

Outcome of Lumbar Spine Surgery Using Spinal Anaesthesia in Nigeria: A Multi-Centre Review.

ABSTRACT:

Background: Lumbar spine surgery is traditionally performed under general anaesthesia (GA). However, spinal anaesthesia (SA) has emerged as a safe and effective alternative, offering potential benefits in perioperative outcomes, cost, and recovery. This multi-centre study evaluated the outcomes of lumbar spine surgery performed under SA in Nigeria and identified predictors of favourable outcomes.

Methods: A retrospective multi-centre cohort study of 232 patients who underwent lumbar spine surgery under SA across four tertiary centers in Nigeria from January 2010 to December 2024 was conducted. Procedures included discectomy (n=98), laminectomy (n=89), and fusion (n=45). Outcomes measured included Visual Analogue Scale (VAS) for pain, length of hospitalization, opioid use, functional independence (Oswestry Disability Index, ODI), return to work, sexual satisfaction, and mortality. Multivariate logistic regression identified predictors of favourable outcomes.

Results: The mean age was 52.4 ± 12.6 years; 132 (56.9%) were male. Significant improvements were observed in VAS (7.6 ± 1.4 preoperatively to 2.8 ± 1.6 postoperatively, $p < 0.001$) and ODI (58.4 ± 14.2 to 26.8 ± 13.5 , $p < 0.001$). Mean length of hospital stay was 4.2 ± 1.8 days. Postoperative opioid use was required in 28 patients (12.1%). Return to work was achieved in 78.0% (181/232), and sexual satisfaction was reported by 68.5% (159/232). Two deaths (0.9%) occurred. Independent predictors of favourable outcome included: age < 60 years (adjusted OR 3.2, 95% CI: 1.5–6.8), absence of comorbidities (OR 2.8, 95% CI: 1.3–5.9), discectomy procedure (OR 2.4, 95% CI: 1.1–5.2), and single-level surgery (OR 2.2, 95% CI: 1.0–4.8).

Conclusions: Lumbar spine surgery under spinal anaesthesia is associated with significant pain relief, functional improvement, short hospital stay, low opioid requirement, and favourable return-to-work and sexual satisfaction rates in this Nigerian multi-centre cohort. Spinal anaesthesia is a safe and effective alternative to general anaesthesia in carefully selected patients.

Keywords: Spinal anaesthesia; lumbar spine surgery; discectomy; laminectomy; spinal fusion; Nigeria; multi-centre study

INTRODUCTION

Lumbar spine surgery is one of the most commonly performed orthopaedic procedures worldwide, addressing conditions such as lumbar disc herniation, spinal stenosis, and degenerative spondylolisthesis (1,2). Traditionally, these procedures have been performed under general anaesthesia (GA) with endotracheal intubation, a practice driven by the need for a secured airway, patient positioning, and surgeon comfort (3). However, spinal anaesthesia (SA) has emerged as a safe and effective alternative, offering numerous potential benefits (4).

The use of SA in lumbar spine surgery has gained traction due to evidence suggesting favourable perioperative haemodynamic stability, reduced intraoperative blood loss, lower mortality, and decreased risk of pulmonary embolism and myocardial infarction (5,6). A Nigerian study of 242 patients who underwent lumbar spine surgery under SA reported satisfactory postoperative outcomes(7). A comparative Nigerian study of 50 patients undergoing lumbar laminectomy found that SA offered a better early postoperative recovery profile than GA, as evidenced by significantly lower pain scores at 4 hours postoperatively (8).

A systematic review and meta-analysis of spinal versus general anaesthesia in decompressive lumbar surgeries found that awake surgery was associated with shorter surgery duration and a lower risk of postoperative complications, including nausea and vomiting (9). An umbrella review of seven meta-analyses identified potential advantages of SA, including shorter operative time, reduced length of stay, lower intraoperative blood loss, and reduced postoperative analgesic requirements, while finding no consistent differences in haemodynamic events or overall complications (4). A prospective comparative study from Iraq demonstrated that SA was associated with significantly lower intraoperative blood loss, better haemodynamic stability, higher surgeon and patient satisfaction, and reduced 24-hour analgesic requirements compared to GA (10).

In resource-limited settings such as Nigeria, where shortages of anaesthetists and anaesthetic machines are prevalent, SA offers a cost-effective alternative that can increase patient turnover and reduce healthcare costs (11,12). A protocol for lumbar spine surgery under SA in resource-limited countries has been proposed, emphasizing reduced opioid usage, improved anaesthesia outcomes, and suitability for patients who do not favour GA (6).

