Plain Lumbosacral X-ray Findings for Low Back Pain and the Correlation With Patient Characteristics

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Abstract: Low Back Pain (LBP) is a condition characterized by pain in the lower back and can disrupt daily activities. The most common causes of LBP are mechanical causes and degenerative processes. A plain lumbosacral X- ray examination is essential to evaluate radiological findings for LBP. The study aimed to investigate the plain lumbosacral X-ray findings for LBP and conducted their correlation with patient characteristics represented by gender, age, and BMI. This is an analytical observational method with a cross-sectional approach on patients with LBP confirmed by plain lumbosacral X-rays. The data was obtained from October 2022 to September 2023 at Dr. Moewardi Hospital, Surakarta, Indonesia. Of the 77 eligible samples, most LBP cases were found in females (n=44;57.1%), age groups of 60 years and older (n=33;42.9%), and BMI was overweight (n=37;48.1%). The most radiographic findings for LBP were abnormal features (n=58;75.3%) and most established spondylosis (n=34;44.2%). The radiographic findings for LBP were not significantly correlated with gender, age, and BMI (p>0.05). LBP cases were more prevalent in females, age groups of 60 years and older, and BMI was overweight. The radiographic findings established more spondylosis cases and presented no significant correlation with patient characteristics.

1 INTRODUCTION

Low Back Pain (LBP) is one of the most common worldwide health problems and can be experienced at any age, including children and adolescents. The World Health Organization (WHO) stated that most people experience LBP at least once in their life (WHO, 2023). The 2010 Global Burden of Disease Study estimates that LBP was among the six most common diseases and the first ranked in terms of disability (Hoy et al., 2014). LBP is one of the three major health problems that need more attention because it is associated with loss of work productivity and produces a huge economic burden for individuals and society (WHO, 2023). In 2020, about 619 million people lived with LBP, and it was the leading cause of disability worldwide (GBD 2021 Low Back Pain Collaborators, 202). In the United States, the LBP prevalence was estimated at around 15-20% and exhibited the fifth reason patients visit medical care (Isaacs, Marinac, & Sun, 2004).

Most LBP was also found in developing countries. A one-year prevalence in adults in Africa was 57%. The prevalence of non-specific LBP in Latin America was 9-81%, with a one-year prevalence of 67% (Sharma & McAuley, 2022). In Indonesia, the LBP prevalence is uncertain, yet it was estimated around 7.6-37% of the population (Prayogo & Sutikno, 2022) In Central Java, approximately 40% of the population has experienced LBP (Panduwinata, 2015). Based on the PERDOSSI (Indonesian Neurologist Specialist Association) study in May 2002 in 14 academic hospitals, the LBP prevalence was 18.37% of the total pain cases. Several hospitals across Jakarta, Semarang, and Jogjakarta also reported that the LBP prevalence was estimated to be 5.4-5.8% of the total patients (Panduwinata, 2015).

LBP is a non-specific condition characterized by complaints of severe pain and discomfort around the lumbosacral area that can disrupt daily activities. This

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pain comes from disorders of the musculoskeletal system caused by excessive body activity or inappropriate sleeping positions. In some cases, the pain can radiate into the thigh and even down the leg or can cause sharp pain and feel like an electric shock, and the most serious stage is unable to stand due to the pain caused (Panduwinata, 2015; Santoso, Husna, Munir & Kurniawan, 2021).

Prior studies presented risk factors for LBP by gender, age, and Body Mass Index (BMI) (Hoy et al., 2014; GBD 2021 Low Back Pain Collaborators, 2023; Isaacs et al., 2004; Siddiqui et al., 2022; AlAteeq et al., 2020; Igbinedion & Akhigbe, 2011; Wu et al., 2020). Most of them reported that LBP was prevalent in females, older age, and BMI category in overweight and obese. WHO also stated that LBP cases are more common in females than males. The risk of LBP increases with age due to abnormalities in intervertebral discs in older and peaks at 50-55 years (WHO, 2023). In the other study, LBP peaked at 80-89 years and then decreased slightly. Moreover, BMI also has a significant association with LBP, where every one-unit increase in BMI will increase the LBP pain score by 11% (Siddiqui et al., 2022).

