eISSN:2708-888X
http://journals.khalijedental.com.ly/index.php/ojs/index

Original Article

Magnetic Resonance Imaging Findings in Lumbosacral Spine among Young Arabic Patients with Back Pain

Wadyan Mustafa

Department of Diagnostic Radiology, Faculty of Medicine, University of Omar AlMukhtar, Al-Bayda, Libya

Corresponding Email: wadyan.mustafa@omu.edu.ly

ABSTRACT

Lower back pain is a significant health issue that affects approximately 80% of adults. Lumbar disc herniation is a common cause of this pain, and lumbosacral magnetic resonance imaging (MRI) is considered the gold standard for diagnosing disc abnormalities. Due to socioeconomic factors, there has been an increased interest in studying disc herniation among young individuals. This retrospective study involved 72 consecutive Arabic patients (34 females and 38 males) aged between 15 and 30 years, all presenting with lower back pain. The aim was to investigate the magnetic resonance imaging findings of the lumbosacral spine. Our study reveals a high prevalence of disc abnormalities in young patients, with approximately 40 individuals (55.6%) exhibiting varying degrees of disc prolapse and bulging. The older subgroup (ages 23-30) was more significantly affected, with no discernible sex predominance. The L4/L5 disc level was the most commonly involved (40%), and central disc prolapse was identified as the most frequent type, observed in 65% of cases. This study revealed a high prevalence of disc prolapse among individuals aged 15 to 30 years, which may be attributed to factors such as lifting heavy objects, obesity, and fluctuations in physical activity levels, both increased and decreased.

Keywords: MRI, Lower Back Pain, Lumbosacral Spine, Disc Prolapse.

Citation: Mustafa W. Magnetic Resonance Imaging Findings in Lumbosacral Spine among Young Arabic Patients with Back Pain. Khalij-Libya J Dent Med Res. 2024;8(2):286–291. https://doi.org/10.47705/kjdmr.248219

Received: 03/10/24; **accepted**: 02/12/24; **published**: 10/12/24

الام أسفل الظهر هي مشكلة صحية كبيرة تؤثر على ما يقرب من 80٪ من البالغين. يعد الانزلاق الغضروفي القطني سببًا شائعًا لهذا الألم، ويعتبر التصوير بالرنين المغناطيسي ـ القطني العجزي المعيار الذهبي لتشخيص تشوهات القرص. بسبب العوامل الاجتماعية والاقتصادية، كان هناك اهتمام متزايد بدراسة الانزلاق الغضروفي بين الأفراد الشباب. شملت هذه الدراسة الاسترجاعية 72 مريضًا عربيًا متتاليًا (34 أنثى و 38 ذكرًا) تتراوح أعمارهم بين 15 و 30 عامًا، وجميعهم يعانون من آلام أسفل الظهر. كان الهدف هو التحقيق في نتائج التصوير بالرنين المغناطيسي للعمود الفقري القطني العجزي. تكشف دراستنا عن انتشار مرتفع لتشوهات القرص بين المرضى الشباب، حيث أظهر ما يقرب من 40 فردًا (55.6٪) درجات متفاوتة من تدلي القرص وانتفاخه. كانت المجموعة الفرعية الأكبر سنًا (من سن 23 إلى 30 عامًا) أكثر تأثرًا بشكل ملحوظ، مع عدم وجود غلبة جنسية ملحوظة. كان مستوى القرص L4/L5 هو الأكثر تأثرًا (40٪)، وتم تحديد تدلي القرص المركزي باعتباره النوع الأكثر شيوعًا، حيث لوحظ في 65٪ من الحالات. كشفت هذه الدراسة عن انتشار مرتفع لتدلي القرص بين الأفراد الذين تتراوح أعمارهم بين 15 و 30 عامًا، والذي قد يعزى إلى عوامل مثل رفع الأشياء الثقيلة والسمنة وتقلبات مستويات النشاط البدني، سواء كانت متزايدة أو منخفضة.

