Original Article

Plain lumbosacral X-rays for low back pain: Findings correlate with clinical presentation in primary care settings

Mohammed AlAteeq[1,2], Abdelelah A. Alseraihi[2], Abdulaziz A. Alhussaini[2], Sultan A. Binhasan[2], Emad A. Ahmari[2]

[1]Family Medicine Department, Ministry of National Guard - Health Affairs, Riyadh, Saudi Arabia, [2]King Abdullah International Medical Research Center, Riyadh, Saudi Arabia, King Saud bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia

Abstract

Background: Low back pain (LBP) is a common disabling condition frequently seen and managed in primary care. LBP is considered to be the most common health problem for which general practitioners order an imaging test. **Objective:** To correlate radiological findings of plain lumbosacral X-rays with the initial clinical presentation of patients with back pain. **Materials and Methods:** This is a descriptive cross-sectional retrospective chart review study, conducted for 384 adult patients, with back pain who had plain lumbosacral X-rays, at three primary healthcare centers at King Abdul-Aziz Medical City (KAMC) in Riyadh, Saudi Arabia, in the period from 1 Jan 2017 to 31 Dec 2018. **Results:** The majority of cases had either normal lumbosacral X-rays (32.8%) or incidental findings that were nonspecific. The most abnormal findings were degenerative changes such as spondylosis (osteophytosis) and narrowing of the intervertebral foraminal space (45.3%). The vast majority of cases of chronic back pain was associated with abnormal findings on a plain lumbosacral X-ray, which constituted most cases with abnormal findings among subjects. **Conclusion:** Lumbosacral X-ray findings in the vast majority of cases do not correlate with clinical presentation and do not justify routinely ordering imaging studies for nonspecific back pain in a primary care setting.

Keywords: Imaging, lumbago, lumbalgia, musculoskeletal, quality

Background

Low back pain (LBP) refers to spinal and paraspinal symptoms in the lumbosacral region; it is a common disabling condition frequently seen and managed in primary care, with variable degrees of suffering and disability worldwide.[1-4] In developed countries, around 50–90% of people experience at least one episode of LBP in their lifetime.[5] The pain usually resolves within two weeks, but up to 35% of patients will experience another episode within a year, and 2–7% will develop chronic LBP.[6] Causes of LBP vary from muscle spasm to compression fracture, herniated disc, spinal stenosis, and so on.

The most common reported of LBP in general population is the disc degeneration, which is typically associated with increasing age. However, there is no clear idea about the real association

Address for correspondence: Dr. Mohammed AlAteeq, Department of Family Medicine and Primary Health Care, King Abdulaziz Medical City, National Guard Health Affairs, P.O. Box 22490, Riyadh 11426, Saudi Arabia.
E-mail: malateeq@hotmail.com

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of LBP severity with the degree of degeneration or the findings in imaging studies.[2]

The social, economic, and financial burden of low back pain in healthcare costs for evaluation and management, disabilities, and days absent from work are reported in several studies.[1,2,7] In Portland, OR, USA, up to 25% of people with LBP will consult a healthcare provider, with primary care physicians taking the initial evaluation in 65% of cases.[8] Several treatment modalities for back pain are often recommended by physicians, including bed rest, nerve blocks, steroids, spinal implant stimulators, and opioids, which tend to find little support, despite that some actually show efficacy in reducing LBP.[7]

LBP is considered to be the most common health problem for which general practitioners order an imaging test.[9] Downie A *et al.* made a systematic review and meta-analysis of over 4 million imaging requests for low back pain in primary and emergency care in UK across 21 years. Among patients presenting to primary care with LBP, one in four had imaging study, while one in three patients presented to emergency department had one. Complex imaging for LBP had increased over 21 years despite the developed guidelines.[10]

The plain X-ray of the spine is usually requested to rule out a serious underlying systemic disease or fracture. Common findings on plain radiographs of patients with LBP include deformity, discspace narrowing, and osteophyte formation.[2] However, the real association between these findings and the clinical presentation is questionable.

The American Board of Internal Medicine established an initiative called Choosing Wisely to minimize unnecessary interventions for LBP. The initiative recommended avoidance of spinal imaging unless the patient has clear indications of serious pathology or had the LBP for more than 6 weeks.[4]

Defining the indications of serious pathology or red flags to assess the appropriateness of imaging studies for LBP is widely variable between studies.[4]

Study by Sharma S *et al.* investigate the clinicians and patients beliefs about diagnostic imaging for LBP. They found that clinicians usually requested imaging studies to minimize the risk of a missed diagnosis that could lead to lawsuit, patients with chronic LBP believe imaging studies will provide evidence that pain is real, and patients and clinicians believe diagnostic imaging is an important test to locate the source of low back pain.[11]

