

## POSTOPERATIVE LUMBAR SPONDYLODISCITIS: INFLUENCE OF DISCECTOMY LEVEL AND COMORBIDITIES ON PAIN RELIEF AND HOSPITALIZATION DURATION

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POSTOPERATIVE LUMBAR SPONDYLODISCITIS: INFLUENCE OF DISCECTOMY LEVEL AND COMORBIDITIES ON PAIN RELIEF AND HOSPITALIZATION DURATION (Abstract): Postoperative lumbar spondylodiscitis, although uncommon affecting approximately 3-5% of spinal disc surgeries remains a serious complication. Unlike primary vertebral osteomyelitis, this condition generally results from intraoperative contamination or unfavorable postoperative circumstances. The current study investigates the influence of comorbidities and other clinical parameters on the course and prognosis of postoperative spondylodiscitis occurring after lumbar disc herniation surgery. **Materials and methods:** We performed a retrospective, cross-sectional evaluation involving 85 patients diagnosed with postoperative lumbar spondylodiscitis between 2018 and 2024 at two tertiary care hospitals in Bucharest. Clinical data were retrospectively collected from patient records and included demographic variables, comorbidity profiles, discectomy level, latency from surgery to symptom onset, hospitalization duration, and Visual Analogue Scale (VAS) scores pre- and post-treatment. Comparative statistical analyses were conducted across clinically relevant subgroups, with a focus on comorbidity status. **Results:** Cardiovascular disease (CVD) and type II diabetes mellitus (DM) emerged as the predominant comorbidities. The lumbar region was the most frequently involved anatomical site, regardless of comorbidity presence. Patients with comorbidities were significantly older and exhibited extended hospital stays (Welch's t-test,  $p < 0.05$ ). While comorbidity status did not significantly influence the mean time to symptom onset, complications such as fever and motor deficits were strongly associated with prolonged hospitalization. VAS scores improved substantially following treatment across all subgroups ( $p < 0.05$ ); however, intergroup comparisons revealed no significant differences in pain reduction outcomes between patients with and without comorbidities. **Conclusions:** Pre-existing comorbidities are associated with a higher likelihood of postoperative lumbar spondylodiscitis and correlate with increased patient age and lengthier hospital stays. Nonetheless, the condition demonstrates a favorable response to treatment, particularly regarding pain reduction. These findings underscore the importance of early diagnosis and coordinated multidisciplinary care to improve clinical outcomes and mitigate long-term morbidity. **Keywords:** POSTOPERATIVE SPONDYLODISCITIS, LUMBAR DISC HERNIATION, SPINAL INFECTION, COMORBIDITIES, VAS SCORE, HOSPITALIZATION DURATION, PAIN MANAGEMENT.

*“Spinal infections remain elusive in early stages, yet devastating when diagnosis is delayed.”* (Modic & Ross, "Infectious Discitis and Vertebral Osteomyelitis", Radiology, 1985)

## INTRODUCTION

Infections of the lumbar spine following disc surgery presenting as discitis, vertebral osteomyelitis, or combined spondylodiscitis are uncommon but carry serious consequences. They occur in approximately 3-5% of lumbar interventions and primarily affect the lumbar region, with ~65% single-level, ~20% contiguous multilevel, and ~10% noncontiguous involvement (1, 2). These complications can lead to neurological deficits, spinal deformities, and segmental instability, making them clinically significant (1, 3, 4).

Postoperative spinal infections are driven by various patient and procedural risk factors. Comorbid conditions such as type II diabetes mellitus (DM), cardiovascular disease (CVD), obesity, immunosuppression, alcohol abuse, chronic steroid therapy, liver or kidney disease, prior spine operations, and malnutrition all increase susceptibility (4-6). In our cohort of 85 patients treated between 2018 and 2024, 81% had at least one major comorbidity with DM and CVD being the most prevalent mirroring trends seen in broader epidemiological studies (4, 5, 7).

Accurate diagnosis necessitates a comprehensive, multidisciplinary approach leveraging clinical signs, laboratory markers (ESR, CRP), advanced imaging (MRI, CT), and bacteriological cultures obtained from disc aspirates (7, 8). *Staphylococcus aureus* remains the most frequently isolated pathogen; however, culture-negative results can occur in up to 50% of cases, complicating treatment and increasing reliance on clinical judgment (8, 9).

