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Research Article

Significant Correlation Between Pain Severity and Lumbosacral Radiology Findings in Patients with Low Back Pain

Nabila Sarah Shafira[1*], Laily Irfana[2], Muslim Andala Putra[3], Brilliant Citra Wirashada[4]

1) Medical Study Program, Faculty of Medicine, Universitas Muhammadiyah Surabaya, East Java, 60113, Indonesia
2) Department of Neurology, Faculty of Medicine, Universitas Muhammadiyah Surabaya, East Java, 60113, Indonesia
3) Department of Radiology, Faculty of Medicine, Universitas Muhammadiyah Surabaya, East Java, 60113, Indonesia
4) Department of Orthopaedic and Traumatology, Faculty of Medicine, Universitas Muhammadiyah Surabaya, East Java, 60113, Indonesia

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Correspondence:
nabilasarahshafra@gmail.com

ABSTRACT

Low Back Pain (LBP) is one of the most common pain complaints in daily life, with significant impacts on patients' quality of life. This study aims to analyze the correlation between pain severity, as measured by the Numeric Rating Scale (NRS), and lumbosacral radiographic findings in LBP patients at Siti Khodijah Sepanjang Hospital. This observational-analytical study used a cross-sectional design. A total of 45 patients who met the inclusion and exclusion criteria and had undergone a lumbosacral X-ray (AP/lateral) within the last 3 months were included in the sample. Pain severity was measured using the NRS questionnaire, and lumbosacral radiology findings were evaluated for muscle spasms, spondylolisthesis, osteophytes, intervertebral disc (IVD) narrowing, and compression fractures. The analysis revealed that 84.4% of patients experienced moderate pain. Regarding lumbosacral radiology abnormalities, 62.2% were classified as moderate in severity. Osteophyte formation was the most prevalent radiology finding, present in 86.7% of cases. Spearman's correlation test showed a significant correlation between pain severity and lumbosacral radiology findings ($p = 0.00 < 0.05$). The analysis demonstrated a strong, statistically significant positive correlation between radiology findings and pain severity ($r = 0.62$). These findings suggest that pain severity may serve as an indicator of the severity of lumbosacral radiological conditions in patients with low back pain and could be used as an adjunct in clinical evaluation and management strategies.

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INTRODUCTION

Low Back Pain (LBP) is one of the most commonly encountered pain complaints in clinical practice and daily life. Most cases of low back pain are musculoskeletal disorders localized in the lumbosacral region. The majority of individuals experience at least one episode of acute or recurrent LBP in their lifetime, with the frequency increasing with age (WHO, 2023). Beyond pain, LBP can progress to functional motor disability and significantly impair quality of life. However, despite the high number of LBP cases, only 15% have a known etiology, while the remaining cases are classified as nonspecific low back pain. This complicates treatment and reduces the likelihood of a favorable prognosis (Zanuto et al., 2020).

In Indonesia, the exact incidence of LBP remains difficult to determine, but data from Riskesdas (2018) indicate a prevalence ranging from 7.6% to 37% (Riskesdas, 2018). LBP is a serious public health issue because of its broad spectrum and the large number of people impacted. Despite its prevalence, LBP care and diagnostic precision remain inadequate, especially in resource-limited settings. The majority of LBP patients lack distinct diagnostic indicators, which highlights the need for improved evaluation instruments and clinical correlation to inform treatment plans.

LBP is considered a health issue that necessitates diagnostic confirmation through radiology testing. Previous studies have produced varying results. A study by Andela et al. (2019) showed that the most common radiology finding was spondylosis (92.3%) (Andela, VT, , Zainun, & , Jelmila, 2019). Nicol et al. (2020) explained that there is a correlation between radiology findings and pain, particularly in patients with radiculopathy (Nicol et al., 2020). Conversely, research by Budi Cahyono (2015) found no significant correlation between clinical symptoms and lumbosacral radiology findings using AP/lateral view methods in LBP patients (Budi Cahyono, 2015). These inconsistencies highlight a gap in understanding the correlation between radiologic findings and the subjective experience of pain, warranting further investigation.

