, he or she can significantly help the patient in relieving the patient's pain (40). Another study considered LBP as a multifactorial disorder and in association with anxiety and depression. They also mention that functional and structural changes in central nervous system such as gray matter atrophy in the centers of pain processing, i.e. prefrontal dorsal cortex, thalamus, and middle cingulate gyrus, were responsible for LBP and the patients may become more sensitive to pain in comparison to normal population. Although the results of psychiatric tests had no relation with these structural and functional changes in central nervous system, transcranial stimulation in combination with routine treatments for LBP were recommended for increasing the quality of life in these patients (41, 42).

Our study demonstrated that in spite of some previous beliefs in discopathies, especially LDH, as the leading cause of LBP was not necessarily true. In addition, the most common causes of LBP are some nonspecific causes such as heavy working and inappropriate positions during working, which can be simply corrected with simple exercises and cautions (17). Moreover, we have to exclude rare but serious diseases of the spine such as compression fractures and malignancies with taking a thorough history and performing physical examination. Physicians should not rapidly relate patients' LDH to their LBP. It should be mentioned that among clinical examinations, straight leg rising test (SLR) has the highest sensitivity, whereas cross SLR has the highest specificity. Therefore, it is more justified to use both tests (22). Notably, sometimes dissociation between the result of physical examination and MRI findings in diagnosing discopathy poses some difficulties (22).

Finally, we concluded that even after proving the dis-

copy in a patient with LBP, we have to evaluate the patient thoroughly for excluding other causes of LBP. Obviously, this strategy results in avoiding unnecessary surgeries and helps to find the exact problem of the patient and its proper treatment.

## Authors' Contributions

Fariborz Samini: study concept and design; Mohammad Gharedaghi: analysis and interpretation of data; Mahdi Khajavi: Acquisition of data; and Mohamad Samini: drafting the manuscript.

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آموزش نرم افزار Word برای پژوهشگران

آموزش نرم افزار Word  
برای پژوهشگران