Radiological examination plays an important role in patient management. The radiographic findings can help doctors discover the cause of LBP and plan appropriate therapy for the patient. One of the most frequently used in the radiological examination is X-ray. The X-ray was used more than CT or MRI because it was easy to find in most healthcare centers in Indonesia at less cost and with less radiation. This examination can assess the spine's structure, assess for suspected causes of spinal fractures due to falls or aging, and assess whether spinal joints are displaced (Lateef & Patel, 2009). Therefore, the current study aimed to investigate the characteristics of radiographic findings in patients with LBP confirmed by plain lumbosacral X-ray and conducted their correlation with patient characteristics represented by gender, age, and BMI.

2 MATERIALS AND METHODS

This study used an analytical observational method with a cross-sectional approach in LBP patients. Data was obtained from October 2022 to September 2023 at Dr. Moewardi Hospital, Surakarta, Indonesia. The population is all patients who had performed a plain X-ray examination recorded in the SIMRS application. The sampling method used was the Total Sampling. Samples were obtained based on inclusion criteria, namely patients with major clinical symptoms of LBP and who had performed plain lumbosacral X-rays. Furthermore, patients were selected again based on those aged 30 years and older who had complete individual data such as gender, age, weight, and height. Meanwhile, the exclusion criteria were patients with non-LBP complaints and non-lumbosacral plain X-rays. Patients with major symptoms of LBP confirmed by plain lumbosacral X-rays and aged below 30 years were also excluded. Patients with major symptoms of LBP confirmed by plain lumbosacral X-rays and aged 30 years and older who did not have complete individual data were also excluded. Thus, the eligible sample was 77 patients involved in this study.

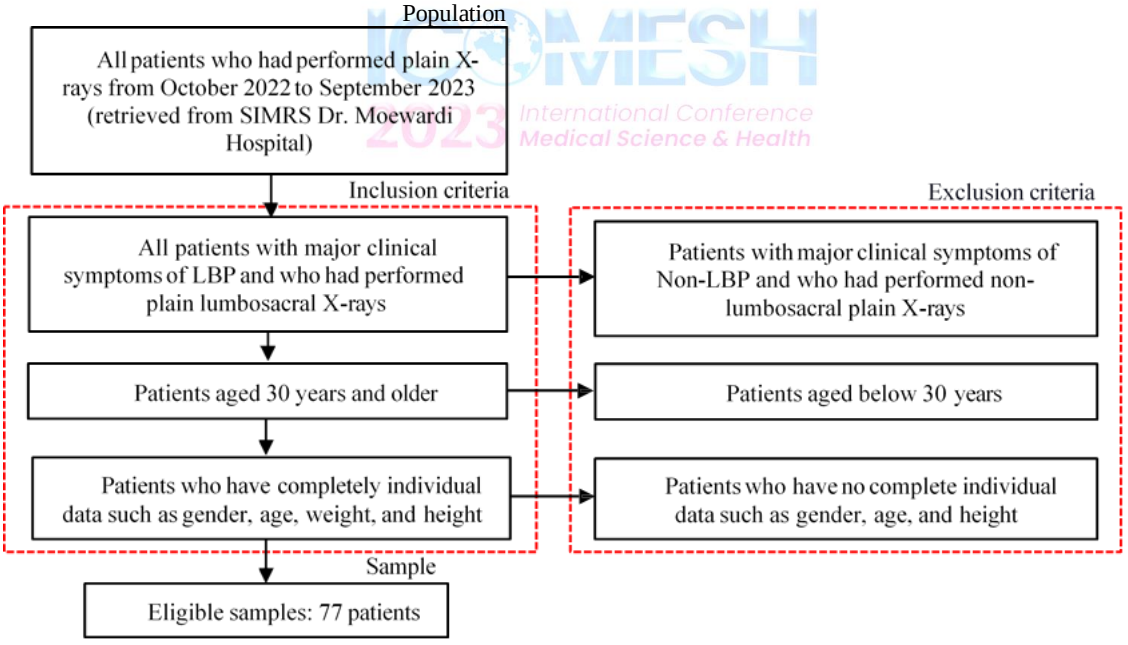

Figure 1: The criteria for sampling.

