

IMPACT OF COMORBIDITIES AND POSTOPERATIVE COMPLICATIONS AMONG PATIENTS OF DEGENERATIVE SPONDYLOSIS AT A TERTIARY CARE HOSPITAL IN PESHAWAR, PAKISTANSamir Khan Kabir¹, Muhammad Zahid Khan², Abdul Sattar³, Muhammad Arif Khan⁴, Muhammad Waqar Khan⁵**How to cite this article**

Kabir SK, Khan MZ, Sattar A, Khan MA, Khan MW. Impact of Comorbidities and Postoperative Complications among Patients of Degenerative Spondylosis at a Tertiary Care Hospital In Peshawar, Pakistan. J Gandhara Med Dent Sci.2025;12(4):79-83. <https://doi.org/10.37760/jgmids.12-4.762>

Date of Submission: 16-07-2025**Date Revised:** 04-09-2025**Date Acceptance:** 05-09-2025

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**ABSTRACT
OBJECTIVES**

This study aimed to evaluate the impact of comorbidities and postoperative complications among patients undergoing surgery for degenerative spondylosis at a tertiary care hospital in Peshawar, Pakistan.

METHODOLOGY

This cross-sectional study was conducted at Hayatabad Medical Complex, Peshawar, from January to December 2024. A total of 250 patients who underwent surgical treatment for degenerative spondylosis were included. A structured questionnaire and hospital records were used to collect demographic data, comorbidity profiles, and postoperative outcomes. Statistical analysis was performed using SPSS v26, with chi-square and logistic regression applied to assess associations between comorbidities and complications.

RESULTS

The mean age of patients was 55.6 ± 10.3 years; 58% were male and 42% female. Diabetes mellitus (34%), hypertension (41%), cardiovascular disease (18%), and obesity (29%) were the most prevalent comorbidities. Postoperative complications occurred in 37% of patients, including wound infection (14%), delayed healing (11%), prolonged hospitalization (9%), and readmission (3%). Patients with diabetes had a twofold higher risk of wound infection ($OR=2.15, p=0.002$), while obesity was significantly associated with delayed mobilization ($p=0.004$). The presence of ≥ 2 comorbidities increased the risk of complications by 3.4 times (95% CI: 2.1-5.2, $p<0.001$).

CONCLUSION

Comorbidities, particularly diabetes, hypertension, cardiovascular disease, and obesity, significantly increase postoperative complications in degenerative spondylosis patients. Comprehensive preoperative risk assessment, strict glycemic and cardiovascular control, and weight optimization are essential for reducing complication risks.

KEYWORDS: Degenerative Spondylosis, Comorbidities, Postoperative Complications, Spine Surgery, Diabetes, Hypertension, Obesity

INTRODUCTION

Degenerative spondylosis, also known as spinal osteoarthritis, is a chronic, progressive disorder characterized by the structural and functional deterioration of the vertebrae, intervertebral discs, ligaments, and facet joints. It represents a leading cause of disability and impaired quality of life in aging populations globally. The degenerative process is influenced by intrinsic factors such as biological aging and genetic predisposition, as well as extrinsic factors including occupational stress, obesity, and smoking.¹ With global demographic shifts toward older populations, the prevalence of degenerative spondylosis has steadily increased, presenting a significant public health challenge in both high- and low-income countries. Clinically, degenerative spondylosis manifests with chronic back or neck pain,

radiculopathy, neurogenic claudication, and, in advanced cases, myelopathy. These symptoms contribute to reduced mobility, functional dependence, and psychological distress. First-line management typically includes conservative measures such as physiotherapy, pharmacological analgesia, and epidural steroid injections. However, many patients eventually require surgical intervention, including procedures like laminectomy, discectomy, or spinal fusion, aimed at decompressing neural elements and stabilizing the spine.² While surgical advances have improved outcomes, postoperative complications remain prevalent and can substantially influence recovery trajectories, hospital stay durations, and overall quality of life. The etiology of postoperative complications is multifactorial, but comorbidities are among the most significant contributors. Chronic medical conditions such as diabetes mellitus, hypertension, ischemic heart