Despite these advantages, the adoption of SA for lumbar spine surgery remains limited in many centres. This multi-centre study aimed to evaluate the outcomes of lumbar spine surgery performed under SA in Nigeria and to identify predictors of favourable outcomes.

METHODOLOGY

Study Design and Setting

This was a retrospective multi-centre cohort study conducted across four tertiary centres in Nigeria: National Orthopaedic Hospital Dala, Kano; University of Abuja Teaching Hospital Gwagwalada Abuja, Kwara State University Teaching Hospital Ilorin, and Muhammadu Buhari Specialist Hospital Kano. The study period was 1 January 2010 to 31 December 2024. Ethical approval was obtained from the institutional research ethics committees of all participating centres. Individual patient consent was waived due to the retrospective nature.

Participants

All consecutive adult patients (≥ 18 years) who underwent elective lumbar spine surgery under spinal anaesthesia during the study period were eligible. Inclusion criteria: (1) lumbar spine surgery (discectomy, laminectomy, or fusion) performed under SA; (2) complete medical records; (3) minimum 6-month follow-up. Exclusion: patients with instrumented fusion requiring more than two levels, emergency surgery, or incomplete records. A total of 232 patients met the inclusion criteria: 98 discectomy, 89 laminectomy, and 45 fusion procedures.

Anaesthetic Technique

Spinal anaesthesia was performed using a standardised protocol across all centres. Patients were premedicated with midazolam 0.02 mg/kg intravenously. Lumbar puncture was performed at the L3–L4 or L4–L5 interspace using a 25-gauge or 27-gauge Quincke needle. Hyperbaric

bupivacaine 0.5% (10–15 mg) was administered, with or without fentanyl 10–25 mcg. The sensory block level was targeted at T10 or higher. Patients were positioned prone after confirmation of an adequate block. Intraoperative sedation with propofol or midazolam was administered as needed.

Data Collection

Data were extracted from patient case files, anaesthesia records, operative notes, and follow-up records. Variables collected included: age, sex, body mass index (BMI), comorbidities (hypertension, diabetes, etc.), type of surgery (discectomy, laminectomy, fusion), number of levels, operative time, intraoperative complications, and length of hospital stay.

Outcome Measures

- Pain: Visual Analogue Scale (VAS, 0–10) measured preoperatively and at 6-month follow-up.
- Functional disability: Oswestry Disability Index (ODI, 0–100) measured preoperatively and at 6-month follow-up.
- Length of hospitalization: Total days from surgery to discharge.
- Opioid use: Requirement for opioid analgesia postoperatively (excluding the first 24 hours).
- Return to work: Ability to resume pre-injury employment or alternative gainful employment within 6 months.
- Sexual satisfaction: Patient-reported satisfactory sexual function at 6 months.
- Mortality: All-cause mortality within 30 days of surgery.

Statistical Analysis

Data were analysed using SPSS version 26. Continuous variables are presented as mean±SD, categorical as frequencies (%). Comparisons between groups used independent t-test for

continuous variables and chi-square for categorical variables. Univariate and multivariate logistic regression identified predictors of favourable outcome (defined as $\geq 50\%$ reduction in VAS and ODI improvement ≥ 15 points). Variables with $p < 0.10$ in univariate analysis were entered into the multivariate model. Adjusted odds ratios (OR) with 95% confidence intervals (CI) were calculated. Statistical significance was set at $p < 0.05$.

RESULTS

Patient Characteristics

A total of 232 patients were included. The mean age was 52.4 ± 12.6 years; 132 (56.9%) were male. The most common indication was lumbar disc herniation (42.2%), followed by spinal stenosis (38.4%) and degenerative spondylolisthesis (19.4%). Discectomy was performed in 98 patients (42.2%), laminectomy in 89 (38.4%), and fusion in 45 (19.4%). Single-level surgery was performed in 168 patients (72.4%) and multi-level in 64 (27.6%). Table 1 presents the baseline characteristics.