The descriptive analysis method was used to describe the characteristics of LBP patients and the characteristics of radiographic findings. The bivariate analysis method was also used to correlate radiographic findings and patient characteristics for LBP. The dependent variable is radiographic findings, grouped into normal and abnormal features. The independent variables are patient characteristics represented by gender, age, and BMI. Gender is grouped into male and female. Age is grouped into 30-39 years, 40-49 years, 50-59 years, and 60 years and older. BMI is dividing body weight (kg) by the patient's height (meter square). Furthermore, BMI is classified into three categories depending on the WHO criteria: underweight (BMI <18.5), normal (BMI 18.5-24.9), and overweight (BMI≥ 25). The data processing was in the SPSS-23, and we used the Chi-square test to provide the correlation between dependent and independent variables. The test will be significant at $p<0.05$, and it can be concluded that an independent variable strongly correlates with the dependent variable.

3 RESULTS

Figure 2 shows that females dominated sample characteristics more than males (n=44;57.1%: n=33;42.9%). In the age group, 60 years and older more dominated (n=33;42.9%), followed by 50-59 years (n=24;31.2%), 40-49 years (n =11;14.3%), and 30-39 years (n=9;11.7%). Meanwhile, BMI shows more samples in an overweight group (n=37;48.1%), followed by a normal weight group (n=35;45.5%) and an underweight group (n=5;6.5%).

Plain lumbosacral X-ray findings for LBP patients are presented in Figure 3. We found that the abnormal features (n=58;75.3%) were more than normal features (n=19;24.7%). The most abnormal features found were spondylosis, followed by spondylolisthesis, unstable lumbosacral, intervertebral disc narrowing, paralumbar muscle spasm, scoliosis, and fracture with the prevalence of n=34;44.2%, n=21;27.3%, n=19;24.7%, n=18;23.4%, n=9;11.7%, n=4;5.2%, and n=2;2.6%, respectively.

The abnormal findings on plain lumbosacral X-rays were more common in females (n=32;55.2%) than males (n=26;44%). The abnormal features were more established in the age group 60 years and older (n=29;50%), followed by 50-59 years (n=17;29.3%), 40-49 years (n=8;13.8%), and 30-39 years (n=4;6.9%). The abnormal features were also more established in the group with normal weight (n=29;50%), followed by the overweight group (n=27;46.6%) and the underweight group (n=2;3.4%). The correlation between the dependent and independent variables is presented in Table 1. The result shows that gender, age groups, and BMI have p-values more than 0.05 (0.542, 0.052, 0.104), respectively. Thus, it can be concluded that patient characteristics represented by gender, age, and BMI do not correlate statistically with radiographic findings for LBP.