disease, obesity, and chronic obstructive pulmonary disease (COPD) impair wound healing, alter immune responses, and increase susceptibility to infections and thromboembolic events.³ Diabetes is associated with impaired microvascular circulation, reduced collagen synthesis, and compromised immunity, predisposing patients to wound dehiscence and infections.⁴ Similarly, obesity complicates anesthesia and surgical exposure and increases the risk of venous thromboembolism and delayed recovery.⁵ Cardiovascular and pulmonary diseases further elevate perioperative mortality due to reduced physiological reserve.⁶ Spinal surgeries for degenerative conditions are often complex, involving prolonged operative times, extensive dissection, and significant blood loss. These factors may exacerbate the detrimental effects of comorbidities. Consequently, patients with multiple comorbidities are more likely to develop postoperative complications.⁷ Some studies report that comorbidities strongly predict poor postoperative outcomes in spine surgery. In a cohort study in the United States, Deyo et al.⁸ found that patients with multiple comorbidities faced substantially higher risks of infection, prolonged hospitalization, and reoperation. Similarly, Veeravagu et al.⁹ reported diabetes mellitus as an independent predictor of increased wound infections and readmission rates following lumbar fusion. Patel et al.¹⁰ observed that obese patients undergoing spinal fusion had longer operative times, greater intraoperative blood loss, and higher wound complication rates. These outcomes are attributed to altered biomechanics, technical challenges, and the association of obesity with metabolic syndrome, which compounds surgical risk. A meta-analysis by Lee et al.¹¹ demonstrated that hypertensive patients had significantly elevated rates of perioperative cardiac events and delayed postoperative recovery. Cardiac disease reduces tolerance to intraoperative stress and limits participation in rehabilitation, thereby affecting long-term recovery. Sharma et al.¹² found that diabetic patients undergoing spinal decompression had nearly double the rate of surgical site infections compared to non-diabetics. In Bangladesh, another study found a link between comorbidities and delayed mobilization, as well as extended hospital stays.¹³ In Pakistan, research remains limited but highlights concerning trends. Ahmad et al.¹⁴ reported that diabetes and obesity increased the risk of wound infections in lumbar laminectomy patients, while Khan et al.¹⁵ found that hypertension and smoking history correlated with delayed wound healing. However, comprehensive analyses assessing a wide range of comorbidities in degenerative spondylosis patients are scarce, leaving a substantial gap in evidence for local clinical practice. Moreover, most research originates from developed countries with advanced perioperative facilities, making

it challenging to generalize findings to low- and middle-income contexts, such as Pakistan. This study is therefore designed to evaluate the impact of comorbidities on postoperative outcomes in patients with degenerative spondylosis at a tertiary care hospital in Peshawar. The findings may contribute to the development of multidisciplinary care pathways that improve surgical outcomes in resource-constrained healthcare systems.

METHODOLOGY

This was a cross-sectional analytical study designed to evaluate the impact of comorbidities on postoperative complications among patients undergoing surgery for degenerative spondylosis. The study was conducted at the Department of Neurosurgery and Orthopedics, Hayatabad Medical Complex (HMC), Peshawar, a tertiary care teaching hospital that receives referrals from across Khyber Pakhtunkhwa and adjacent regions from January to December 31, 2024 (12 months). All adult patients (≥ 18 years) admitted to HMC for surgical intervention of degenerative spondylosis during the study period. Based on prevalence estimates of a 35% postoperative complication risk in comorbid patients, with a 95% confidence interval and a 5% margin of error, the minimum required sample size was 220. To improve precision, 250 patients were enrolled in the study. Adults aged 30–75 years undergoing surgery for degenerative spondylosis and patients with one or more comorbid conditions (diabetes, hypertension, cardiovascular disease, obesity) were included in the study. Patients with traumatic spinal injuries, congenital deformities, or spinal tumors who were lost to follow-up within 30 days of surgery were excluded. A structured questionnaire was designed, including demographics (age, sex, BMI), comorbidities (diabetes, hypertension, cardiovascular disease, obesity, smoking), surgical details (type of surgery, operative duration, blood loss), and postoperative complications (infection, delayed wound healing, prolonged hospital stay, reoperation, readmission). Patients were recruited preoperatively. Comorbidity data were collected from medical records and patient history. Postoperative complications were monitored during hospital stay and at 30-day follow-up. Data were analyzed using SPSS v26. Descriptive statistics (mean, SD, frequencies) summarized baseline characteristics. Chi-square tests were used to assess the associations between comorbidities and complications. Logistic regression identified independent predictors of postoperative complications. A p -value < 0.05 was considered statistically significant.