Table 1. Baseline Characteristics of 232 Patients

Characteristic	Category n (%)
Age (years) Mean $\pm$ SD	52.4 $\pm$ 12.6
<60 years	148 (63.8)
≥ 60 years	84 (36.2)
Sex	
Male	132 (56.9)
Female	100 (43.1)
BMI (kg/m ²) Mean $\pm$ SD	26.2 $\pm$ 4.1
Comorbidities	

Yes	76 (32.8)
No	156 (67.2)
Surgery type	
Discectomy	98 (42.2)
Laminectomy	89 (38.4)
Fusion	45 (19.4)
Number of levels	
Single-level	168 (72.4)
Multi-level	64 (27.6)
Operative time (min) Mean±SD	95.2 ± 28.6

122 Clinical Outcomes

123 Table 2 presents the clinical outcomes. Significant improvements were observed in VAS
124 (7.6±1.4 preoperatively to 2.8±1.6 postoperatively, $p<0.001$) and ODI (58.4±14.2 to 26.8±13.5,
125 $p<0.001$). The mean length of hospital stay was 4.2±1.8 days. Postoperative opioid use was
126 required in 28 patients (12.1%). Return to work was achieved in 181 patients (78.0%), and
127 sexual satisfaction was reported by 159 patients (68.5%). Two deaths (0.9%) occurred, both in
128 patients with significant comorbidities who developed postoperative sepsis.

129 Table 2. Clinical Outcomes

Outcome	Preoperative	Postoperative	p-value
VAS (0–10)	7.6 ± 1.4	2.8 ± 1.6	<0.001
ODI (0–100)	58.4 ± 14.2	26.8 ± 13.5	<0.001
Outcome	Value		

Length of hospital stay (days)	4.2 ± 1.8		
Postoperative opioid use n (%)	28 (12.1)		
Return to work n (%)	181 (78.0)		
Sexual satisfaction n (%)	159 (68.5)		
Mortality n (%)	2 (0.9)		

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131 Outcomes by Surgery Type

132 Table 3 presents outcomes stratified by surgery type. Discectomy patients had the shortest
 133 hospital stay (3.5±1.2 days) and lowest opioid use (8.2%), while fusion patients had the longest
 134 stay (5.8±2.1 days) and highest opioid use (20.0%). Return to work was highest in the
 135 discectomy group (86.7%) and lowest in the fusion group (62.2%).

136 Table 3. Outcomes by Surgery Type

Outcome	Discectomy (n=98)	Laminectomy (n=89)	Fusion (n=45)	p-value
Hospital stay (days)	3.5 ± 1.2	4.0 ± 1.5	5.8 ± 2.1	<0.001
Opioid use n (%)	8 (8.2)	10 (11.2)	9 (20.0)	0.04
Return to work n (%)	85 (86.7)	69 (77.5)	28 (62.2)	0.002
Sexual satisfaction n (%)	74 (75.5)	60 (67.4)	25 (55.6)	0.03
Mortality n (%)	0 (0)	0 (0)	2 (4.4)	0.02

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Complications

Intraoperative and postoperative complications were recorded in 18 patients (7.8%). The most common complications were dural tear (3.0%), post-dural puncture headache (2.2%), and hypotension requiring intervention (1.7%). No patient developed neurological deficit, epidural haematoma, or deep surgical site infection.

Predictors of Favourable Outcome

Univariate analysis identified age <60 years, absence of comorbidities, discectomy procedure, and single-level surgery as factors associated with favourable outcome ($p < 0.10$). Multivariate logistic regression retained four independent predictors (Table 4):

- Age <60 years: adjusted OR 3.2 (95% CI: 1.5–6.8), $p = 0.002$
- Absence of comorbidities: adjusted OR 2.8 (95% CI: 1.3–5.9), $p = 0.008$
- Discectomy procedure: adjusted OR 2.4 (95% CI: 1.1–5.2), $p = 0.03$
- Single-level surgery: adjusted OR 2.2 (95% CI: 1.0–4.8), $p = 0.048$

Table 4. Predictors of Favourable Outcome (Multivariate Analysis)

Predictor	Adjusted OR	95% CI	p-value
Age <60 years	3.2	1.5 – 6.8	0.002
Absence of comorbidities	2.8	1.3 – 5.9	0.008
Discectomy procedure	2.4	1.1 – 5.2	0.03
Single-level surgery	2.2	1.0 – 4.8	0.048

155

156 DISCUSSION

157 This multi-centre study evaluated the outcomes of lumbar spine surgery performed under spinal
158 anaesthesia in a large Nigerian cohort. The findings demonstrate that SA is associated with
159 significant pain relief, functional improvement, short hospital stay, low opioid requirement, and
160 favourable return-to-work and sexual satisfaction rates.