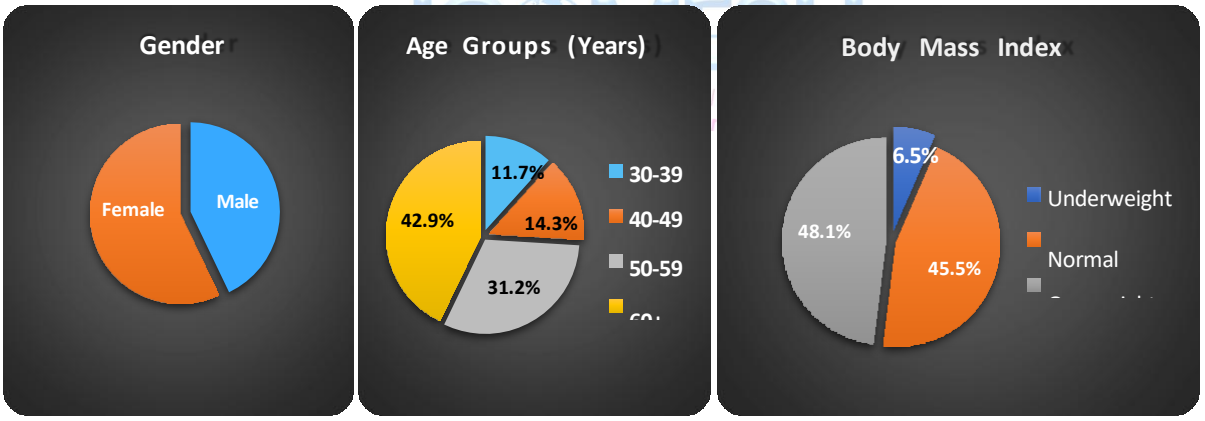

Figure 2: Characteristics of the sample.

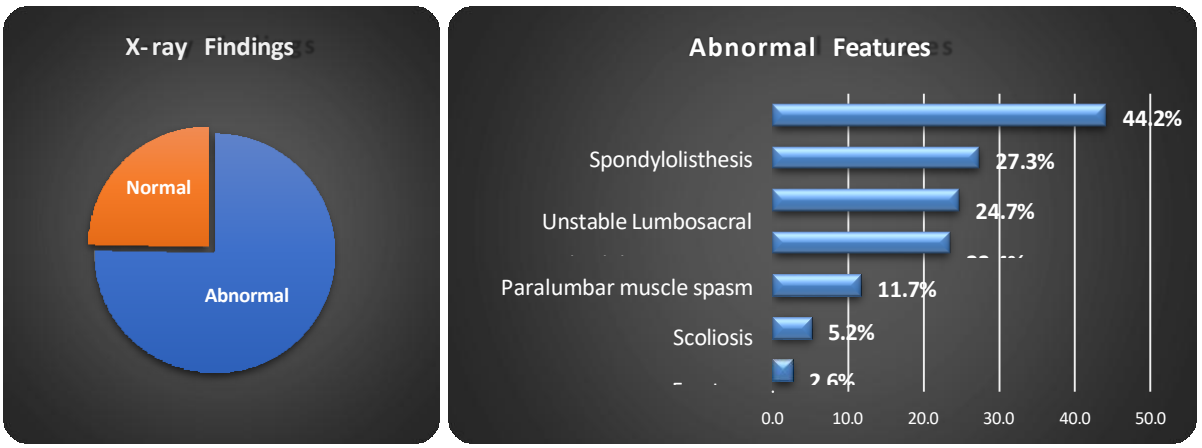

Figure 3: Plain lumbosacral X-ray findings for LBP

Table 1. The correlation between Lumbosacral X-ray findings and Patient Characteristics

Patient Characteristics		X-ray Findings			Chi-square ($\chi 2$)	p
		Abnormal	Normal	Total		
Gender	Female	32 (55.2%)	12 (63.2%)	44 (57.1%)	0.373	0.542
	Male	26 (44.8%)	7 (36.8%)	33 (42.9%)		
	Total	58 (100%)	19 (100%)	77 (100%)		
Age Groups	30-39	4 (6.9%)	5 (26.3%)	9 (11.7%)	7.716	0.052
	40-49	8 (13.8%)	3 (15.8%)	11 (14.3%)		
	50-59	17 (29.3%)	7 (36.8%)	24 (31.2%)		
	60+	29 (50.0%)	4 (21.1%)	33 (42.9%)		
	Total	58 (100%)	19 (100%)	77 (100%)		
BMI	Underweight	2 (3.4%)	3 (15.8%)	5 (6.5%)	4.535	0.104
	Normal Weight	29 (50.0%)	6 (31.6%)	35 (45.5%)		
	Overweight	27 (46.6%)	10 (52.6%)	37 (48.1%)		
	Total	58 (100%)	19 (100%)	77 (100%)		