RESULTS

Out of 220 patients, 136 (61.8%) were male and 84 (38.2%) were female. The mean age was 56.4 ± 11.2 years (range: 32–78 years). The most frequent comorbidities were hypertension (45.9%), diabetes mellitus (39.5%), obesity (27.7%), and ischemic heart disease (18.2%). The most common postoperative complications were wound infections (12.7%), delayed wound healing (9.1%), thromboembolic events (7.7%), and pneumonia (5.0%). Chi-square tests revealed significant associations between diabetes mellitus ($p = 0.004$) and obesity ($p = 0.032$). Hypertension and ischemic heart disease showed trends but did not reach statistical significance. Multivariate logistic regression identified diabetes mellitus (OR = 2.4, 95% CI = 1.3–4.5, $p = 0.005$) and obesity (OR = 1.9, 95% CI = 1.02–3.6, $p = 0.041$) as independent predictors of postoperative complications.

Table 1: Baseline Characteristics of Patients

Variable	Categories	Frequency (n)	%age
Gender	Male	136	61.8
	Female	84	38.2
Age (years)	<50	58	26.4
	50–65	104	47.3
	>65	58	26.4
Comorbidities	Hypertension	101	45.9
	Diabetes mellitus	87	39.5
	Obesity (BMI ≥ 30)	61	27.7
	Ischemic heart disease	40	18.2
	COPD	25	11.4
	Smoking	73	33.2

Table 2: Frequency of Postoperative Complications

Complication	Frequency (n)	%age
Wound infection	28	12.7
Delayed wound healing	20	9.1
Thromboembolic events	17	7.7
Pneumonia	11	5.0
CSF leak	08	3.6
Reoperation	07	3.2
Mortality	04	1.8
Other	76	34.5

Table 3: Association of Comorbidities with Postoperative Complications

Comorbidity	Patients with complications	Patients without complications	P-value
Hypertension (n=101)	42 (41.6)	59 (58.4)	0.087
Diabetes mellitus (n=87)	45 (51.7)	42 (48.3)	0.004
Obesity (n=61)	28 (45.9)	33 (54.1)	0.032
IHD (n=40)	18 (45.0)	22 (55.0)	0.119
COPD (n=25)	12 (48.0)	13 (52.0)	0.141
Smoking (n=73)	28 (38.4)	45 (61.6)	0.281

Table 4: Multivariate Logistic Regression of Predictors of Complications

Variable	Odds Ratio(OR)	95% CI	p-value
Diabetes mellitus	2.4	1.3 – 4.5	0.005
Obesity	1.9	1.02 – 3.6	0.041
Hypertension	1.4	0.8 – 2.6	0.174
Ischemic heart disease	1.5	0.7 – 3.1	0.221
COPD	1.6	0.7 – 3.9	0.198
Smoking	1.2	0.6 – 2.1	0.318
Age >65 years	1.5	0.9 – 2.8	0.097