The overuse of X-rays for acute back pain, in the absence of a clear clinical indication, carries possible harm for patient safety and overutilization of resources. The initial investigation will sometimes lead to more advanced assessments, which will increase the bill.[12] The second concern is radiation exposure, although X-rays produce a small amount (e.g., in the dose range >10 mSv); however, one cannot ignore it, with epidemiologic evidence linking exposure to ionizing radiation to the subsequent development of cancer.[13] Finally, the psychological aspect cannot be ignored, stemming from previous negative effects, cost and radiation, as well as people's anxiety before an X-ray, and that the X-ray may take time due to limited resources.[14]

Studies show that plain film X-rays for most acute back pain cases are not aligned with recommended clinical guidelines.[15] Almost 36% of family practitioners and 13% of general internists routinely image patients with acute LBP. In another study of Medicare beneficiaries, almost 30% of older patients with LBP were imaged within 28 days.[16]

To our knowledge, no local studies have been done to explore the efficacy of plain X-rays in the evaluation of back pain in primary healthcare settings.

The aim of this study is to correlate radiological findings of plain lumbosacral X-rays with the initial clinical presentation of patients with back pain.

Methods

This is a descriptive cross-sectional retrospective chart review study, conducted for patients at three primary healthcare centers, handling military and civilian employees of the National Guard and their dependents at King Abdul-Aziz Medical City (KAMC) in Riyadh, Saudi Arabia, within the period from 1 Jan 2017 to 31 Dec 2018.

Primary healthcare centers include: Health Care Specialty Centre (HCSC), which serves a population of around 200,000. Given 600,000 annual visits, King Abdulaziz City Housing (Iskan Yarmouk) serves a population of around 50,000 with 212,000 annual visits, and the National Guard Comprehensive Specialized Clinic (NGCSC), serving a population of around 100,000, with 300,000 annual visits.

The study population included male and female adult patients, >18 years, all nationalities, who presented to the primary healthcare clinics with back pain and received plain lumbosacral X-rays during the study period.

Using Raosoft sample-size calculator (Seattle, WA, USA), with 5% margin of error, 95% confidence interval, infinite population size, and a response distribution of 50% in a population of 500,000, the sample was estimated at 384. The study sample was selected randomly from the original patient list, meeting inclusion criteria. Data were obtained from the electronic medical records system (*BestCare*) with a predesigned data collection sheet.

For statistical analysis, we used IBM Statistical Package for Social Studies, v. 25. 0 (IBM Corp., Armonk, NY, USA). A descriptive analysis of numerical variables was reported in terms of means and standard deviation, while categorical variables were described with frequencies and percentages. In examining the relationship between variables, the Student's t-test or analysis of variance compared the means of two groups for dependent variables.

Ethical approval was obtained from the Institutional Review Board of King Abdullah International Medical Research Centre, with an official memo dated 28 Nov 2018 and approval number (SP18/512/R). Data collection sheets were coded in 3-digit serial numbers and maintained by the co-investigator. Participants could not be traced after data sheet collection. The study was carried out as per the principles of the Helsinki Declaration.

Results

The study captured data for 384 cases of patients with back pain, who had a lumbosacral X-ray in a primary healthcare center. The subjects' characteristics are shown in Table 1. The patients were predominantly female (57.6%), in the 26- to 35-year age group (30.5%).

The most common abnormal findings can be seen in Table 2, while the most abnormal finding was degenerative changes such as spondylosis (osteophytosis) and narrowing of the intervertebral foraminal space (45.3%).

Table 1: Patients characteristics

Age	Frequency	Percent
18-25	36	9.4
26-35	117	30.5
36-45	90	23.4
46-55	72	18.8
56-64	37	9.6
65+	32	8.3
Gender		
Male	163	42.4
Female	221	57.6
Duration of symptoms		
Acute (≤3 weeks)	157	40.9
Chronic (>3 weeks)	227	59.1
Chronic diseases		
No	240	62.5
Yes	144	37.5
Joint disease		
No	357	93.0
Yes	27	7.0

Table 2: Plain lumbosacral X-ray results

	Frequency	Percent
Normal findings	126	32.8
Abnormal findings	258	67.2
Common abnormal findings		
Discovertebral degeneration: spondylosis/ osteophytes	174	45.3
Narrowing of intervertebral foramina/space	67	17.4
Scoliosis	58	15.1
Spondylolisthesis	48	12.5
Inflammatory disorder	46	12.0
Osteopenia	29	7.6
Sacroiliac joint disease	23	6.0

The relationship between the findings of lumbosacral X-rays and age group, gender, and duration of back pain is shown in Table 3 and Figure 1. Almost half (44.4%) of the lumbosacral X-rays with normal findings were in the age group of 26-35 (χ^2) value = 36.22 and were statistically significant, with ($P < 0.05$); most of the lumbosacral X-rays with abnormal findings were in females, which was not statistically significant.