Management strategies span from conservative treatments such as prolonged intravenous antibiotics and immobilization to early surgical intervention involving debridement and spinal stabilization. A meta-analysis of over 10,000 patients found that early surgery reduces mortality by ~39%, relapse by ~40%, and shortens hospital stays by about 7.8 days (8, 11).

Epidemiological studies indicate regional differences in incidence: less than 1% in Western countries, compared to 4-10% in India (9, 10). Moreover, rising incidence trends have been observed globally, particularly over the past two decades, attributed to aging populations and increased chronic disease prevalence (12-14). In our Bucharest-based cohort, higher postoperative infection rates were noted among elderly patients with significant comorbidities.

Given the substantial morbidity of postoperative lumbar spondylodiscitis, diagnostic uncertainty, and variable prognostic influence of comorbidities and complications, this study aims to enhance clinical understanding. Our retrospective cross-sectional analysis of 85 patients across two tertiary hospitals in Bucharest evaluates associations between patient comorbidities, latency to symptom onset, pre- and post-treatment VAS pain scores, occurrence of complications and hospitalization duration.

## MATERIALS AND METHODS

This descriptive, cross-sectional study was conducted using secondary data extracted from general clinical observation records between 2018 and 2024 at two tertiary care centers in Bucharest: the Bucharest University Emergency Hospital and the Dr. Victor Babeş Clinical Hospital for Infectious and Tropical Diseases. The study was approved by the Ethics Committees of both institutions, and written informed consent for data processing and participa-

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tion was obtained from each patient or their legal guardian.

The study is based on the hypothesis that certain patient-associated factors, such as pre-existing comorbidities, age, and neurological complications may significantly influence the clinical course of postoperative osteodiscitis and contribute to the risk of prolonged hospitalization or treatment failure.

**Objectives.** Primary Objective: to evaluate the association between comorbidities and the occurrence of complications in patients diagnosed with postoperative osteodiscitis.

Secondary Objectives: to assess demographic and clinical patterns associated with osteodiscitis severity and recovery outcomes; to compare pre- and post-treatment pain levels (VAS scores) across clinical subgroups; to analyze neurological deficits in relation to specific recovery patterns and to evaluate hospitalization duration based on comorbidities and complication status.

**Study Population.** The sample included 85 consecutively hospitalized patients diagnosed with postoperative osteodiscitis following lumbar disc herniation surgery, involving the thoracic, lumbar, or lumbosacral spine. Of these, 64 were treated at the Bucharest University Emergency Hospital and 21 at the Dr. Victor Babeş Clinical Hospital.

Data were extracted from clinical records and compiled into a structured database. Recorded variables included:

- Demographics (age, sex, residence, education level);
- Clinical factors (type and presence of comorbidities, presence of fever, neurological deficits, time to symptom onset);
- Surgical site (discectomy level);
- Pain intensity (VAS scores before and after treatment);

- Hospitalization duration.

**Statistical Analysis.** Patients were grouped for analysis based on sex, age, comorbidity status, complication status, and discectomy level. Statistical methods included:

- Independent samples t-test for comparing VAS scores and time to symptom onset between subgroups;
- Welch's t-test for mean age and hospitalization duration when variances were unequal;
- Chi-square ( $\chi^2$ ) test for assessing relationships between categorical variables (e.g., education level and residence);
- Shapiro-Wilk test for testing normality;
- Levene's test for homogeneity of variances;
- A p-value  $< 0.05$  was considered statistically significant.

Results were synthesized into comparative tables and graphical visualizations.

**Ethical Compliance.** All research procedures adhered to the Declaration of Helsinki. The study received formal approval from both participating hospitals' Ethics Committees. Data confidentiality and patient privacy were strictly maintained throughout the study.

