

Risk Factors of Prolapse Lumbar Intervertebral Disc (PLID): A Synthesis of Short Review

Md Nazmul Hassan¹, Parvin Akter², Mohammad Anwar Hossain³

¹MSc in physiotherapy, Clinical Physiotherapist, ²MSc in physiotherapy, Clinical Physiotherapist, ³Senior Consultant Physiotherapist, Associate Professor and Head, Department of Physiotherapy, Centre for the Rehabilitation of the Paralysed (CRP), Savar, Dhaka, Bangladesh

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Abstract

Introduction: LDH, defined as the localized displacement of disc material beyond the margins of the intervertebral disc space is considered the most common cause of lumbosacral radiculopathy. Compared with nonspecific low back pain without radiating leg pain, LDH is associated with radiating pain/ radiculopathy, severe pain, disability, healthcare use and intervention.

Objectives: To explore the risk-factors associated with PLID/ LDH.

Literature: In this review, best evidence synthesis included systemic reviews, cohort studies and case-control studies that investigated the risk factors for LDH/ PLID.

Critiques: LDH with radiculopathy results from complex relationships between individual, behavioural, and work-related variables. Evidence revealed that- age, sex, education, BMI, cardiovascular risk factors, smoking, occupational lumbar load by forward bending postures and manual materials handling, perceived risk of work injury, decision freedom at work, regular or irregular three-shift work or regular night work in and time pressure at work are associated with the development. It is also found that manual occupation, genetics, and previous back pain may contribute to the development of LDH with radiculopathy in adults.

Conclusion: Although the literature is varying quality and heterogeneous, but the evidence revealed that LDH/ PLID is an important source of pain and disability in society. Future research should focus on prospective designs examining modifiable risk factors and prevention strategies.

Keywords: PLID; Lumbar Radiculopathy; Associated risk factors.

Corresponding Author: Md Nazmul Hassan, MSc in physiotherapy, Clinical Physiotherapist, Department of Physiotherapy, Centre for the Rehabilitation of the Paralysed (CRP), Savar, Dhaka, Bangladesh.

Mobile: +880 1918 032333

E-Mail: hassan.crp@gmail.com

Background

Low back pain is a leading cause of disability and associated with a large economic burden on individuals, industry and society.¹ Radiculopathy due to lumbar disc herniation (LDH) is one of the most recognizable presentations of low back pain. The diagnosis is typically based on a combination of symptoms and signs suggesting lumbar spinal nerve root compression or irritation, such as nerve root tension signs, neurologic deficits, and advanced imaging findings that correlate with the clinical syndrome.²

LDH, defined as the localized displacement of disc material beyond the margins of the intervertebral disc space,³ is considered the most common cause of lumbosacral radiculopathy.⁴ Compared with nonspecific low back pain without radiating leg pain, LDH with radiculopathy is associated with greater pain, disability, healthcare use and intervention.⁵

Previous studies of symptomatic LDH have reported a point prevalence of about 5% among the general adult population⁶ varying by sex and age. In people aged 25–55 years, 95% of symptomatic herniated discs occur at the lower lumbar spine (L4-L5 and L5-S1 levels).⁷ However, we know very little about the incidence of LDH and therefore risk factors are not well understood.

The objective of this review was to synthesize the best available evidence on the incidence and determinants of LDH with radiculopathy. Our aim was to create a baseline of the best scientific evidence to inform clinicians, researchers and policymakers about the risk factors of LDH/ PLID.

Review of Literature

In this review, best evidence synthesis included systemic reviews, cohort studies and case-control studies that investigated the risk factors for LDH/ PLID.

Age: Incidence of LDH with radiculopathy increases with age, peaking about the fourth and fifth decades of life, and then decreases in later life.^{8,9}

Gender: Men have more risk than women.^{8,10} Although, one study found no association between

gender and the development of LDH with sciatica in Finnish forestry workers.⁹

Education: Incidence of LDH with radiculopathy decreases with years of education.⁸ Another study found no association between education and the risk of LDH.¹¹

Income: The evidence linking income and the risk of hospitalized LDH varies in one to another study. In their Phase III analysis, Leino-Arjas and colleagues found an increased incidence of hospital care due to LDH across lower quintiles of personal net income compared to the highest quintile.⁸

Socioeconomic status: One study found a higher risk among middle class men.¹² Another study reported some indication of an association between higher social class and LDH in women, but no association in men.¹³

Race: Preliminary evidence from two studies suggests that race is not associated with the incidence of LDH with radiculopathy.¹³

Occupation: It is preliminary evidence that manual occupations are associated with the risk of LDH with radiculopathy. One study reported a greater risk for LDH with radiculopathy in male concrete workers compared with male house painters,¹⁴ in female assistant nurses compared with all Danish females. in machine operators and carpenters compared with office workers,¹³ and in manual occupations compared with upper white-collar occupations.¹⁵

Body mass index and obesity: The association seems to differ in women and men where women, evidence from two studies^{8,16} indicates that the incidence of LDH with radiculopathy increases with obesity but not in men. However, three studies found a positive association in men.

Genetics: Five studies reported an increased risk of LDH for polymorphisms and sequence variations (mutations) involving inflammatory mediator;¹⁷ cartilage collagen genes;¹⁸ intervertebral disc extracellular matrix protein genes, the human sickle tail gene and, the cartilage intermediate layer protein gene.¹⁹

Cardiovascular risk factors: one study revealed that cardiovascular risk factors, including diabetes, high cholesterol, hypertension, and a family history of coronary heart disease, are associated with an increased risk of LDH with radiculopathy in women,²⁰ and no study examined these associations in men.