To address this issue, the present study was conducted in two phases: first, determining pain severity using the Numeric Rating Scale (NRS) questionnaire; and second, correlating the findings with the lumbosacral X-ray obtained in AP and lateral views. The primary objective is to determine the correlation between pain severity and radiological abnormalities in patients with LBP. This study makes a novel contribution by categorizing radiologic abnormalities by severity and correlating them with patient-reported pain scores. The results of this study can serve as a useful tool in clinical decision-making and contribute to the existing literature on LBP management.

METHODS

This study is an observational analytical study with a cross-sectional design. Primary data collection was conducted using the NRS questionnaire completed by patients with low back pain (LBP). Participants were recruited through consecutive sampling, based on established inclusion and exclusion criteria. The inclusion criteria were patients with low back pain who had recently undergone lumbosacral AP/lateral X-ray at the Radiology Department of Siti Khodijah Sepanjang Hospital within the past three months. The exclusion criteria included patients with congenital vertebral abnormalities, patients with neurological disorders caused by tumors, patients with kidney stones, patients with a history of surgery

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such as vertebral fixation with pins, and patients with lumbosacral metastases.

The sample size was calculated using the Lemeshow formula, yielding a total of 45 samples for this study. Secondary data collection was also performed by retrieving the lumbosacral AP/lateral radiology findings from medical records, which were then evaluated by radiologists at the Radiology Department of Siti Khodijah Sepanjang Hospital. To evaluate the association between pain severity and lumbosacral radiographic findings in patients with low back pain, data were analyzed using the Statistical Package for the Social Sciences (SPSS), and the Spearman correlation test was used to assess the presence and strength of the correlation. This study has been approved by the Health Research Ethics Committee of Siti Khodijah Sepanjang Hospital (No. 28/KET-KEPK/10-2024).

Before initiating data collection, respondents were thoroughly informed about the study procedures and ethical considerations. Although respondents were urged to fill out the form on their own to ensure data authenticity, the researcher or accompanying family members were allowed to help if needed. The NRS was used to assess pain severity, with a score of 0 indicating no pain and higher scores reflecting increasing levels of discomfort. According to the patient's score, the pain was classified as mild (scores 1–3), meaning that it was tolerable and did not interfere much with daily activities; moderate (scores 4–6), meaning that the pain was noticeable and might interfere with some activities; and severe (scores 7–10), meaning that the pain was severe enough to significantly limit function and necessitate immediate medical attention (Suwondo, 2017).

In this study, lumbosacral radiographic abnormalities were classified into three categories: mild, moderate, and severe. Mild abnormalities included: (a) muscle spasm, (b) spondylolisthesis (0–25%), (c) osteophytes (<2 mm), (d) narrowing of the intervertebral disc (IVD) space (25–50%), and (e) compression fractures (<25%). Moderate abnormalities included: (a) spondylolisthesis (25–50%), (b) osteophytes (2–4 mm), (c) narrowing of the intervertebral disc space (50–75%), and (d) compression fractures (26–40%). Severe abnormalities included: (a) spondylolisthesis (50–75% and 75–100%), (b) osteophytes (>4 mm), (c) narrowing of the intervertebral disc space (75–100%), and (d) compression fractures (>40%) (Budi Cahyono, 2015; Ofiram et al., 2009). Assessment was performed by evaluating radiographic findings on the lumbosacral AP/lateral X-rays. If multiple abnormalities of varying severity were found within a single vertebra, the categorization was determined by the most severe finding.

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RESULTS

Table 1. Characteristics of Subjects (N=45)

Characteristic	n	%
Age (years)		
26 – 35	4	8.9
36 – 45	5	11.1
46 – 55	15	33.3
56 – 65	13	28.9
66 – 75	8	17.8
Sex		
Male	15	33.3
Female	30	66.7
Pain Severity Based on Numeric Rating Scale (NRS)		
Mild	2	4.4
Moderate	38	84.4
Severe	5	11.1
Lumbosacral Radiology Findings (AP/lateral views)		
Muscle Spasm	19	42.2
Spondylolisthesis	14	31.1
Osteophyte	39	86.7
Intervertebral Disc Space Narrowing	16	35.6
Compression Fracture	5	13.3
Classification of Lumbosacral Radiology Findings (AP/lateral views)		
Mild	4	8.9
Moderate	28	62.2
Severe	13	28.9