161 The significant reduction in VAS (7.6 to 2.8) and ODI (58.4 to 26.8) at 6-month follow-up is
162 consistent with findings from previous studies. A study from the West African College of
163 Surgeons reported statistically significant satisfactory outcomes using the Oswestry scoring
164 system in patients undergoing non-instrumented lumbar spine surgery under SA, with no
165 mortalities (7). Another Nigerian study found that SA offered a better early postoperative
166 recovery profile than GA, with significantly lower pain scores at 4 hours postoperatively (8). The
167 ODI improvement of 31.6 points exceeds the minimal clinically important difference (MCID) of
168 12.8 points for lumbar spine surgery, indicating clinically meaningful functional recovery (13).

169 The mean length of hospital stay of 4.2 days is shorter than the 5–7 days typically reported for
170 lumbar spine surgery under GA in similar settings (14). This is consistent with findings from an
171 umbrella review that identified reduced length of stay as a potential advantage of SA (4). The
172 low rate of postoperative opioid use (12.1%) is notable, particularly given the opioid crisis and
173 the emphasis on multimodal analgesia. A prospective comparative study found that at 24 hours,
174 eight GA patients required additional analgesia versus none in the SA group ($p=0.003$),
175 highlighting the superior analgesic profile of SA (10).

176 The return-to-work rate of 78.0% compares favourably with rates of 60–70% reported in studies
177 of lumbar spine surgery under GA (16). This may reflect the faster recovery and reduced
178 postoperative pain associated with SA. The sexual satisfaction rate of 68.5% is consistent with
179 previous studies reporting that 60–75% of patients experience improvement in sexual function
180 after lumbar spine surgery (17). The lower rates observed in fusion patients (55.6%) compared
181 with discectomy (75.5%) reflect the greater surgical morbidity associated with fusion procedures.

The mortality rate of 0.9% is comparable to rates reported in high-income countries (0.5–1.5%) for lumbar spine surgery (17). Both deaths occurred in fusion patients with significant comorbidities, highlighting the importance of careful patient selection. The complication rate of 7.8%, including dural tear (3.0%) and post-dural puncture headache (2.2%), is consistent with rates reported in the literature for SA (7,18). No neurological deficits or epidural haematomas occurred, confirming the safety of SA in this setting.

The identification of age <60 years, absence of comorbidities, discectomy procedure, and single-level surgery as independent predictors of favourable outcome provides useful guidance for patient selection. These factors are consistent with the literature and reflect the lower surgical complexity and better physiological reserve in younger, healthier patients with less extensive procedures (19). In resource-limited settings where SA is particularly advantageous, these predictors can help clinicians identify patients most likely to benefit from this approach (6).

While this study did not include a GA comparison group, the findings are consistent with comparative studies. A systematic review and meta-analysis found that awake surgery under SA was associated with shorter surgery duration and lower risk of postoperative complications, including nausea and vomiting, compared with GA (9). An umbrella review concluded that SA offers potential advantages including shorter operative time, reduced length of stay, lower intraoperative blood loss, and lower postoperative analgesic requirements, while finding no consistent differences in haemodynamic events or overall complications (4). A matched cohort study of TLIF patients found that SA provided significant economic advantages over GA while yielding comparable clinical outcomes (20).

This study has several strengths, including a large sample size (n=232) and multi-centre design, which enhances generalizability. Comprehensive outcome assessment across multiple domains provides a holistic view of patient recovery. However, there are limitations. The retrospective design introduces selection and information bias. The absence of a GA comparison group limits the ability to directly compare outcomes between anaesthetic techniques. Outcome assessment at 6 months may not capture longer-term functional recovery. Future prospective, randomised studies comparing SA and GA in the Nigerian setting are warranted.

In conclusion, lumbar spine surgery under spinal anaesthesia is associated with significant pain relief, functional improvement, short hospital stay, low opioid requirement, and favourable return-to-work and sexual satisfaction rates in this Nigerian multi-centre cohort. The mortality rate of 0.9% and complication rate of 7.8% are acceptable. Age <60 years, absence of comorbidities, discectomy procedure, and single-level surgery are independent predictors of favourable outcome. Spinal anaesthesia is a safe and effective alternative to general anaesthesia in carefully selected patients undergoing lumbar spine surgery in resource-limited settings.

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