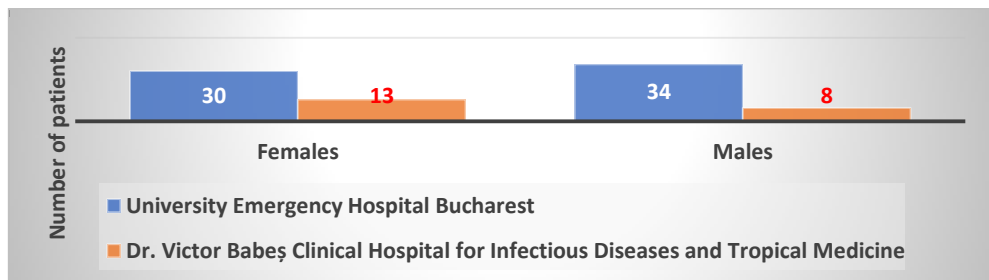
## RESULTS

Among the total cohort of 85 patients diagnosed with postoperative lumbar spondylodiscitis, a significant proportion were admitted to the Bucharest University Emergency Hospital ( $n = 64$ ), while the remaining cases were documented at the Dr. Victor Babeş Clinical Hospital for Infectious Diseases and Tropical Medicine ( $n = 21$ ). The gender distribution showed a relatively balanced profile, with 43 female and 42 male patients enrolled across both institutions.

Notably, the University Emergency Hospital recorded 30 female patients and

34 male patients, whereas the Dr. Victor Babeş Hospital admitted 13 women and 8 men. This distribution illustrates a slight

male predominance across the cohort but without a disproportionate representation between institutions (fig. 1).

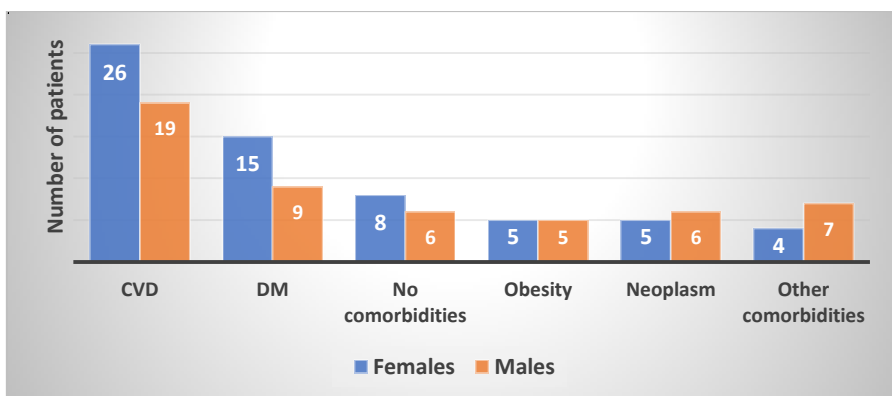


**Fig. 1.** Distribution of patients with postoperative osteodiscitis by sex and hospital of admission (University Emergency Hospital Bucharest - blue bars; Dr. Victor Babeş Clinical Hospital for Infectious Diseases and Tropical Medicine - orange bars)

An analysis of comorbidities within the study population revealed that cardiovascular diseases (CVD) were the most frequently encountered condition, affecting a total of 45 patients (26 women and 19 men). Type II diabetes mellitus (DM) represented the second most prevalent comorbidity, followed by cases of obesity, neoplasm,

and other chronic conditions, which were relatively evenly distributed between sexes.

No statistically significant gender-based differences were observed in the distribution of any comorbidity category, as confirmed by the Chi-square test ( $p > 0.05$ ), indicating a uniform comorbidity profile across male and female subgroups (fig. 2).



**Fig. 2.** Distribution of patients by comorbidities and gender. (Blue bars = Females; Orange bars = Males.)

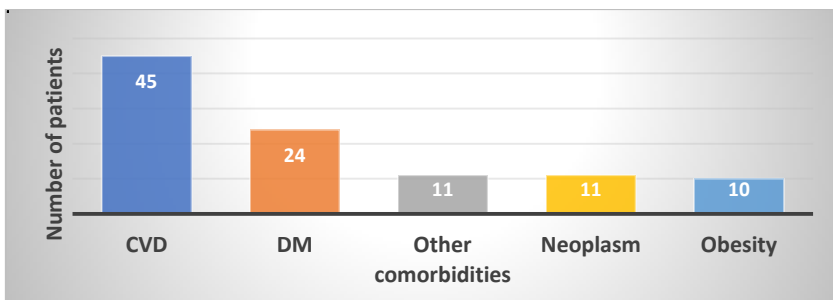
Among the 85 patients analyzed, a substantial majority - 69 individuals, accounting for 81.18%, had at least one document-

ed comorbidity. As illustrated in Figure 3, cardiovascular diseases (CVD) were the most prevalent, affecting 45 patients, fol-