INTRODUCTION

Lower back pain is considered one of the most prevalent health issues, with approximately 70-80% of adults experiencing it at some point in their lives [1]. The primary contributors to back pain include degenerative changes, osteoarthritic or inflammatory conditions, spinal canal stenosis, infections, traumatic injuries, and neoplastic diseases [2].

One of the most frequently identified conditions leading to lower back pain is lumbar disc herniation [3]. The extent of disc herniation does not correlate with the severity of symptoms. For instance, two patients may have the same size of disc herniation, yet one may be asymptomatic while the other experiences severe symptoms due to nerve root compression, despite having identical herniation sizes [4].

The resulting disability significantly affects the economy by increasing healthcare resource consumption and reducing economic productivity [5].

Lumbar disc herniation commonly affects middle-aged and older individuals who spend long hours sitting or performing manual tasks [6]. However, in recent years, rising work pressures have resulted in a younger onset of lumbar disc herniation (LDH) which has a significant impact on the economy [6].

Recently, the younger onset of lumbar disc herniation (LDH) has attracted the attention of many researchers. However, the high-risk factors and age demographics of the study populations have not been thoroughly assessed [7].

Disc herniation is uncommon in children and adolescents. Some studies indicate that children account for only 0.5–3% of all patients undergoing surgery for lumbar disc herniation (LDH) [8]. The study by Garrido et al. found that adolescent patients make up approximately 0.5% to 6.8% of all lumbar disc herniation cases [9], whereas Zitting et al. reported a significantly higher rate of about 27% in the pediatric and adolescent population [10].

The study by Al-Saeed et al. indicated a high prevalence of disc herniation among young Arab patients as observed through MRI, especially when compared to findings from another research [11].

Determining the actual rate of adolescent disc herniation is difficult, in part due to the differing age ranges used in published studies [12].

The primary symptom of disc degeneration is lower back pain, which may be accompanied by mild tingling, a dull ache, or a burning sensation. Pain can radiate to the calf or the sole of the foot, and sciatic pain tends to worsen with routine daily activities. In some cases, the pain can be severe, making it difficult for the patient to move around [13, 14].

In developing countries, plain X-rays are often the only imaging option accessible in most primary healthcare centers [15]. Anteroposterior and lateral views can aid in detecting significant intervertebral disc abnormalities, with the lateral view providing the clearest visualization. However, these images may produce ambiguous results for patients who have undergone lumbar spine evaluations, potentially leading to unsatisfactory and harmful treatment outcomes [16]. However, MRI is considered the superior imaging modality for diagnosing disc pathology due to its advantages, including no radiation exposure, the ability to produce multiplanar images, excellent soft-tissue contrast, and precise localization of changes in the intervertebral discs [17, 18].

MRI findings indicative of disc abnormalities may include reduced signal intensity, irregular nucleus shape, decreased disc height, tears in the annulus fibrosus, high-intensity zones within the annulus, and changes in disc contour (such as bulging, protrusion, extrusion, and sequestration). Additionally, non-disc abnormalities may be observed, including nerve root compression, Modic changes, endplate irregularities, central or foraminal canal stenosis, degeneration, facet joint asymmetry, and spondylolisthesis [19].

Herniations at the L4-L5 or L5-S1 disc levels account for 95% of lumbar disc herniations [1]. This research aims to examine MRI findings in 72 young Arab patients.

METHODS

Study design

This retrospective study was conducted from 1st January 2023 to 30 October 2023 on 72 consecutive Arabic patients, all patients referred to Tyba imaging center that is a private centre for Radiodiagosis located at Albaida city in Libya.

The patients were referred for further evaluation by lumbosacral spine MRI, most of patients complained of back pain and were referred by clinician to exclude degenerative spine disease especially disc prolapse.

Exclusion Criteria

Patients who have history of congenital spinal diseases, previous spinal surgery or fracture. Patients who have a contraindication to MRI scanning.