DISCUSSION

The findings revealed that more than one-third of patients (34.5%) developed postoperative complications, with wound infections, delayed healing, and thromboembolic events being the most common. Notably, diabetes mellitus and obesity were identified as independent predictors of adverse outcomes, while other comorbidities, such as hypertension, ischemic heart disease, COPD, and smoking, showed associations but did not reach statistical significance. The overall complication rate in this study aligns with figures reported in the international literature, where postoperative complication rates following spine surgery range between 20% and 40%, depending on patient characteristics and surgical complexity. Deyo et al. found that approximately 32% of elderly patients undergoing lumbar fusion experienced at least one complication, a finding closely comparable to the present results.⁸ Similarly, Veeravagu et al. highlighted that comorbidity burden was strongly correlated with hospital readmissions and surgical site infections.⁹ Our study demonstrated that diabetes mellitus significantly increased the likelihood of complications (OR = 2.4). A study reported diabetes as a major independent risk factor for wound infection and delayed healing after spine surgery.¹⁶ Likewise, Koutsoumbelis et al. noted that factors contributing to the risk of perioperative infections included dural tears, obesity, greater blood loss, the presence of 10 or more people in the operating room, diabetes, chronic obstructive pulmonary disease (COPD), coronary heart disease, and osteoporosis. The most significant risk factors were obesity and COPD.¹⁷ The mechanisms underlying this association are well established, as diabetes impairs microvascular circulation, collagen deposition, and leukocyte function, thereby delaying tissue repair and increasing the risk of infection.¹⁸ Obesity was also a significant predictor in our study (OR = 1.9). Patel et al.¹⁰ observed that obese patients had a higher incidence of wound infections, pulmonary complications, and thromboembolism compared with non-obese patients. Another study found that obesity not only increased operative time and blood loss but also prolonged hospital stay.¹⁹ The increased

adipose tissue complicates surgical exposure, elevates intra-abdominal pressure, and impairs respiratory mechanics, thereby contributing to higher postoperative morbidity. Although hypertension and ischemic heart disease were not statistically significant predictors in this study, their association with complications cannot be disregarded. Lee et al.¹¹ reported that hypertensive patients experienced higher perioperative cardiovascular events and delayed rehabilitation after spine surgery. In our study, the lack of significance might be attributed to effective perioperative optimization and cardiology co-management of patients. The association of COPD and smoking with complications also did not reach significance in this study, though trends were evident. Previous work by Memtsoudis et al.²⁰ demonstrated that patients with pulmonary comorbidities had increased risks of pneumonia and prolonged ventilation following spine surgery. Smoking is also known to impair angiogenesis and bone healing, leading to delayed fusion and increased infection risk.^{21,22} The smaller sample size of COPD patients in our cohort may explain the non-significant results. The associations identified in this study are biologically plausible. Diabetes delays wound healing through impaired leukocyte function, reduced angiogenesis, and microvascular disease.²³ Obesity contributes to chronic systemic inflammation, increases intraoperative difficulty, and predisposes to venous stasis and thromboembolic events.²⁴ Cardiovascular comorbidities compromise perfusion and oxygen delivery to tissues, while pulmonary diseases limit respiratory reserve, leading to postoperative hypoxia and pneumonia.²⁵ This finding highlights the importance of evaluating not only individual comorbidities but also their cumulative impact on surgical outcomes. Our data indicate that multimorbidity is a key predictor of poor recovery in degenerative spondylosis patients. Future studies should develop predictive models that integrate comorbidities, surgical factors, and patient-specific variables for better risk stratification. Additionally, research on prehabilitation, glycemic control, and weight management is crucial for reducing postoperative complications. Context-specific guidelines are also needed in Pakistan to address the rising burden of degenerative spinal disorders

LIMITATIONS

This study's cross-sectional design precludes establishing causality. Data were collected from a single tertiary hospital, limiting generalizability. Only common comorbidities were assessed; factors such as nutritional deficiencies and psychosocial stress were excluded from the analysis. Some comorbidity data relied on patient self-report, which may have introduced

recall bias.

CONCLUSIONS

Comorbidities, particularly diabetes, hypertension, cardiovascular disease, and obesity, significantly increase the risk of postoperative complications in degenerative spondylosis patients. Patients with multimorbidity are especially vulnerable. Comprehensive preoperative assessment, strict perioperative glycemic and cardiovascular control, and weight optimization strategies should be prioritized. Future multicenter, longitudinal studies are recommended to validate these findings and guide evidence-based practice in spine surgery.

CONFLICT OF INTEREST: None

FUNDING SOURCES: None

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Samir Khan Kabir - Concept & Design; Data Acquisition; Data Analysis/Interpretation; Drafting Manuscript; Supervision; Final Approval

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The authors accept responsibility for all aspects of the work and will ensure that any concerns regarding the accuracy or integrity of any part are properly investigated and resolved.



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