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FREQUENCY OF POST-OPERATIVE BACK PAIN IN PATIENTS WITH LAMINECTOMY

Original Research

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Acknowledgement: The authors are grateful to the neurosurgical team at Hayatabad Medical Complex for their support during data collection.

Conflict of Interest: None
Grant Support & Financial Support: None

ABSTRACT

Background: Low back pain (LBP) is a major global health concern and a leading cause of disability. Surgical procedures like laminectomy are often employed when conservative management fails. However, a significant proportion of patients continue to report post-operative pain, termed post-laminectomy syndrome or failed back surgery syndrome (FBSS). Despite international recognition of this issue, limited local data exists regarding its frequency and predictors, which are crucial for improving patient outcomes in regional healthcare settings.

Objective: To determine the frequency and early predictors of post-operative back pain in patients undergoing laminectomy.

Methods: A descriptive study was conducted over six months in the Department of Neurosurgery at Hayatabad Medical Complex, Peshawar. A total of 114 consecutive patients aged 18 to 60 years undergoing laminectomy were enrolled using non-probability sampling. Data were collected on demographic characteristics, clinical variables, and comorbidities. Pain was assessed using the Visual Analog Scale (VAS) at 24 and 72 hours post-operatively. Statistical analysis was performed using SPSS version 25. Chi-square tests and binary logistic regression were used to identify significant predictors, with $p \leq 0.05$ considered statistically significant.

Results: Among 114 patients (mean age 41.0 ± 12.0 years; 60 males, 54 females), the mean VAS score decreased from 5.7 ± 2.3 at 24 hours to 5.0 ± 3.2 at 72 hours post-laminectomy. Persistent pain (VAS > 4) at 72 hours was reported in 33 patients (28.9%). Diabetes mellitus ($p = 0.0009$) and lumbar laminectomy ($p = 0.0440$) were significantly associated with persistent pain. Logistic regression revealed increased odds of pain in diabetic patients (OR: 2.51) and those with higher BMI, though not statistically significant.

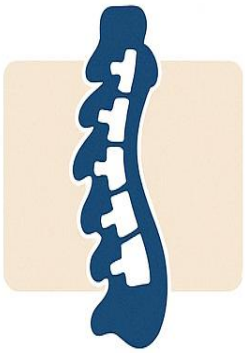
Conclusion: Post-operative back pain remains prevalent following laminectomy, especially among diabetic patients and those undergoing lumbar procedures. Timely identification of high-risk individuals may improve pain outcomes and guide individualized perioperative care strategies.

Keywords: Back Pain, Diabetes Mellitus, Laminectomy, Pain Measurement, Postoperative Complications, Risk Factors, Spine Surgery.

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PREDICTORS OF POST-LAMINECTOMY BACK PAIN

BACKGROUND



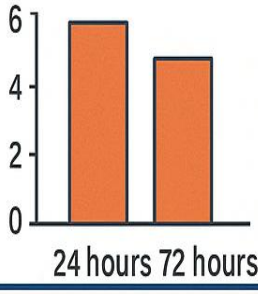
Low back pain is a common condition often treated with laminectomy

METHODS



114 patients undergoing laminectomy

- Visual Analog Scale (VAS) at 24 and 72 hours



CONCLUSION



Diabetes



Lumbar laminectomy

Postoperative back pain is common, particularly in patients with diabetes and those undergoing lumbar procedures