Muscular strength: Preliminary one study suggests that back and abdominal musculature strength is not associated with the incidence of LDH with radiculopathy.¹⁴

History of musculoskeletal symptoms and injuries: Preliminary evidence on history of back pain increases the risk of LDH with radiculopathy.¹⁴ Three studies explored those have a history of back symptoms or low back pain were at greater risk of developing clinical LDH (sciatica) than those without a history of back pain¹³ where another reported no association between a history of back accidents or low back injuries and LDH with radiculopathy or sciatica.⁹

Smoking: Incidence of LDH with radiculopathy increases with smoking.¹⁵ However, 4 studies found no association between smoking and the risk of LDH with radiculopathy.¹²

Physical or sports activity: One study reported an increased incidence of clinical LDH (sciatica) associated with walking, but a decreased incidence associated with jogging.⁹ Another study found a positive association between the frequency of participation in sports clubs (4-5 times per week) and risk of LDH surgery in women, but not in men.¹⁶

Non-occupational lifting, bending and other activities: Preliminary evidence from one study suggests that out-of-job lifting with the knees straight, back bent where starting and ending lifts at the waist may be positively associated with an increased incidence of LDH with radiculopathy.¹⁵

Car driving and motor vehicle characteristics: Two older studies explored an increased incidence of LDH with radiculopathy in persons driving non-Japanese and non-Swedish cars but no association was reported for driving pattern characteristics, such as use of local roads, highways, bucket seats, regular seats, automatic or manual transmission, and being the driver or passenger.¹⁵

Psychological stress and personality: The evidence varies in studies found an increased incidence of LDH in those who reported: mental stress "to some extent" or "rather much or much".⁹ However, 4 other studies reported no associations between the risk of LDH with radiculopathy and personal mental stress.¹⁴

Forward bending postures: Evidence from two studies that occupational lumbar load from forward bending is positively associated where increased incidence of LDH with radiculopathy in: i) both men and women with aggregate lumbar load by intensive-load postures (postures with trunk inclination of ≥ 20 -degrees) at work,¹⁵ and ii) men with increased work hours of extreme forward bending (> 90 -degrees trunk flexion).²¹

Physical workload or difficulty of work: One study from Germany, found some indication of a positive association between working ≥ 10 years in occupations with high physical workload and LDH,²¹ while another study found a positive association in women, but no association in men.²²

Time pressure, job control and other psychosocial factors at work: Study indicating a link between time pressure at work and the risk of LDH with radiculopathy that the men and likely to experience LDH with radiculopathy compared to those who reported no work years with high time pressure,²¹ but no association for other psychosocial characteristics of work as monotonous, boring, opportunities to use knowledge and skills, information about future plans, satisfaction with supervisor, satisfaction with workmates, psychic strain through contact with clients, and too much responsibility.

Summary and Critiques

The evidence suggests that the etiology of LDH/ PLID is multifaceted. While there is evidence that several occupational factors are important contributors to the development of LDH with radiculopathy, it is also clear that other individual and behavioural factors may contribute to the development of the condition. For instance, although high cumulative lumbar load from occupational forward bending is a strong risk factor for LDH with

radiculopathy, not every person exposed to high cumulative lumbar workload will develop LDH. Instead, combinations of risk factors are necessary to cause LDH with radiculopathy and the specific combination of risk factors leading to an episode of the condition likely varies among person to person.

Challenges faced as an author in using different criteria to define cases of LDH with radiculopathy, and the lack of a standard differentiation for the lower range to higher level of severity for LDH/PLID. Another obvious problem is that many studies do not identify the population at risk that should in an incidence calculation. Many studies report the number of cases admitted to hospitals over a specified time period, but do not provide information on the population at risk for being admitted.

Limitations

Studies also have variable inclusion and exclusion criteria that impact on the interpretation and comparability of the findings. Many of the studies include hospital admissions only. This is problematic since hospital admission policy for LDH with radiculopathy can vary over time and place. In addition, many studies didn't report cases of LDH treated at the emergency department, but not admitted to hospital.

Recommendations

This review highlights many existing gaps in knowledge of the epidemiology of LDH. Further descriptive and analytic investigations are needed as the incidence and determinants of this neuromusculoskeletal condition have not been adequately described or examined.

We recommend that better studies will differentiate modifiable and un-modifiable risk factors to inform evidence-based prevention and intervention programs.

Conclusion

Despite the limitations of this literature, there are some important conclusions that can be made. Thus, we have limited information on risk factors for LDH with radiculopathy in adults. Nonetheless, some evidence suggests that age and sex are non-

modifiable risk factors for LDH and modifiable risk factors include lower education, higher BMI and the presence of cardiovascular risk factors in women, smoking, greater cumulative occupational lumbar load by forward bending postures and manual materials handling, higher levels of perceived risk of work injury, lower job control or decision latitude at work, regular or irregular three-shift work or regular night work in women, and increased time pressure at work. Although, the literature is varying quality and heterogeneous but the evidence revealed that LDH/PLID is an important source of pain and disability in society. Future research should focus on prospective designs examining modifiable risk factors and prevention strategies.

Ethical Clearance

The proposal of the "Short Review" was presented to the Institutional Review Board (IRB) of Bangladesh Health Professions Institute (BHPI) and taken permission accordingly.

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- The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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