The vast majority of cases of chronic back pain was associated with abnormal findings on a plain lumbosacral X-ray, which constituted most cases with abnormal findings among subjects. This was statistically significant with a *P* value = 0.001. The mean number of radiological studies in the past 12 months (± standard deviation) was 2.68 ± 2.66.

Discussion

The present study aimed to correlate the findings of plain lumbosacral imaging with the clinical presentation of patients with back pain. The study data showed slight gender differences in the prevalence of back pain, with females exhibiting more than males. More than half of the patients in this study fall in the age group between 25 and 45. These findings were reported in another local study by *Awaji*.[17] The gender and age difference in terms of prevalence of back pain was reported by several other international studies.[18-23]

The majority of cases had either normal lumbosacral X-rays (32.8%) or incidental findings that were nonspecific and poorly associated with symptoms or causation of back pain, such as degenerative changes, scoliosis, spondylolisthesis, and osteopenia. A similar number of normal lumbosacral X-rays was found by *Halpin et al.*, in which 37% of patients with LBP (referred by GPs for lumbar spine radiography) showed essentially normal X-ray findings.[24]

This is expected, since the majority of back pain is nonspecific, without identifiable causes or is due to mechanical causes not apparent on imaging. Mechanical back pain is a term to describe a variety of causes related to muscle and ligaments, like muscle sprain, ligamentous strain, facet joint syndrome, sacroiliac syndrome; however, nonspecific LBP is defined as back pain not attributable to a recognizable or known pathology.[3] The prevalence of potentially serious causes, such as infection, tumors, osteoporosis, fractures, structural deformities, inflammatory disorders, or radicular syndrome range between 5 and 8%.[25,26]

Degenerative changes that include disc height variations, spondylosis, or osteophyte formation and sclerosis are common findings, present in almost all patients above 60, in 60% of patients between 40 and 60 years of age, and in 30% of patients less than 30 years of age.[26] Several studies reported a correlation between nonspecific back pain and the presence of degenerative changes in plain lumbosacral X-rays.[22,23,27] Nevertheless, it is not clear if this association would have an impact on therapeutic strategies.

Table 3: The relationship between findings of lumbosacral X-ray and age group, gender, and duration of back pain

Patients characteristic	Patients characteristic	Abnormal (*n*=258, 67.2%)	Normal (*n*=126, 32.8%)	Chi-square (χ^2)	*P*
Age group	18-25	19 (7.3%)	17 (13.5%)	36.222[a]	0.000
	26-35	61 (23.6%)	56 (44.4%)		
	36-45	59 (22.9%)	31 (24.6%)		
	46-55	58 (22.5%)	14 (11.1%)		
	56-64	31 (12%)	6 (4.8%)		
	65+	30 (11.6%)	2 (1.6%)		
Gender	Male	102 (39.5%)	61 (48.4%)	2.731[a]	0.098
	Female	156 (60.5%)	65 (51.6%)		
Duration of back pain	Acute (≤3 weeks)	91 (35.3%)	66 (52.4%)	10.254[a]	0.001
	chronic (>3 weeks)	167 (64.7%)	60 (47.6%)		

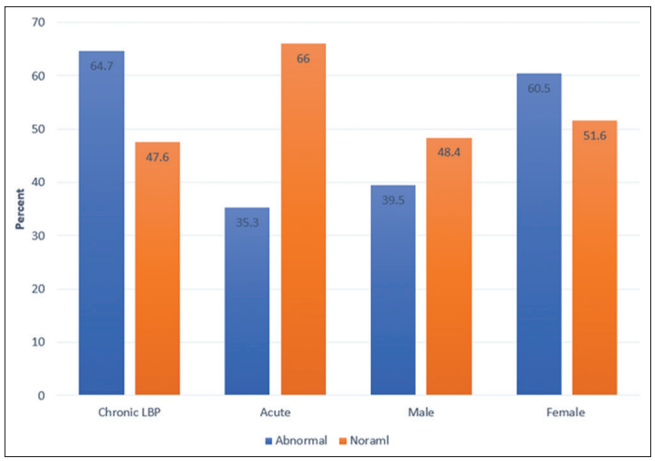

Figure 1: Outcome of lumbosacral x-ray in relation to duration of back pain and patient gender

Spondylolysis (pars interarticularis), a mild degree of vertebral slippage, mild to moderate scoliosis, schmorl nodes, and facet joint arthritis have a similar prevalence in symptomatic patients and the general population. These findings do not coincide with the development of LBP, and do not predict the response to evidence-based therapy.[3,26]

Moreover, *van Tulder et al.* in their systemic review, concluded there was no firm evidence for the presence or absence of a causal relationship for spondylolysis, spondylolisthesis, and nonspecific LBP. On the other hand, degenerative changes seemed to be associated with nonspecific back pain, with the odds ratio (OR) ranging from 1.21 to 3.32.[28]