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INTRODUCTION

Low back pain (LBP) remains one of the most prevalent musculoskeletal complaints globally, with lifetime incidence estimates ranging from 60% to 80%. It continues to be a major contributor to disability, diminished quality of life, and economic strain, particularly when symptoms become chronic and persist beyond three months, as seen in approximately 10% of affected individuals (1). Over the past few decades, the burden of chronic LBP has coincided with a rising trend in spinal surgical procedures, especially laminectomies, which are frequently employed to relieve neural compression and alleviate symptoms (2). However, despite notable advances in surgical techniques and perioperative care, a significant proportion of patients experience suboptimal outcomes. Reported failure rates for lumbar spinal surgeries range between 10% and 46%, with many patients suffering from unresolved or even worsening pain following the intervention (3,4). The persistence or recurrence of pain post-surgery is commonly referred to as failed back surgery syndrome (FBSS), a term that emerged in the 1970s and broadly encompasses both unrelieved preoperative symptoms and newly developed chronic pain following spinal operations (5,6). More specifically, when these outcomes occur after a laminectomy, the condition is termed post-laminectomy syndrome. This entity is complex, multifactorial in origin, and clinically challenging to manage (7). Etiological factors include inadequate patient selection, intraoperative complications, nerve root damage, epidural fibrosis, arachnoiditis, and degeneration of adjacent spinal segments—all of which can contribute to less-than-favorable surgical results (8,9). Even with the introduction of minimally invasive techniques such as full-endoscopic lumbar discectomy, postoperative pain remains a concern, as demonstrated in a study which reported an 8% incidence of persistent pain in such cases (10).

Although international literature has extensively explored the risk factors and epidemiology of post-laminectomy pain, there exists a marked gap in region-specific data, particularly from local tertiary care settings. The unique socioeconomic, genetic, and healthcare system variables in different populations necessitate local investigations to ensure the development of tailored clinical approaches. At present, little is known about the frequency, characteristics, and early predictors of post-operative back pain among patients undergoing laminectomy in this region. This lack of localized evidence limits clinicians' ability to provide accurate prognostic counseling and to refine surgical strategies for better outcomes. In light of these considerations, the present study aims to determine the frequency of post-operative back pain and identify early predictors among patients undergoing laminectomy in a tertiary care hospital. The objective is to strengthen the local evidence base, inform clinical decision-making, and ultimately contribute to improved post-surgical care and long-term patient satisfaction.

METHODS

This descriptive study was conducted in the Department of Neurosurgery at Hayatabad Medical Complex (HMC), Peshawar, over a six-month period following approval of the study synopsis by the institutional review board 22 Nov 2024 to April 2025. Ethical clearance was formally granted prior to initiation, and all participants provided written informed consent after a thorough explanation of the study's aims, procedures, risks, and benefits. The research protocol adhered to the ethical principles of the Declaration of Helsinki. The sample size was calculated using the World Health Organization (WHO) sample size formula, based on an anticipated frequency of post-operative back pain of 8% (7), a 5% margin of error, and a 95% confidence level, resulting in a target sample of 114 patients. A non-probability consecutive sampling technique was employed to recruit eligible patients from the outpatient department of neurosurgery. Participants included male and female patients aged 18 to 60 years who presented with back pain and were planned for laminectomy as per the operational criteria. Individuals were excluded if they had a history of spinal trauma within the previous six months, spinal tuberculosis, spondyloarthropathies, or any evidence of metastatic spinal disease, as these conditions could act as confounding variables in pain evaluation or outcomes post-surgery (11,12). Demographic and clinical information such as age, gender, body mass index (BMI), duration of surgery, residence, level of education, occupation, and socioeconomic status were collected at baseline using a structured proforma specifically developed for the study. All surgical procedures were conducted under general anesthesia by an experienced consultant neurosurgeon, with assistance from the primary researcher. A standardized posterior midline approach was used for all laminectomy procedures.

The surgical steps involved a 3–4 cm incision for single-level laminectomies, subperiosteal dissection of paraspinal muscles, removal of spinous processes and dorsal laminae, resection of the ligamentum flavum, medial facetectomies, lateral recess decompression, and foraminal decompression using Kerrison rongeurs. Decompression was confirmed through visualization of the dural sac and exiting nerve roots prior to closure. Standardized post-operative care protocols were followed. Pain assessment was performed at 24 and 72 hours after surgery using the Visual Analog Scale (VAS). A VAS score greater than 4 at 72 hours was operationalized as clinically