MRI exams were performed on each patient. MRI were obtained according to conventional protocol using a 1.5 Tesla machine. (Philips Achieva 1.5T, Netherlands) with a circular polarised spine array

eISSN:2708-888X
http://journals.khalijedental.com.ly/index.php/ojs/index

coil positioned beneath the lower back. T1-weighted fast spin echo scans (TR/TE/NEX: 500 ms /12 ms /1 ms, slice thickness: 3 mm, matrix size: 256 × 516 FOV: 25 cm, flip angle: 90°) and T2-weighted fast spin echo scans (TR/TE/NEX: 2,220 ms/ 80 ms/ 20 ms, slice thickness: 3 mm, matrix size: 256 × 516 FOV: 25 cm, flip angle: 67°) were the two scan types included in the protocol. Axial sections across the lumbar discs and superior and inferior end plates of the lumbar vertebrae were abstained, together with sagittal plane scans. MRI findings were interpreted by 2 diagnostic radiology specialists.

Statistical Analysis

The collected data were entered into a computer and organized into tables using IBM SPSS Statistics version 21. Data analysis involved calculating frequencies and percentages for numerical and nominal variables. The correlation between nominal data was assessed using the Chi-Square test, and the P value was calculated to determine significant differences between the observed variables. A P value of less than 0.05 was considered statistically significant.

RESULTS

Our study is carried on 72 Arabic patients (34 females and 38 males), aged between 15-30 years with a mean 24.9 years, range 15 years. The age of patients was distributed into two groups, table (1) showing demographic distribution of the sex of patients according to age groups.

About 54 patients represent 23-30 years age group that regarded the largest age group in our study with equal sex distribution (27 females and 27 males).

Table 1. Demographic distribution of study group.

Age group	Sex of patients		Total
	Female	Male	
15-22 years	7	11	18
23-30 years	27	27	54
Total	34	38	72

All patients subjected to lumbosacral MRI for further evaluation to their complains or for further assessment after lumbosacral x-rays or CT findings. Around 40 patients (55.6 %) showing a variable degree of disc prolapse and bulging, while 32 patients (around 44.6) showing normal lumbosacral MRI scanning as illustrated in table (2).

Table 2. Disc bulge/prolapse percentage among study group.

Presence of disc abnormality	Frequency	Percentage
No	32	44.4
Yes	40	55.6
Total	72	100.0

Table (3) showing most of patients with disc prolapse from 23-30 years age group (around 32 from 40 patients), i.e. around 80 % of the affected group, while only 20 % of diseased group were from 15-22 years age group.

Table 3. Relation between disc bulge/prolapse percentage and age among study group. (Chi square = 1.200, P value =0.273).

Age group	Presence of disc prolapse/bulge		Total
	No	Yes	
15-22 years	10	8	18
23-30 years	22	32	54
Total	32	40	72

Around 20 female patients from 34 female patients have disc abnormality (58.8% of females), while around 20 male patients from 38 male patients have disc abnormality (52.6% of males) as seen in Table (4).

Table 4. Relation between disc bulge/prolapse percentage and sex among study group (Chi square = 027, P value =0.598).

Sex of patients	Presence of disc prolapse/bulge		Total
	No	Yes	
Female	14	20	34
Male	18	20	38
Total	32	40	72

The most common disc affected were at L4/L5 level whatever seen as single disc affection (40% of affected cases) or combined with L5/S1 disc affection (17 % of affected cases), followed by L5/S1 disc affection (32 %), that were illustrated in Table (4).
No disc prolapses detected at L1/L2 and L2/L3 levels could be detected in our study group.

Table 5. Frequency and percentage of disc bulge/prolapse level among study group.

Level of prolapse/bulge	Frequency	Percentage
L5/S1	13	32.5
L4/L5	16	40.0
L4/L5 & L5/S1	7	17.5
L3lL4 & L4/L5	2	5.0
L3/L4,L4/L5 & L5/S1	2	5.0
Total	40	100.0

Central disc prolapse is the commonest type as it seen in 65 % of affected patients, the frequency and percentage of type disc abnormality illustrated in Table (6).