The abnormal findings on plain lumbosacral X-rays were more common in females (n=32;55.2%) than males (n=26;44%). The abnormal features were more established in the age group 60 years and older (n=29;50%), followed by 50-59 years (n=17;29.3%), 40-49 years (n=8;13.8%), and 30-39 years (n=4;6.9%). The abnormal features were also more established in the group with normal weight (n=29;50%), followed by the overweight group (n=27;46.6%) and the underweight group (n=2;3.4%). The correlation between the dependent and independent variables is presented in Table 1. The result shows that gender, age groups, and BMI have p-values more than 0.05 (0.542, 0.052, 0.104), respectively. Thus, it can be concluded that patient characteristics represented by gender, age, and BMI do not correlate statistically with radiographic findings for LBP.

4 DISCUSSION

The occasions of LBP are infectious conditions, degenerative processes, neoplasms, trauma, congenital disorders, metabolic diseases, and autoimmune. Of the various etiology, the most common cause of LBP is mechanical causes, such as trauma to the vertebrae, discs, and adjacent soft tissue. The second vast cause is due to degenerative processes such as osteoarthritis and osteoporosis. LBP cannot be identified entirely by patient complaints, medical history, or physical examination. Most LBP feel painful in different locations (Santoso et al., 2021). A radiological examination is needed to support the diagnosis of LBP. One of the radiological examination modalities frequently used is X-ray.

Several risk factors of LBP, such as gender, age, and BMI, need more attention and consideration by clinicians when evaluating patients. In this study, the

abnormal features on plain lumbosacral X-ray for LBP patients were more commonly found in females, with a prevalence of 55.2%. These results align with those reported by Hoy et al. (2012) and AlAteeq et al. (2020) in their study that LBP cases were prevalent in females. The abnormal features are also more commonly found in patients aged 60 years and older, with a prevalence of 50%. Igbinedion and Akhigbe (2011) also reported the same findings in their research that the age group 61-70 years has experienced the highest LBP prevalence. Wu et al. (2020) also reported that LBP prevalence increases with age, peaks at 80-89 years, and decreases slightly. Most elderly experience LBP because of decreased body functions, especially spines. Furthermore, people with normal BMI were more experiencing LBP, with a prevalence of 50%. It means that people with an ideal weight were included in the supporting factors for experiencing LBP. It was similar to research conducted by Hershkovich et al. (2013). They stated that people with normal weight have a higher LBP prevalence (74.87%). Chowdhry et al. (2014) also reported that people with an ideal weight have a high LBP prevalence (46.78%).

The abnormal features on plain lumbosacral X-rays for LBP were more presenting spondylosis (44.2%), spondylolisthesis (27.3%), unstable lumbosacral (24.7%), and intervertebral disc narrowing (23.4%). It aligns with research conducted by Mutmainna, Ali & Loho (2014) that spondylosis, spondylolisthesis, and unstable lumbosacral are the most commonly found in LBP, with prevalences of 42.96%, 15.62% and 6.25%, respectively. Spondylosis is often found due to the degeneration process of the lumbar spine. The major cause of intervertebral disc degeneration is age and the type of injury, while several risk factors for spondylosis are poor posture habits, stress, and body type. Degenerative changes in the lumbar spine can be asymptomatic and symptomatic. Symptoms that often appear are back pain, muscle spasms, limited movement in all directions, and sexual dysfunction.