Table 1 presents the characteristics of the study respondents. Based on age distribution, the largest proportion of respondents were aged 46–55 years, comprising 15 individuals (33.3%), followed by those aged 56–65 years with 13 individuals (28.9%), 66–75 years with 8 individuals (17.8%), 36–45 years with 5 individuals (11.1%), and the fewest in the 26–35 years age group with 4 individuals (8.9%). Regarding gender distribution, the majority of respondents were female, totaling 30 individuals (66.7%), while male respondents accounted for half that number, totaling 15 individuals (33.3%).

Based on pain severity measured using the NRS, the majority of respondents reported moderate pain, with 38 individuals (84.4%), while 2 individuals (4.4%) experienced mild pain, and 5 individuals (11.1%) reported severe pain. Lumbosacral radiology findings among the 45 samples showed that osteophytes were the most common abnormality, found in 39 cases (86.7%), followed by muscle spasms in 19 cases (42.2%), narrowing of the intervertebral disc space (IVD) in 16 cases (35.6%), spondylolisthesis in 14 cases (31.1%), and compression fractures in 5 cases (13.3%). Regarding the severity of lumbosacral radiology findings, most respondents had moderate abnormalities (28 individuals, 62.2%), followed by severe abnormalities (13 individuals, 28.9%) and mild abnormalities (4 individuals, 8.9%).

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Table 2. Correlation Between Pain Severity with Lumbosacral Radiology Findings (N=45)

Variable	Lumbosacral Radiology Findings						p-value	Correlation Coefficient (r) value
	Mild		Moderate		Severe			
	n	%	n	%	n	%		
Pain Severity								
Mild	2	4.4	0	0	0	0		
Moderate	2	4.4	28	62.2	8	17.8	0.00	0.620
Severe	0	0	0	0	5	11.1		

Table 2 shows that among the 2 respondents (4.4%) who reported mild pain, both were categorized as having mild lumbosacral radiology findings. Of the 38 respondents (84.4%) who experienced moderate pain, 2 (4.4%) had mild lumbosacral radiographic findings, 28 (62.2%) had moderate findings, and 8 (17.8%) had severe findings. Meanwhile, all 5 respondents (11.1%) who reported severe pain were categorized as having severe lumbosacral radiology findings.

To assess the correlation between pain severity and lumbosacral radiology findings, a Spearman correlation test was performed. The analysis revealed a correlation coefficient (r) of 0.620 and a significance (p) value of 0.00, both of which are lower than the alpha level of 0.05. Therefore, the null hypothesis (H_0) was rejected, indicating a statistically significant correlation between pain severity and lumbosacral radiographic findings in patients with low back pain at Siti Khodijah Sepanjang Hospital. The correlation coefficient (r) of 0.620 indicates a strong positive association between pain severity and lumbosacral radiographic findings.

DISCUSSION

The results of this study showed that the majority of respondents with low back pain were aged 46-55 years. This finding is consistent with previous studies, which reported that most LBP patients were aged between 50 and 55 years, within an age range of 18 to 82 years (Konstantinou, Dunn, Ogollah, Vogel, & Hay, 2015). The increased prevalence of LBP in individuals aged 30 to 60 years reflects significant lifestyle and occupational changes. The continuous use of computers in the workplace and the rising dependence on technology contribute to decreased physical activity, which, combined with muscle weakness, heightens the risk of developing LBP. Moreover, degenerative processes that begin around age 30 also contribute to the rising incidence of LBP (Meucci, Fassa, & Xavier Faria, 2015).

Regarding gender, female respondents were approximately twice as numerous as male respondents. This finding aligns with previous research involving 381 samples, where 221 were female, and the remainder were male (Alateeq, Alseraihi, Alhussaini, Binhasan, & Ahmari, 2020). The reason for the higher prevalence of LBP in females compared to males remains unclear; however, it is hypothesized to be associated with higher pain sensitivity and different responses to pain stimuli in females (Wong et al., 2017). Furthermore, increased prostaglandin production (an inflammatory marker associated with back pain during menstruation) and reduced osteoblast and osteoclast activity during menopause, leading to decreased bone density (Lestari, Safei, Hidayati, Rachman, & Putra, 2024). Other

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studies have indicated that females are generally more susceptible to LBP than males, regardless of age (Williams et al., 2015).