Table 6. Frequency and percentage of disc bulge/prolapse abnormality among study group

Type of prolape/bulge	Frequency	Percentage
Central	26	65
Right paracentral	3	7.5
Left paracentral	8	20
Mixed	3	7.5
Total	40	100.0

Modic changes seen only in 5 patients with coexistence of disc abnormality as illustrated in table (7).

Table 7. Cross tabulation between presence of disc bulge/prolapse abnormality and presence of Modic changes (Chi square = 4.299, P value =0.038)

Presence of disc prolapse/bulge	Presence of Modic changes		Total
	No	Yes	
No	32	0	32
Yes	35	5	40
Total	67	5	72

Schmorl nodes seen in 10 patients, 5 of them with coexistence disc prolapse abnormality, as seen in table (8).

Table 8. showing the cross tabulation between presence of disc bulge/prolapse abnormality and presence of Schmorl nodes (Chi square = 0.145 , P value =0.703)

Presence of disc prolapse/bulge	Presence of Schmorl nodes		Total
	No	Yes	
No	27	5	32
Yes	35	5	40
Total	62	10	72

DISSCUSION

Low back pain is a prevalent clinical issue encountered by orthopedic surgeons and neurosurgeons [20].
Lower back pain affects quality of life both directly and indirectly by diminishing productivity and increasing employee absenteeism, making it a major contributor to musculoskeletal disability worldwide [21, 22]. Compared to other diagnostic methods, MRI has become the preferred investigation for low back pain and is now considered the gold standard for diagnosing disc herniation [23].
Most studies exploring the relationship between lumbosacral MRI findings and low back pain have been conducted on older adults, with very few limited studies focusing on younger populations.
This research done to study findings of Lumbosacral spine MRI in 72 young Libyan patients (34 females and 38 males), aged between 15-30 years, the main complaints of patients was low back pain.
Our study revealed 55.6 % of study group had a variable degree of disc prolapse and bulging, most of patients with disc prolapse from 23-30 years age group (80 % of the affected group), with P value =0.273 that revealed no correlation between disc abnormalities and the age.
The study by Al-Saeed et al., which involved 214 Arabic patients aged 16 to 29 with lower back pain, revealed that 65% of symptomatic patients displayed pathological changes in their lumbosacral spine MRI. This frequency is notably higher compared to findings from other studies [11].
The study conducted by Lukecha et al. included 157 patients aged 18 to 39 with low back pain and revealed that 65 patients (41.4%) showed MRI evidence of disc abnormalities [24].

The high frequency may be explained by reports indicating that a lack of physical activity is associated with a greater incidence of disc diseases in adults, which in turn contributes to a rise in low back pain among younger individuals [25, 26].

Conversely, other studies have indicated that high levels of activity in competitive sports serve as a risk factor, contributing to a greater prevalence of lower back pain and an increased occurrence of MRI findings in young individuals [27, 28].

Additionally, factors such as obesity, genetic history, sitting posture, and prolonged sitting are significant risk factors for lumbar spine abnormalities and disc herniation [7,11,29]. While most studies demonstrate a higher prevalence of lumbar disc herniation in males [30, 31], our study revealed a nearly equal distribution of males and females. This may be explained by the fact that Libya is considered a matriarchal society, where women tend to engage in more physical activity within the household. In our study, the most commonly affected disc was at the L4/L5 level, with a single occurrence rate of 40%. This is consistent with the findings of Bajpa et al. [32], which indicated that 36% of patients had disc involvement at the L4/L5 level.

This study indicated that central disc prolapse is the most common type, observed in 65% of affected patients. This finding does not align with the study by Lukecha et al. [24], which reported that the paracentral type is the most prevalent, affecting 66% of patients. Modic changes were observed in only 5 patients (6.9%), consistent with the results of the Al-Saeed et al. study [11]. Schmorl nodules were found in 10 patients (13.8%). In contrast, the study by Hamanishi et al. reported a significantly higher incidence of Schmorl nodes in the lumbar spine, with a rate of 57% during the second decade of life [33]. Although our study aligns with the findings of some previous research, it faces several limitations, including a small sample size due to economic constraints and a lack of comprehensive clinical data.