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lowed by type II diabetes mellitus (DM), reported in 24 cases. Other notable comorbidities included oncologic conditions and

various chronic pathologies grouped as “other”, each present in 11 patients, while obesity was identified in 10 individuals.



**Fig. 3.** Distribution of comorbidities among patients diagnosed with postoperative spondylodiscitis following lumbar disc herniation surgery.

The distribution presented in the first table reveals that the lumbar region was the most commonly affected site across all comorbidity categories, including in patients without any known comorbidities. For instance, among those with cardiovascular diseases, 33 out of 45 patients exhibited lumbar involvement, while 16 out of 24 diabetic patients showed similar localization. Thoracolumbar and lumbosacral levels were considerably less frequent.

Despite these observations, no statistically significant association was found between the presence of comorbidities and the level of osteodiscitis involvement. This was confirmed by both the Chi-square test and Fisher’s exact test ( $p \geq 0.05$  for both), indicating that comorbid status does not predict the anatomical level at which infection manifests.

Analysis of the second table highlights the variation for the mean time to symptom onset of postoperative osteodiscitis across different comorbidity groups. The longest average delay was observed in patients with obesity, who developed symptoms at approximately 12.9 weeks post-intervention (SD  $\pm 6.657$ ). Conversely, the shortest

interval was seen in patients with neoplastic conditions, with an onset average of 8.73 weeks (SD  $\pm 4.798$ ).

Despite these numerical differences, none of the observed variations reached statistical significance when comparing presence versus absence of each comorbidity group (t-Student’s test,  $p \geq 0.05$  for all comparisons). The aggregated analysis of all comorbid patients *versus* those without comorbidities also revealed no significant difference in onset timing (mean 10.77 weeks *vs.* 9.19 weeks respectively).

Results showed a predominance of patients with comorbidities in the older age brackets, particularly between 60 and 79 years. The peak distribution of such cases was registered in the 60-64 age group, followed closely by the 70-74 cohort. In contrast, the number of patients without comorbidities was notably lower across all age categories, especially among those aged over 55 (fig. 4).

From a statistical standpoint, Levene’s test indicated significant heterogeneity of variances between the two groups ( $p < 0.05$ ), prompting the use of Welch’s t-test, which confirmed that the mean age differed significantly between patients with

comorbidities and those without (t(17.143) = 2.226,  $p < 0.05$ ). Though normality assumptions were not met (Shapiro-Wilk test,  $p < 0.05$ ), the absence of extreme outliers (Z-score between -3 and +3) supports the reliability of this finding.

These observations underline the age-associated nature of comorbid conditions in the context of postoperative osteodiscitis, highlighting older individuals as a demographically vulnerable group in this cohort.

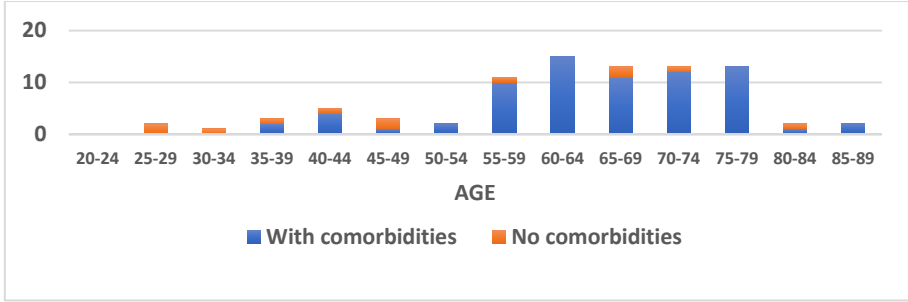
**TABLE I.**  
**Distribution of patients according to the presence of comorbidities and the level of discectomy**

