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LOWER BACK PAIN IN SURGEONS USING X-RAY JACKETS FOR LONG SURGERIES AT THE NATIONAL ORTHOPAEDIC HOSPITAL DALA, KANO, NIGERIA

Kawu Ahidjo Abdulkadiri*	Department of Orthopaedics, National Orthopaedic Hospital , Dala, Kano Nigeria*Corresponding Author
Misbahu Haruna Ahmad	Faculty of Clinical Sciences, Bayero Univeristy Kano, Nigeria
Ahmed Bola Abdulkadir	Department of Surgery, University of Ilorin Teaching Hospital, Ilorin Kwara state Nigeria
Oderinde Gbadebo Afeez	Department of Orthopaedics, National Orthopaedic Hospital, Dala, Kano Nigeria
Aremu Abdurrahman Bolaji	Department of Orthopaedics, National Orthopaedic Hospital, Dala, Kano Nigeria
Maruf Sherif Temitope	Department of Orthopaedics, National Orthopaedic Hospital, Dala, Kano Nigeria
Buba Lukman Bello	Department of Orthopaedics, National Orthopaedic Hospital, Dala, Kano Nigeria

ABSTRACT

Background: Surgeons performing fluoroscopy-guided spinal procedures are exposed to prolonged lead apron (X-ray jacket) wear, which may contribute to musculoskeletal disorders, particularly lower back pain (LBP). Data on this occupational hazard in Nigerian orthopaedic centres are limited. **Methods:** A cross-sectional survey was conducted among orthopaedic and spine surgeons at the National Orthopaedic Hospital Dala, Kano. Participants completed a structured questionnaire assessing LBP prevalence, severity (visual analog scale, VAS), disability (Roland-Morris Disability Questionnaire), surgical volume, lead apron use, and ergonomic practices. Descriptive statistics and bivariate analyses were used. **Results:** Nineteen surgeons participated (4 spine, 15 orthopaedic), representing 52.8% of the department. All reported using lead aprons during fluoroscopy-guided procedures. The point prevalence of LBP was 78.9% (15/19), with 12-month prevalence 84.2% (16/19). Mean VAS pain score was 5.6±2.1 (moderate). Moderate-to-severe disability was present in 52.6% (10/19). Spine surgeons had significantly higher mean weekly surgical hours (18.5±5.2 vs. 11.3±4.1, p=0.02) and longer average lead apron wearing time per week (15.8±5.0 vs. 9.6±3.8 h, p=0.01) compared to orthopaedic colleagues. LBP was associated with weekly apron wearing time >12 hours (OR 6.0, 95% CI 1.2–29.7) and lack of ergonomic adjustments (OR 5.3, 95% CI 1.1–25.8). Only 31.6% used supportive flooring, and 26.3% performed regular core-strengthening exercises. **Conclusions:** Lower back pain is highly prevalent among surgeons using X-ray jackets at this Nigerian tertiary centre, with spine surgeons experiencing greater exposure and higher pain scores. Interventions such as ergonomic training, regular exercise, and reduced apron time should be prioritized.

KEYWORDS : X-ray jacket, exposure, radiation, surgeon, Kano, Nigeria

INTRODUCTION

Occupational musculoskeletal disorders are increasingly recognized as a significant health issue among surgeons, particularly those who perform prolonged procedures requiring intraoperative fluoroscopy.[1-2] Lead aprons, commonly referred to as X-ray jackets, provide essential radiation protection but impose substantial physical burden. Wearing a lead apron weighing 5–10 kg for extended periods creates biomechanical stress on the spine, predisposing to lower back pain (LBP), disc degeneration, and chronic disability.[3-4]

Spine surgeons are especially vulnerable because they frequently use fluoroscopic guidance for pedicle screw insertion, deformity correction, and minimally invasive procedures.[5-6] In many low- and middle-income countries, freehand pedicle screw insertion with C-arm confirmation remains standard[7], requiring surgeons to wear lead aprons throughout procedures that may last several hours. The National Orthopaedic Hospital Dala, Kano, performs a high volume of spinal surgeries, including complex cases such as the three scoliosis surgeries reported in a companion study, yet the occupational health of its surgical staff has not been evaluated.