CONCLUSION

MRI plays a crucial role in the diagnosis of disc prolapse among young individuals. Its ability to provide detailed images of soft tissue structures allows for accurate identification of disc abnormalities, including herniation and degeneration. Given the increasing prevalence of lower back pain in younger populations aged between 15-30 years.

Conflict of Interest

There are no financial, personal, or professional conflicts of interest to declare.

REFERENCES

1. Amin RM, Andrade NS, Neuman BJ. Lumbar disc herniation. Current reviews in musculoskeletal medicine. 2017 Dec;10:507-16.
2. Olmarker K, Rydevik B. Pathophysiology of sciatica. Orthopedic Clinics of North America. 1991 Apr 1;22(2):223-34.
3. Frymoyer JW, Pope MH, Clements JH, Wilder DG, MacPherson B, Ashikaga T. Risk factors in low-back pain. An epidemiological survey. JBJS. 1983 Feb 1;65(2):213-8.
4. Andersson GB, Deyo RA. ▪ History and Physical Examination in Patients With Herniated Lumbar Discs. Spine. 1996 Dec 15;21(24S):10S-8S.
5. Deyo RA, Cherkin D, Conrad D, Volinn E. Cost, controversy, crisis: low back pain and the health of the public. Annual review of public health. 1991 May;12(1):141-56.
6. Tian W, Lv Y, Liu Y, Xiao B, Han X. The high prevalence of symptomatic degenerative lumbar osteoarthritis in Chinese adults: a population-based study. Spine. 2014 Jul 15;39(16):1301-10.
7. Qi L, Luo L, Meng X, Zhang J, Yu T, Nie X, Liu Q. Risk factors for lumbar disc herniation in adolescents and young adults: A case–control study. Frontiers in Surgery. 2023 Jan 6;9:1009568.
8. Luukkonen, K. Partanen, M. Vapalahti M. Lumbar disc herniations in children: a long-term clinical and magnetic resonance imaging follow-up study. British journal of neurosurgery. 1997;11(4):280-5.
9. Epstein JA, Lavine LS. Herniated lumbar intervertebral discs in teen-age children. Journal of neurosurgery. 1964 Dec 1;21(12):1070-5.
10. Garrido E, Humphreys RP, Hendrick BE, Hoffman HJ. Lumbar disc disease in children. Neurosurgery. 1978 Jan 1;2(1):22-6.
11. Al-Saeed O, Al-Jarallah K, Raeess M, Sheikh M, Ismail M, Athyal R. Magnetic resonance imaging of