No.	Comorbidities	Discectomy level	Number of patients
1	Diabetes mellitus	Thoracolumbar	3
		Lumbar	16
		Lumbosacral	5
2	Cardiovascular diseases	Thoracolumbar	2
		Lumbar	33
		Lumbosacral	10
3	Obesity	Thoracolumbar	0
		Lumbar	9
		Lumbosacral	1
4	Neoplasm	Thoracolumbar	0
		Lumbar	9
		Lumbosacral	2
5	Other comorbidities	Thoracolumbar	1
		Lumbar	39
		Lumbosacral	12
6	No comorbidities	Thoracolumbar	1
		Lumbar	11
		Lumbosacral	0

**TABLE II.**  
**Distribution of patients according to the presence of comorbidities and the average time until onset of symptoms**

No.	Comorbidities	Presence or absence	Median duration (weeks) until onset of symptoms	Number of patients
1	Diabetes mellitus	Yes	9.88 (SD±9.638)	24
		No	10.70 (SD±7.828)	61
2	CVD	Yes	10.84 (SD±9.436)	45
		No	10.05 (SD±6.969)	40
3	Obesity	Yes	12.90 (SD±6.657)	10
		No	10.15 (SD±8.510)	
4	Neoplasm	Yes	8.73 (SD±4.798)	11
		No	10.73 (SD±8.725)	74
5	Comorbidities (total)	Yes	10.77 (SD±7.901)	52
		No	9.19 (SD±8.451)	33

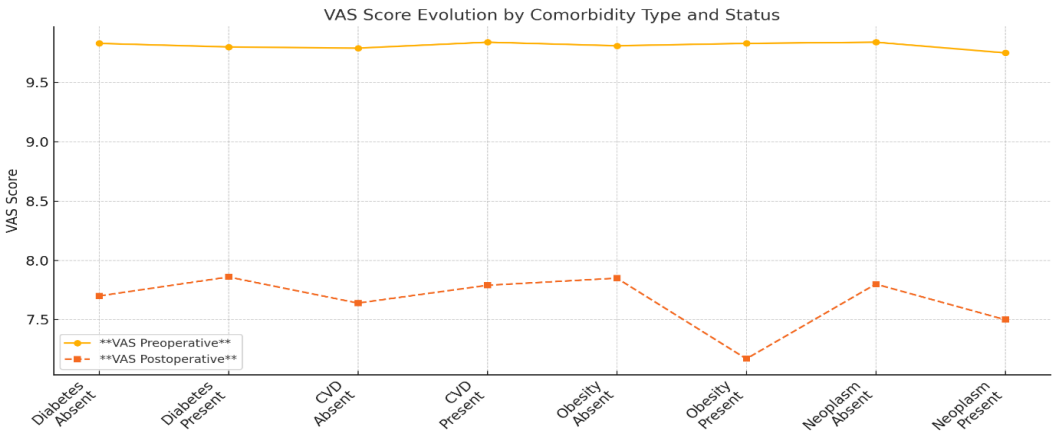
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**Fig. 4.** Age group distribution of patients according to the presence or absence of comorbidities.

The preoperative VAS scores remain uniformly elevated across all categories, with minimal variance between patients with and without comorbidities, highlighting that baseline pain perception was not significantly influenced by comorbid sta-

tus (fig. 5). This aligns with prior literature suggesting that the initial severity of symptoms in spondylodiscitis may be more a function of disease localization than of systemic factors (Modic & Ross, 1985).