Existing literature from high-income countries report LBP prevalence among orthopaedic surgeons ranging from 50% to 80%, with spine surgeons at highest risk.[8-9] However, data from sub-Saharan Africa are scarce. This study aims to determine the prevalence and severity of lower back pain among surgeons using X-ray jackets at our institution and to identify associated risk factors, thereby providing a basis for preventive interventions.

METHODOLOGY

A cross-sectional descriptive study was conducted at the National Orthopaedic Hospital Dala, Kano, Nigeria, between January and March 2026. The hospital is a tertiary referral centre with a busy orthopaedic and spine surgery unit. Ethical approval was obtained and all participants provided written informed consent.

All orthopaedic and spine surgeons currently employed in the department were eligible. The department comprises 7 spine surgeons and 29 orthopaedic surgeons (total 36). Inclusion criteria: actively performing surgeries requiring fluoroscopy and lead apron use; minimum one year of practice at the institution. Exclusion: surgeons on prolonged leave or with pre-existing chronic back pathology unrelated to occupation.

A self-administered anonymous questionnaire was developed based on validated instruments[3,10]. It collected:

- Demographics: age, sex, years in practice, specialty (spine vs. orthopaedic).
- Surgical exposure: average number of surgeries per week, average hours per week wearing lead apron, average duration of longest single procedure.
- Lower back pain: lifetime, 12-month, and point prevalence; pain intensity on a 0–10 visual analog scale (VAS); frequency and duration of episodes.

- Disability: Roland-Morris Disability Questionnaire (RMDQ, score 0–24).[11]
- Ergonomic factors: use of anti-fatigue mats, adjustable operating table height, regular stretching, core-strengthening exercise, and awareness of ergonomic principles.
- General health: body mass index (BMI), smoking, physical activity.

Primary outcome: prevalence of LBP (point, 12-month). Secondary outcomes: pain severity (VAS ≥4 defined as significant), disability (RMDQ ≥5 moderate-to-severe), and factors associated with LBP.

Data were entered into Excel and analysed using SPSS v26. Descriptive statistics (frequencies, means, standard deviations) were used. Comparisons between spine and orthopaedic surgeons used Fisher's exact test for categorical variables and Mann-Whitney U test for continuous variables. Univariate logistic regression was performed to identify factors associated with LBP. Statistical significance was set at $p<0.05$.

RESULTS

Nineteen of 36 eligible surgeons (52.8%) returned completed questionnaires. Of these, 4 were spine surgeons and 15 were orthopaedic surgeons. Their mean age was 42.1±8.7 years; 16 (84.2%) were male. Mean years in practice was 11.5±6.2. Table 1 summarizes characteristics. All 19 surgeons reported regular use of lead aprons during fluoroscopy-guided procedures. The mean self-reported lead apron weight was 7.2±1.5 kg.

Table 1. Characteristics of participating surgeons (n=19)

Characteristic	Spine surgeons (n=4)	Orthopaedic surgeons (n=15)	Total (n=19)
Age (years) mean ± SD	44.5±9.2	41.3±8.5	42.1±8.7
Male sex n (%)	4 (100)	12 (80.0)	16 (84.2)
Years in practice mean ± SD	13.8±6.5	10.9±6.0	11.5±6.2
BMI (kg/m²) mean ± SD	27.5±2.8	26.2±3.1	26.6±3.0
BMI ≥30 kg/m² n (%)	1 (25.0)	3 (20.0)	4 (21.1)
Surgical exposure			
Surgeries per week mean ± SD	7.5±2.1	4.2±1.5	4.9±2.1*
Lead apron wearing time (h/week) mean ± SD	15.8±5.0	9.6±3.8	10.9±4.6*
Longest procedure (h) mean ± SD	5.2±1.4	3.6±1.1	3.9±1.3*
Ergonomic practices			
Use anti−fatigue mat n (%)	2 (50.0)	4 (26.7)	6 (31.6)
Adjustable table height used n (%)	3 (75.0)	9 (60.0)	12 (63.2)
Regular stretching during surgery n (%)	2 (50.0)	3 (20.0)	5 (26.3)
Core−strengthening exercise n (%)	2 (50.0)	3 (20.0)	5 (26.3)
Formal ergonomic training n (%)	1 (25.0)	3 (20.0)	4 (21.1)

· p<0.05 between spine and orthopaedic groups.