the lumbar spine in young arabs with low back pain. Asian spine journal. 2012 Dec;6(4):249.
12. Sarma P, Thirupathi RT, Srinivas D, Somanna S. Adolescent prolapsed lumbar intervertebral disc: Management strategies and outcome. Journal of pediatric neurosciences. 2016 Jan 1;11(1):20-4.
13. Saleem S, Aslam HM, Rehmani MA, Raees A, Alvi AA, Ashraf J. Lumbar disc degenerative disease: disc degeneration symptoms and magnetic resonance image findings. Asian spine journal. 2013 Dec;7(4):322.
14. Bakhsh A. Long-term outcome of lumbar disc surgery: an experience from Pakistan. Journal of Neurosurgery: Spine. 2010 Jun 1;12(6):666-70.
15. Abdulmujeeb AB. Prevalence and factors associated with low back pain among healthcare workers in Kibuli Muslim Hospital Kampala, Uganda.
16. Takatalo J, Karppinen J, Niinimäki J, Taimela S, Näyhä S, Järvelin MR, Kyllönen E, Tervonen O. Prevalence of degenerative imaging findings in lumbar magnetic resonance imaging among young adults. Spine. 2009 Jul 15;34(16):1716-21.
17. Haughton V. Imaging intervertebral disc degeneration. Jbjs. 2006 Apr 1;88(suppl_2):15-20.
18. Maravilla KR, Lesh PH, Weinreb JC, Selby DK, Mooney VE. Magnetic resonance imaging of the lumbar spine with CT correlation. American journal of neuroradiology. 1985 Mar 1;6(2):237-45.
19. Jensen MC, Brant-Zawadzki MN, Obuchowski N, Modic MT, Malkasian D, Ross JS. Magnetic resonance imaging of the lumbar spine in people without back pain. New England Journal of Medicine. 1994 Jul 14;331(2):69-73.
20. Clays E, De Bacquer D, Leynen F, Kornitzer M, Kittel F, De Backer G. The impact of psychosocial factors on low back pain: longitudinal results from the Belstress study. Spine. 2007 Jan 15;32(2):262-8.
21. Ihlebæk C, Hansson TH, Lærum E, Brage S, Eriksen HR, Holm SH, Svendsrød R, Indahl A. Prevalence of low back pain and sickness absence: A``borderline''study in Norway and Sweden. Scandinavian journal of public health. 2006 Oct;34(5):555-8.
22. Ricci JA, Stewart WF, Chee E, Leotta C, Foley K, Hochberg MC. Back pain exacerbations and lost productive time costs in United States workers. Spine. 2006 Dec 15;31(26):3052-60.
23. Cranshaw C, Kean DM. The use of unclear MR in diagnoses of lateral canal extra percent. J Bone Joint Surg Am. B. 1984;66:711-4.
24. Lukecha KR, Geoffrey E, Gonzaga MA, Sam B. Magnetic resonance imaging findings among young adults with low back pain at Nsambya hospital. BMC Medical Imaging. 2022 Jun 4;22(1):108.
25. Salminen JJ. The adolescent back. A field survey of 370 Finnish schoolchildren. Acta paediatrica Scandinavica. Supplement. 1984 Jan 1;315:1-22.
26. Videman TA, Nurminen MA, Troup JD. Lumbar spinal pathology in cadaveric material in relation to history of back pain, occupation, and physical loading. Spine. 1990 Aug 1;15(8):728-40.
27. Kujala UM, Salminen JJ, Taimela SI, Oksanen AI, Jaakkola LA. Subject characteristics and low back pain in young athletes and nonathletes. Medicine and science in sports and exercise. 1992 Jun 1;24(6):627-32.
28. Goldstein JD, Berger PE, Windler GE, Jackson DW. Spine injuries in gymnasts and swimmers: an epidemiologic investigation. The American journal of sports medicine. 1991 Sep;19(5):463-8.
29. Battie MC, Videman T, Gibbons LE, Fisher LD, Manninen H, Gill K. 1995 Volvo Award in clinical sciences. Determinants of lumbar disc degeneration. A study relating lifetime exposures and magnetic resonance imaging findings in identical twins. Spine. 1995 Dec 1;20(24):2601-12.
30. Takahashi H, Suguro T, Okazima Y, Motegi M, Okada Y, Kakiuchi T. Inflammatory cytokines in the herniated disc of the lumbar spine. Spine. 1996 Jan 15;21(2):218-24.
31. Horal J. The clinical appearance of low back disorders in the city of Gothenburg, Sweden: comparisons of incapacitated probands with matched controls. Acta Orthopaedica Scandinavica. 1969 Feb 1;40(sup118):1-09.
32. Bajpai J, Saini S, Singh R. Clinical correlation of magnetic resonance imaging with symptom complex in prolapsed intervertebral disc disease: A cross-sectional double-blind analysis. Journal of Craniovertebral Junction and Spine. 2013 Jan 1;4(1):16-20.
33. Hamanishi C, Kawabata T, Yosii T, Tanaka S. Schmorl's nodes on magnetic resonance imaging: their incidence and clinical relevance. Spine. 1994 Feb 1;19(4):450-3.