Pain severity assessment in this study, measured using the NRS, revealed that moderate pain was the most dominant. This finding is consistent with previous studies, including research by Suzuki et al. (2020), who conducted NRS assessments among 161 patients with chronic low back pain and reported that moderate pain was the most common, followed by severe and mild pain (Suzuki et al., 2020).

Radiology assessment of the lumbosacral region in this study was performed using AP and lateral projections, focusing on findings such as muscle spasm, spondylolisthesis, osteophytes, intervertebral disc narrowing (IVD), and compression fractures. The most frequently observed finding was osteophytes, followed by muscle spasm, IVD narrowing, spondylolisthesis, and finally compression fractures. This pattern is consistent with the study by Njeze et al. (2018), which also found osteophytes as the most common radiology finding in LBP patients, followed by disc narrowing and spondylolisthesis (Njeze, Ezeofor, & Agwu-Umahi, 2018).

The Spearman correlation analysis revealed a strong, statistically significant association between pain severity and lumbosacral radiology findings. This finding is supported by research from Nugent et al. (2021), which also reported a correlation between pain severity as measured by NRS and clinical findings (Nugent, Lovejoy, Shull, Dobscha, & Morasco, 2021). Similarly, a study by Shafshak and Elnemr (2021) demonstrated that pain assessment using the NRS can reflect the severity of LBP (Shafshak & Elnemr, 2021).

The lumbar vertebrae are structurally designed to protect the spinal cord and nerve roots while providing flexibility for a wide range of motion. However, degenerative changes occur with aging. Degenerative processes in the lumbar spine, such as lumbar osteoarthritis and intervertebral disc herniation, lead to inflammation and compression of neural structures in the lumbosacral area. Aging or repetitive trauma can cause the intervertebral discs to lose elasticity, eventually resulting in narrowing or protrusion. These conditions exert pressure on the nerve roots and surrounding structures, triggering inflammation and enhancing nerve sensitivity to pain (Allegri et al., 2016).

Furthermore, degenerative processes affect spinal stability. Chronic LBP patients often experience atrophy of the paraspinal muscles. Muscle weakening leads to uneven distribution of load across the lumbar vertebrae, increasing stress on joints and other spinal structures. This imbalance intensifies existing degenerative changes, which may present as osteophytes, spinal stenosis, or spondylolisthesis. These structural changes further aggravate pain by narrowing the intervertebral foramina, thereby increasing nerve compression. Consequently, the severity of radiology abnormalities tends to increase with the patient's pain severity (Nazihah, Santoso, & Ft, 2021).

An interesting finding from the cross-tabulation analysis was that some respondents with moderate pain severity exhibited mild lumbosacral radiology findings, while others showed severe findings. This may be explained by the concept of maladaptive and adaptive pain responses in chronic pain. Maladaptive responses involve perceiving the same level of nociceptive input as more severe pain, whereas adaptive responses involve perceiving it as milder (Jensen, Tomé-Pires, Vega, Galán, & Ester Solé, 2017).

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This study has several limitations that need to be considered. The study involved only a limited number of people and was conducted in a single location, which may limit the extent to which the results are applicable. Furthermore, soft-tissue anomalies that may be better detected with advanced imaging, such as MRI, are difficult to identify on a standard lumbosacral X-ray. Additionally, pain was measured using a subjective self-report scale. To investigate how radiographic results and pain severity may vary over time, future studies should employ more comprehensive imaging modalities, a larger, more diverse population, and a longitudinal design.

CONCLUSION

Statistical analysis demonstrated a significant correlation between pain severity and lumbosacral radiology findings among patients with low back pain at Siti Khodijah Hospital, Sepanjang, with a strong correlation. These results suggest that the patient's pain severity may serve as an indicator for estimating the extent of lumbosacral pathology. Therefore, pain severity assessment can be used as an important clinical parameter to aid in the evaluation and management of patients with low back pain.

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