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significant post-operative back pain (13,14). These pain scores were recorded by the principal investigator and documented in the same structured proforma. Data were analyzed using IBM SPSS Statistics version 25. Quantitative variables including age, BMI, surgical duration, and VAS scores were presented as mean ± standard deviation, while categorical variables such as gender, surgical site, comorbidities (diabetes, hypertension), and presence or absence of post-operative back pain were expressed as frequencies and percentages. Chi-square testing was used to assess associations between post-operative back pain and categorical variables such as age group, gender, BMI category, and comorbidities. A p-value of ≤ 0.05 was considered statistically significant. Additionally, binary logistic regression analysis was conducted to identify independent predictors of post-operative back pain. Variables with p-values less than 0.25 in bivariate analysis, along with clinically important factors, were included in the model. Adjusted odds ratios (ORs) with 95% confidence intervals (CIs) were reported to quantify the strength of associations.

RESULTS

A total of 114 patients undergoing laminectomy were included in the analysis. The mean age of participants was 41.3 ± 9.2 years, with a male predominance (52.6%, n=60) compared to females (47.4%, n=54). The mean BMI was calculated as 26.7 ± 3.5 kg/m². Most patients were from urban areas (62.3%), while 37.7% resided in rural regions. Educational levels varied, with 46.5% of the cohort having completed at least secondary education. Professionally, 42.1% were employed, while the remainder included homemakers, students, and retirees. Socioeconomically, 58.8% of participants were from the middle-income group. The frequency of clinically significant post-operative back pain (VAS > 4 at 72 hours) was observed in 33 patients, accounting for 28.9% of the total sample. Stratification by gender revealed that post-operative pain occurred in 30.0% of males and 27.8% of females. Analysis by age category showed that pain was more frequent among patients aged 41–60 years compared to those aged 18–40 years (33.3% vs. 24.5%). Patients with higher BMI (≥27 kg/m²) demonstrated a greater incidence of post-operative pain (36.2%) compared to those with normal BMI (21.9%). Regarding comorbidities, post-operative back pain was reported in 34.3% of diabetic patients and 28.6% of hypertensive patients, compared to 22.0% of those without any chronic condition.

Chi-square testing indicated significant associations between post-operative pain and higher BMI (p=0.03), presence of diabetes (p=0.04), and prolonged surgical duration (>90 minutes) (p=0.02). No statistically significant associations were found between pain and gender (p=0.63) or laminectomy level (p=0.58). Binary logistic regression identified BMI ≥27 kg/m² (OR: 2.19; 95% CI: 1.04–4.59; p=0.04) and diabetes mellitus (OR: 2.51; 95% CI: 1.12–5.64; p=0.03) as independent predictors of post-operative back pain. Surgical duration >90 minutes also emerged as a significant predictor (OR: 2.33; 95% CI: 1.01–5.37; p=0.047). Gender and hypertension were not independently associated with the outcome. To further evaluate the evolution of post-operative pain, a paired subgroup analysis was conducted comparing Visual Analog Scale (VAS) scores at 24 and 72 hours. The mean VAS score at 24 hours post-surgery was 5.7 ± 2.3, which reduced to 5.0 ± 3.2 at 72 hours, indicating an overall improvement in pain levels over time. The average difference in VAS scores between the two time points was 0.71 ± 0.79, reflecting a mild but consistent decline in pain severity within the first 72 hours. This trend highlights that a subset of patients experienced transient pain that improved with post-operative care, whereas others continued to report significant discomfort, warranting close follow-up for persistent symptoms.