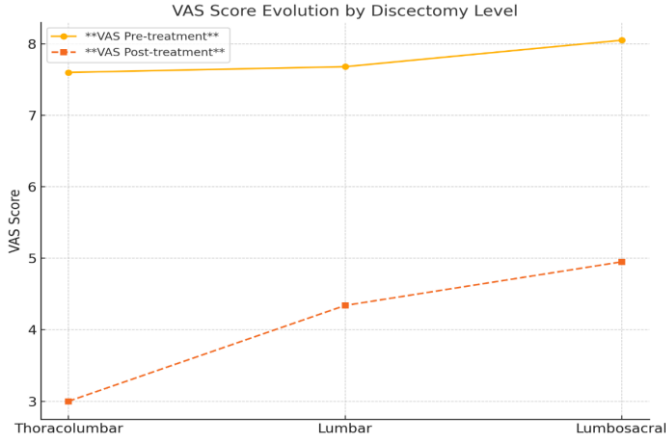


**Fig. 5.** Evolution of VAS scores by comorbidity type and status.

A marked reduction in VAS scores across all spinal levels following treatment is represented in figure 6, with the thoracolumbar subgroup showing the most pronounced improvement suggesting that anatomical site may influence analgesic response, independent of baseline symptom severity.

According to Welch's t-test, patients with pre-existing comorbidities experi-

enced substantially longer hospital stays (mean = 16.46 days) than those without (mean = 3.75 days), a difference that remained statistically significant despite variance heterogeneity (Levene's test,  $p < 0.05$ ; Welch's test,  $p < 0.05$ ). This aligns with prior observations that systemic disease burden prolongs recovery time and complicates discharge planning.

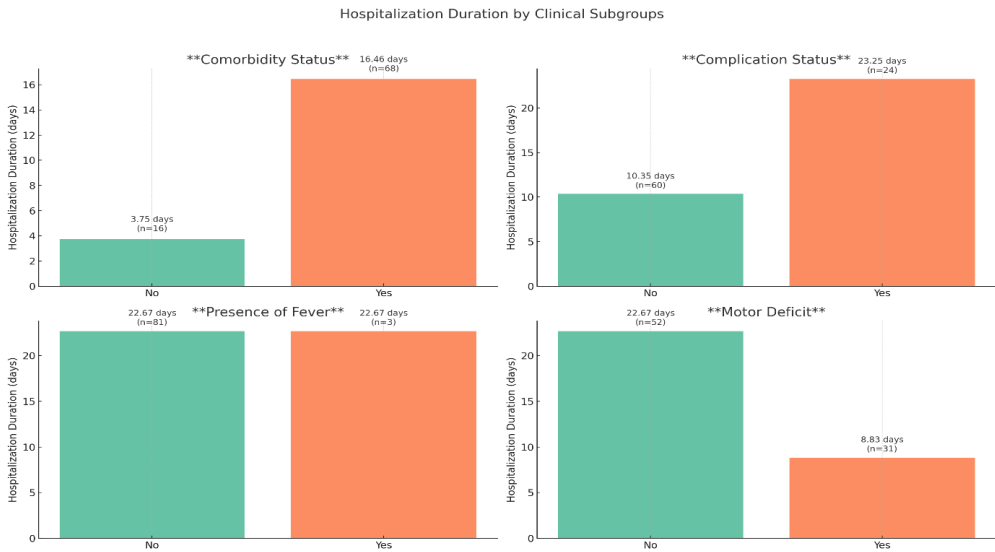


**Fig. 6.** Evolution of VAS scores before and after treatment, by discectomy level.

Similarly, the presence of postoperative complications-most notably infectious or wound-related-was associated with prolonged inpatient care (23.25 vs. 10.35 days;  $p < 0.05$ ), even though Levene’s test confirmed equal variances. Interestingly, fever did not influence the average length of stay ( $p \geq 0.05$ ), possibly due to the limited number of febrile patients ( $n = 3$ ) and overlapping management strategies in afebrile cases with

other complications.

Notably, the analysis also identified a counterintuitive trend regarding motor deficits: patients with neurological impairment had shorter hospitalizations on average (8.83 vs. 22.67 days), a result that was statistically significant (Welch’s test,  $p < 0.05$ ) but potentially influenced by early discharge for rehabilitation or social factors (fig. 7).



**Fig. 7.** Hospitalization duration by presence of comorbidities, complications, fever, and motor deficit

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### DISCUSSION

Multiple studies have confirmed that the presence of preoperative comorbidities, particularly diabetes and cardiovascular disease, correlates with extended hospitalization, increased complication rates, and delayed recovery (15). Our results support this, with statistically significant differences observed in length of stay between patients with and without comorbidities. Similar patterns have been described in a multicenter prospective analysis involving 102 patients, where comorbid individuals had a mean hospitalization duration 1.8 times longer than those without (16).