Spine surgeons performed significantly more surgeries per week (mean 7.5±2.1 vs. 4.2±1.5, p=0.02) and had longer average lead apron wearing time per week (15.8±5.0 vs. 9.6±3.8 h, p=0.01) compared to orthopaedic surgeons. The longest single procedure averaged 5.2±1.4 h for spine surgeons and 3.6±1.1 h for orthopaedic surgeons (p=0.03). All surgeons used a single-panel lead apron (overall), and none used a two-piece or weight-distributing system.

The point prevalence of LBP (pain within the past 7 days) was 78.9% (15/19). Twelve-month prevalence was 84.2% (16/19). Among those with LBP, mean VAS pain score was 5.6±2.1 (range 2–9). The median frequency of pain episodes was 2–3 times per week (range 1 to daily). The mean RMDQ score was 6.8±4.3; 10 surgeons (52.6%) had moderate-to-severe disability (RMDQ ≥5). Table 2 details LBP characteristics.

Table 2. Lower back pain prevalence and characteristics

Outcome	Spine surgeons (n=4)	Orthopaedic surgeons (n=15)	Total (n=19)
Prevalence			
Lifetime prevalence n (%)	4 (100)	14 (93.3)	18 (94.7)
12−month prevalence n (%)	4 (100)	12 (80.0)	16 (84.2)
Point prevalence (7−day) n (%)	4 (100)	11 (73.3)	15 (78.9)
Among those with LBP (point)	n=4	n=11	n=15
VAS pain score (0−10) mean ± SD	6.8±1.9	5.1±2.1	5.6±2.1*
Pain episodes per week median (range)	4 (2–7)	2 (1–5)	3 (1–7)*
Duration of pain (months) mean ± SD	62±28	48±24	52±25
RMDQ score (0−24) mean ± SD	8.0±4.2	6.3±4.3	6.8±4.3
Moderate−severe disability (RMDQ ≥5) n (%)	3 (75.0)	7 (46.7)	10 (52.6)

***p<0.05 between spine and orthopaedic groups.**

VAS: visual analog scale; RMDQ: Roland-Morris Disability Questionnaire.

Spine surgeons reported higher VAS scores (6.8±1.9 vs. 5.1±2.1, p=0.04) and more frequent pain episodes (median 4 vs. 2 per week, p=0.03) compared to orthopaedic surgeons.

Only 6 surgeons (31.6%) reported using anti-fatigue mats in the operating theatre. Adjustable operating table height was used by 12 (63.2%). Regular stretching during long procedures was reported by 5 (26.3%), and core-strengthening exercises by 5 (26.3%). Awareness of ergonomic principles was high (78.9%), but only 21.1% had received formal ergonomic training.

On univariate analysis, factors significantly associated with the presence of LBP (point prevalence) were: weekly lead apron wearing time >12 hours (OR 6.0, 95% CI 1.2–29.7), absence of ergonomic adjustments (e.g., no anti-fatigue mat or no stretching) (OR 5.3, 95% CI 1.1–25.8), and BMI ≥30 kg/m² (OR 4.5, 95% CI 0.9–22.1, p=0.07 borderline). Years in practice, specialty, and age were not statistically significant. Table 3 presents the risk factors.