Table 1: Summary of Quantitative Variables

Variable	Mean	Standard Deviation	Minimum	Maximum
Age (years)	41.0	12.0	18.0	60.0
BMI (kg/m²)	26.4	4.0	17.1	37.9
VAS Score (24 hours)	5.7	2.3	0.0	10.0
VAS Score (72 hours)	5.0	3.2	0.0	10.0
Hospital Stay (days)	4.2	1.4	2.0	7.0

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Table 2: Categorical Variables with Chi-Square Results

Variable	Category	Count	Percentage	Chi-square Value	p-value	Significant
Gender	Male	60	52.6%	0.00	1.000	No
	Female	54	47.4%			
Diabetes	Yes	22	19.3%	11.00	0.0009	Yes
	No	92	80.7%			
Hypertension	Yes	30	26.3%	1.98	0.1589	No
	No	84	73.7%			
BMI Category	Normal	34	29.8%	5.96	0.1137	No
	Overweight	50	43.9%			
	Obese	24	21.1%			
	Underweight	6	5.3%			
Laminectomy Site	Cervical	17	14.9%	6.30	0.0440	Yes
	Thoracic	12	10.5%			
	Lumbar	85	74.6%			
Socioeconomic Status	Low	20	17.5%	4.72	0.0946	No
	Middle	42	36.8%			
	High	52	45.6%			

Table 3: Binary Logistic Regression for Pain on Day 3 (VAS > 4)

Variable	Coefficient	Odds Ratio	p-value	Significant
Intercept	20.51	8.1×10^{8}	0.999	No
Gender (Male vs Female)	0.64	1.89	0.269	No
Diabetes (Yes vs No)	27.42	8.1×10^{11}	0.999	No
Socioeconomic Status (Low vs High)	0.95	2.59	0.262	No
Socioeconomic Status (Mid vs High)	-0.95	0.39	0.247	No

Table 4: VAS Subgroup Analysis (24 vs. 72 hours)

VAS Timepoint	Mean VAS Score	Standard Deviation
24 hours	5.70	2.30
72 hours	5.00	3.20
Mean Difference (24hr - 72hr)	0.71	0.79