Kalichman et al. evaluated CT imaging of 188 subjects for the presence of spondylolysis and spondylolisthesis, and correlated it with a self-report of back pain in the 12 months prior to the study. They found a higher prevalence of spondylosis (11.3%), more than what had been predicated before. Their conclusion was that no statistically significant associations were found between spondylolysis and spondylolisthesis and the occurrence of LBP.[29]

In regards to different types and frequencies of abnormalities, this study saw that the most prevalent findings in a lumbosacral X-ray were degenerative changes, including spondylosis and narrowing of the intervertebral space. This is similar to two studies by *Schepper et al.* and *Igbinedion*.[27,30] Our results show that the incidence of abnormality increases with age, reaching 93% of cases in patients over 65-, while only 48% of patients from 18 to 25 have abnormal X-ray findings. This is consistent with what was reported in other studies.[26,30]

Imaging studies for patients with nonspecific back pain, and an absence of clinical findings suggestive of a specific aetiology, does not lead to extra benefit in condition outcome. In a randomized controlled trial and in an observational study, referral for lumbar spine radiography on first presentation of LBP in a primary care setting was not associated with improved physical functioning, pain, or disability.[31]

Another randomized unblinded controlled trial included 421 participants with LBP, with a median duration of 10 weeks. Patients were managed with lumbar spine radiography and the usual care, without radiography. Researchers concluded that lumbar spine radiography in primary care patients with LBP of at least 6 weeks was not associated with improved functioning, severity of pain, or overall health status.[24]

Similarly, two systemic reviews and meta-analyses concluded that immediate, routine lumbar imaging for LBP without indications of serious underlying conditions did not improve clinical outcomes compared to usual clinical care without immediate imaging; in addition, clinical care without immediate imaging did not show increased odds of failure to identify serious underlying conditions in patients without risk factors for these conditions.[25,32]

Factors that influence physicians to request imaging studies to assess back pain is variable. A systematic review identified factors related to three themes, with a high level of confidence affecting physician behavior with imaging studies for back pain: social influence in the form of pressure from patients, requesting an image or wanting a diagnosis, or beliefs about consequences, as physicians tend to believe that providing a scan will reassure patients, in a context in which physicians report a general lack of time for a full conversation with patients about diagnosis and why a scan is not needed.[33] Similarly, another study found that the patient's age, duration of symptoms,

and radiation protection were the most important factors influencing doctors' decisions to request lumbar radiography.[34]

Interestingly, the mean number of radiological studies done over the past 12 months was 2.6, with a maximum of 24 imaging studies, and almost a quarter of patients having five or more imaging studies done within one year. This number corroborates the waste of resources and the overexposure to radiation that might lead to unwanted consequences. Findings from this study support the need to follow established clinical guidelines for managing LBP, with a focused history and physical examination before considering lumbosacral imaging.

As recommended by the American College of Physicians, routine imaging should not be done for patients with nonspecific LBP, or for those without neurological deficit or suspected underlying conditions.[35] First, a focused history and physical examination must be done to place the patient in one of three categories: nonspecific LBP, back pain potentially associated with radiculopathy or spinal stenosis, or back pain associated with another cause. Second, routine imaging should not be done with nonspecific LBP, but on patients when severe or progressive neurologic deficits are present, or if serious underlying conditions are suspected. Clinicians should encourage patients to stay active, provide information about effective self-care options, and provide medication to manage pain, if the need arises. For those who do not improve, consideration of nonpharmacologic therapy, e.g., physiotherapy, will be made.

Majority of cases in current study had either normal lumbosacral X-rays or incidental findings that were nonspecific and poorly associated with symptoms or causation of back pain. Full clinical assessment and implementing the red flags or serious pathology criteria should be undertaken before requesting imaging studies for LBP.

To our knowledge, this is the first study in SA that investigate the correlation of plain lumbosacral x ray findings and clinical presentation of LBP, and the results are consistent with similar international studies.

The findings of this study should enlighten family physician and primary care doctors, who are the most doctors consulted for LBP, on the proper management of this common condition. They should act as a gates keeper to minimize the over investigation of LBP and perform good clinical assessment to find out the really indicated cases for imaging study according to the guidelines.

Conclusion

Lumbosacral X-ray findings in the vast majority of cases do not correlate with clinical presentation and do not justify routinely ordering imaging studies for nonspecific back pain in a primary care setting.

Recommendations

Further research is needed to explore the practices of primary care physicians in management of back pain, as well as barriers that prevent adherence to guidelines.

Limitation

This study has some limitations. The study did not estimate ordering time of lumbosacral X-rays in relation to patient presentation which may add more on exploration of physician management of back pain. Second, results may not be generalized because the study was done in military-dependents community and it may be different in its background and practice.

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Conflicts of interest

There are no conflicts of interest.

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