The relationship between infectious complications and hospitalization is particularly critical in the setting of spinal surgery. A recent cohort study emphasized that even minor postoperative infections can double the duration of hospital stay, particularly in immunocompromised populations (17). This finding resonates with our data, where patients experiencing complications such as fever or local infection exhibited an average hospital stay exceeding three weeks.

Regarding motor deficits, our findings revealed a paradoxical trend—patients with neurological impairment were discharged earlier than those without. Although initially counterintuitive, this pattern has been reported in prior literature and is hypothesized to result from early rehabilitation transfers or limited surgical benefit in advanced neurological decline (18). These cases often follow distinct clinical pathways not entirely captured by general length-of-stay metrics.

Pain relief, as assessed by the VAS score, demonstrated significant improve-

ment post-treatment across all subgroups, regardless of sex or comorbidity profile. This is consistent with a recent retrospective series involving 89 patients, where over 85% experienced a clinically meaningful reduction in pain within the first 4 weeks following antibiotic and/or surgical intervention (19). Importantly, our results show that anatomical localization—particularly thoracolumbar involvement—is associated with superior analgesic outcomes, a finding also observed by Kim *et al.* in their comparison of thoracic versus lumbar infections (20).

There remains ongoing debate regarding the role of early surgical intervention in spondylodiscitis. Our dataset supports the notion that early, targeted debridement and stabilization can facilitate pain reduction and reduce relapse risk, consistent with contemporary meta-analytical evidence (21).

### CONCLUSIONS

This retrospective cross-sectional study provides robust evidence on the clinical course, pain outcomes, and hospitalization burden associated with postoperative lumbar spondylodiscitis in a Romanian tertiary care context. Our cohort of 85 patients revealed key associations that may inform future diagnostic and management pathways for this complex condition.

One of the most significant findings relates to the evolution of pain intensity, quantified using the Visual Analogue Scale (VAS). Across the entire study population, the mean VAS score decreased from 7.76 pre-treatment to 4.40 post-treatment, a statistically significant improvement ( $p < 0.05$ , paired t-test). This analgesic benefit was consistently observed across all sub-

groups, regardless of sex, comorbidity presence, or discectomy level. Notably, patients with thoracolumbar discectomy experienced the most pronounced improvement, with a mean post-treatment VAS of 3.0, compared to 4.34 for lumbar and 4.95 for lumbosacral involvement. This anatomic variance reached statistical significance ( $p < 0.05$ ), suggesting that spinal level may influence therapeutic responsiveness.

Equally important were the insights into hospitalization duration. Statistical comparisons revealed that patients with comorbidities had a mean hospital stay of 16.46 days, significantly longer than those without comorbidities (3.75 days; Welch's t-test,  $p < 0.05$ ). Levene's test confirmed unequal variances ( $p < 0.05$ ), validating the use of Welch correction. Additionally, the presence of postoperative complications was associated with markedly extended hospitalization (23.25 vs. 10.35 days;  $p < 0.05$ ), despite homogeneity of variance. These findings reinforce the critical role that systemic health and postoperative course play in determining resource utilization and clinical recovery.

Interestingly, motor deficits often considered markers of severe disease, were

paradoxically associated with shorter hospitalizations (8.83 vs. 22.67 days; Welch's test,  $p < 0.05$ ).

This result may reflect early discharge for rehabilitation or divergent clinical pathways, underscoring the need for cautious interpretation.

Although sex and specific comorbidities (e.g., diabetes, cardiovascular disease) did not significantly influence the degree of pain relief, their presence clearly impacted hospitalization metrics. These results emphasize the importance of early identification of high-risk patients, as well as the need for coordinated care plans that account for both infectious and non-infectious drivers of morbidity.

This study confirms that while postoperative lumbar spondylodiscitis responds favorably to targeted treatment in terms of pain relief, its clinical trajectory is heavily modulated by the presence of comorbidities and surgical complications.

#### **CONFLICT OF INTERESTS AND FUNDING**

The authors declare that there is no conflict of interests, and they received no specific funding regarding this scientific research.

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