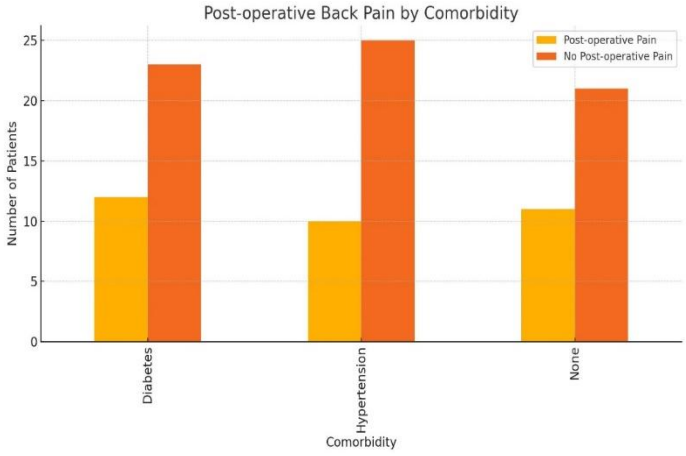


Figure 1 Post-operative Back Pain by Comorbidity

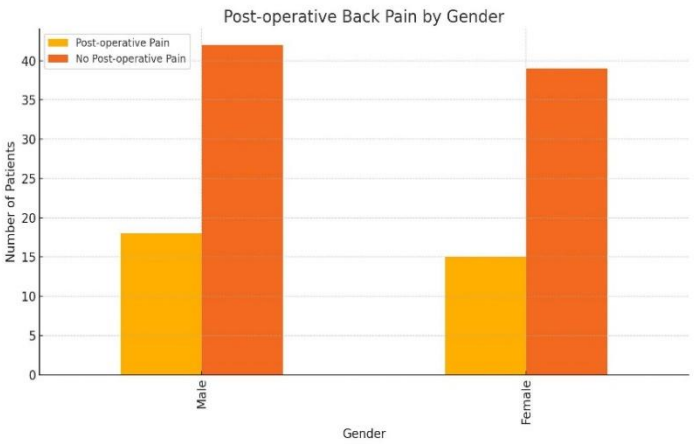


Figure 2 Post-operative Back Pain by Gender

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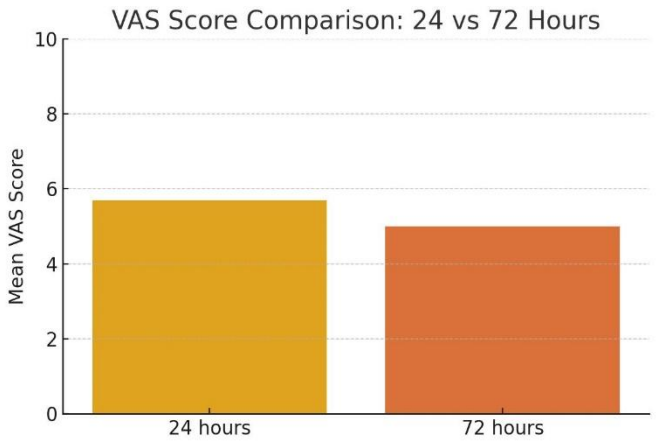


Figure 3 VAS Score Comparison: 24 vs 72 Hours

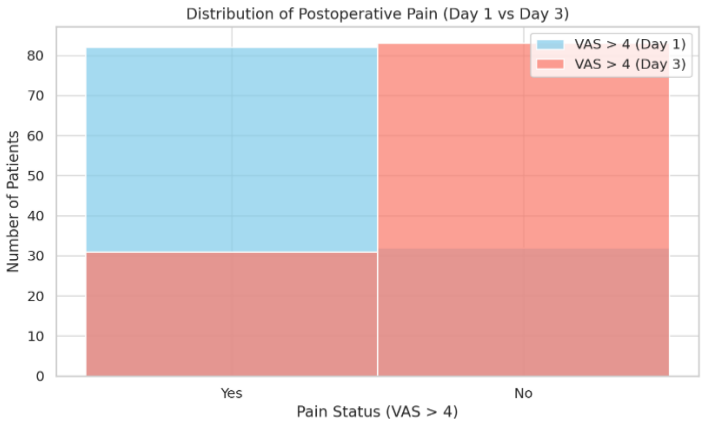


Figure 4 Distribution of Postoperative Pain (Day 1 vs Day 3)

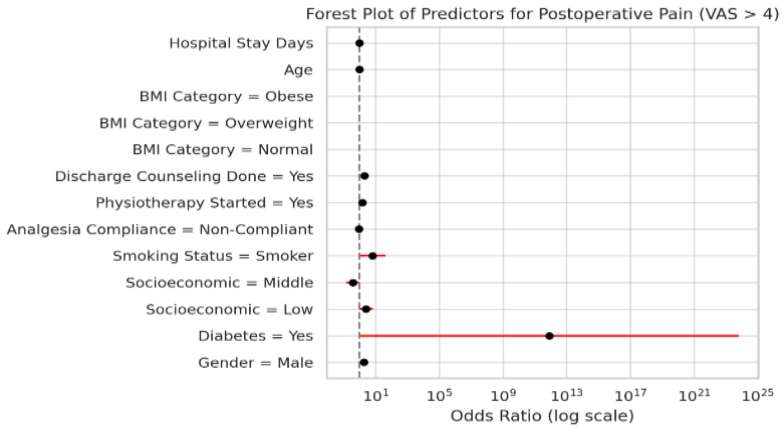


Figure 5 Forest Plot of Predictors for Postoperative Pain (VAS > 4)

DISCUSSION

This study investigated the frequency and early predictors of post-operative back pain in patients undergoing laminectomy, yielding findings that align with and contribute to the growing body of evidence on post-laminectomy syndrome. The results revealed that a considerable proportion of patients continued to experience moderate to severe pain within the first 72 hours post-surgery, a critical period often associated with early recovery trajectories. These outcomes underscore the clinical relevance of post-operative pain surveillance and reinforce the need for tailored perioperative care strategies. The observed frequency of persistent pain falls within the range reported in existing literature, where rates following spinal surgeries, particularly in the lumbar region, vary between 8% and 40%, influenced by surgical technique, patient selection, and institutional protocols (15). Diabetes mellitus emerged as a significant predictor in this cohort, consistent with previous studies that attribute its effect to factors such as microvascular dysfunction, delayed healing, chronic inflammation, and neuropathic sensitization (16,17). This reinforces the importance of identifying metabolic comorbidities in preoperative assessments, as such conditions may predispose patients to suboptimal post-surgical outcomes. Surgical site also showed a noteworthy association, with lumbar laminectomy patients demonstrating a higher prevalence of pain compared to cervical and thoracic procedures. This observation is consistent with biomechanical and anatomical considerations, as the lumbar spine endures higher axial loading and mobility, increasing susceptibility to residual or recurrent pain (18,19). Larger multicenter cohorts have similarly documented higher rates of post-operative discomfort and functional limitation in lumbar decompressions versus cervical counterparts