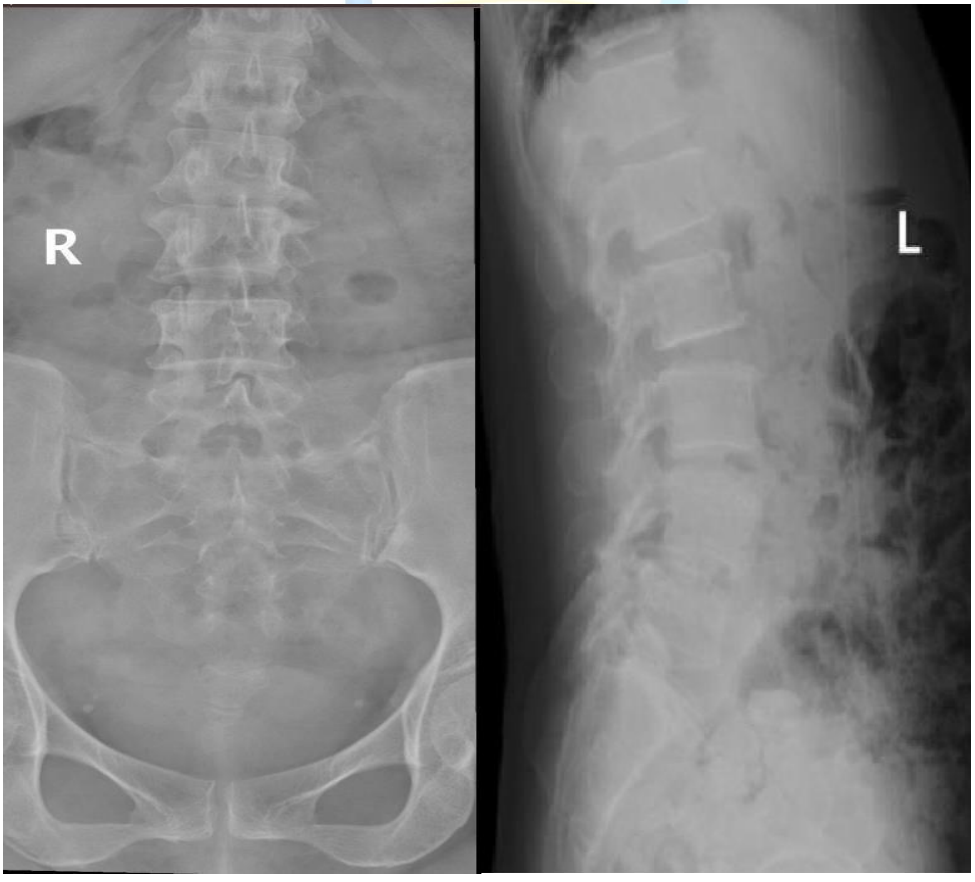

Figure 4: A 55-year-old female patient with LBP has experienced spondylosis, spondylolisthesis, unstable lumbosacral, and a paralumbar muscle spasm on a plain lumbosacral X-ray.

The correlation between radiographic findings and patient characteristics represented by gender, age, and BMI was not statistically significant ($p>0.05$). These results are similar to research by AlAteeq et al. (2020) in gender, whereas they demonstrate different results in age. Distinct results also occurred in BMI. We found that BMI was not significantly correlated with radiographic findings in LBP patients, while the finding from Igbinedion (2011) was significantly correlated. The results of the current study are different from prior evidence because the sample sizes tend to be small. Consequently, they cannot support existing theories.

The abnormal findings on plain lumbosacral X-rays were more common in females (n=32;55.2%) than males (n=26;44%). The abnormal features were more established in the age group 60 years and older (n=29;50%), followed by 50-59 years (n=17;29.3%), 40-49 years (n=8;13.8%), and 30-39 years (n=4;6.9%). The abnormal features were also more established in the group with normal weight (n=29;50%), followed by the overweight group (n=27;46.6%) and the underweight group (n=2;3.4%). The correlation between the dependent and independent variables is presented in Table 1. The result shows that gender, age groups, and BMI have p-values more than 0.05 (0.542, 0.052, 0.104), respectively. Thus, it can be concluded that patient characteristics represented by gender, age, and BMI do not correlate statistically with radiographic findings for LBP.

Figure 4 shows that a 55-year-old female patient has experienced spondylosis, spondylolisthesis, unstable lumbosacral, and paralumbar muscle spasms. The symptoms experienced were back pain, muscle spasms, and limited movement.

5 CONCLUSION

LBP cases were more prevalent in females, age groups of 60 years and older, and BMI was overweight. The most abnormal features on plain lumbosacral X-ray findings were spondylosis. There was no significant correlation between radiographic findings and patient characteristics represented by gender, age, and BMI.

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