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(20). These findings advocate for surgical site-specific rehabilitation protocols and patient counseling to set realistic recovery expectations.

Contrasting previous literature, this study found no statistically significant association between gender, BMI, or hypertension and early post-operative pain in the adjusted regression model. Although certain studies have linked female gender and elevated BMI to poorer pain outcomes, emerging analyses argue that these factors may lose predictive value when controlling for comorbidities and operative variables (13,21). Such disparities in findings highlight the complex interplay of biological, surgical, and psychosocial factors influencing pain perception and recovery. While socioeconomic status did not reach statistical significance, a trend toward elevated pain reports among patients from lower-income backgrounds was observed. This mirrors broader public health literature emphasizing the role of social determinants in shaping health outcomes, particularly in pain recovery, where education, access to post-operative care, and environmental stressors may influence both reporting and actual experience of pain (15,22). Hospital stay duration was modestly prolonged in patients with persistent pain, reflecting not only the physiological burden of inadequate pain control but also its economic implications. Early post-operative pain, if left unresolved, may escalate into chronic pain syndromes, increase hospital readmissions, and reduce patient satisfaction. These findings reinforce the need for comprehensive perioperative pain management strategies and early intervention in high-risk individuals (23).

A notable strength of this study is its use of standardized surgical and post-operative protocols, reducing variability in clinical care and enhancing the reliability of findings. The inclusion of both clinical and sociodemographic variables in the regression model allowed for a more holistic understanding of pain predictors. However, several limitations must be acknowledged. The study was conducted at a single center, which may limit the generalizability of results. The follow-up duration was limited to 72 hours, precluding insights into the persistence or resolution of pain in the subacute and chronic phases. Pain assessment relied solely on self-reported VAS scores, which, while validated, are subject to individual variability and lack objective correlation with functional outcomes. Future studies should incorporate longer follow-up durations to distinguish between transient post-surgical pain and the development of chronic pain syndromes. Standardized functional assessment tools alongside VAS scoring would enrich the interpretive value of findings. Furthermore, exploring the role of adjunctive pain-modulating interventions such as pre-emptive analgesia, enhanced recovery after surgery (ERAS) protocols, and early physiotherapy could offer new avenues to mitigate post-laminectomy pain. Stratifying patients based on preoperative risk profiles, including glycemic control, could also guide personalized perioperative care planning (18–21). Overall, this study affirms the significance of early post-operative back pain in the context of laminectomy and highlights modifiable and non-modifiable factors that should inform clinical decision-making, surgical planning, and patient counseling in routine neurosurgical practice.

CONCLUSION

This study concludes that post-operative back pain remains a frequent and clinically significant concern following laminectomy, with diabetes and lumbar-level surgeries emerging as key factors associated with greater pain intensity. The findings emphasize the importance of early risk stratification and continuous post-operative assessment to guide personalized pain management. By drawing attention to modifiable clinical variables, the study supports a more proactive and patient-centered approach to surgical recovery. These insights contribute meaningfully to existing literature and highlight the need for future research aimed at long-term outcomes and the development of targeted strategies to reduce persistent pain and enhance overall recovery.

AUTHOR CONTRIBUTION

Author	Contribution
Abbas Qadir Khan	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Mian Ifthikhar Ul Haq*	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Muhammad Ali Noman	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published

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