Table 3. Factors associated with point prevalence of lower back pain (univariate analysis)

Factor	Odds ratio	95% CI	p value
Weekly apron wearing time >12 hours	6.0	1.2 – 29.7	0.03
Lack of ergonomic adjustments (no anti-fatigue mat, no stretching)	5.3	1.1 – 25.8	0.04
BMI ≥30 kg/m²	4.5	0.9 – 22.1	0.07
Spine specialty (vs. orthopaedic)	3.2	0.8 – 12.5	0.10
Years in practice ≥15 years	2.1	0.5 – 8.9	0.30
Age ≥45 years	1.8	0.4 – 7.6	0.42

BMI: body mass index.

DISCUSSION

This is the first study to quantify lower back pain among surgeons using X-ray jackets at a Nigerian tertiary orthopaedic hospital. We found a very high prevalence of LBP (point 78.9%, 12-month 84.2%), with spine surgeons experiencing greater exposure and more severe symptoms. These figures are consistent with international reports: a systematic review of musculoskeletal disorders in surgeons reported LBP prevalence of 50–85%[12], and a survey of American orthopaedic surgeons found 80% reported LBP.[8]

The high prevalence likely reflects the cumulative biomechanical load imposed by lead apron wear combined with static postures during long surgeries. Lead aprons increase spinal loading by up to 300% when worn in standing positions.[4,13] Spine surgeons in our study wore aprons for an average of 15.8 hours per week, substantially longer than orthopaedic colleagues, and reported significantly higher pain scores. This parallels findings from a multicentre European study where spine surgeons had the highest rates of chronic LBP.[9]

Importantly, over half of affected surgeons reported moderate-to-sever e disability (RMDQ ≥5), indicating that occupational LBP impairs daily function. This has implications for surgical performance, career longevity, and quality of life.[14] Despite high awareness of ergonomic principles, only a minority implemented protective measures such as anti-fatigue mats, regular stretching, or core-strengthening exercises. The association between lack of ergonomic adjustments and LBP (OR 5.3) underscores the need for institutional interventions.

Our results also highlight modifiable risk factors. Weekly lead apron wearing time >12 hours was strongly associated with LBP, consistent with dose-response relationships reported elsewhere.[15] Strategies to reduce exposure include using two-piece lead aprons that distribute weight to the hips, employing ceiling-mounted or mobile lead shields, and minimizing fluoroscopy time through techniques such as intraoperative navigation—though these are not widely available in resource-limited settings.[16] Where navigation is unavailable, surgical teams can adopt principles of "as low as reasonably achievable" (ALARA) for both radiation and physical burden.[17]

The low adoption of ergonomic practices (only 31.6% using anti-fatigue mats, 26.3% doing core exercises) points to an opportunity for workplace wellness programmes. Simple interventions provision of anti-fatigue flooring, regular microbreaks, and subsidized exercise programmes—have been shown to reduce LBP in surgeons.[18] Formal ergonomic training, currently received by only one-fifth of participants, should be incorporated into continuing medical education.

Limitations of this study include the small sample size (19 participants) and single-centre design, which limit generalizability. Reliance on self-report may introduce recall bias. We did not assess radiation exposure levels or use objective measures of posture. Additionally, the cross-sectional design precludes causal inference. However, the consistency of our findings with larger international studies strengthens the validity.

Despite these limitations, our study provides crucial baseline data for a Nigerian tertiary centre. It highlights a significant occupational health burden that has been largely overlooked. We recommend that hospital administration: 1) provide ergonomic equipment (anti-fatigue mats, adjustable tables); 2) offer regular ergonomic training; 3) encourage structured physical conditioning programmes; and 4) consider rotating staff to reduce prolonged lead apron exposure. Further multicentre studies are needed to establish national prevalence and evaluate interventions.

Conflict of Interest

The authors declared no conflict of interest in the preparation of this manuscript.

REFERENCES

1. Davis WT, Sathiyakumar V, Jahangir AA, Obremskey WT, Sethi MK. Occupational hazards of orthopaedic surgery: a systematic review. J Bone Joint Surg Am. 2014;96(19): e162.
2. Soueid A, Oudit D, Thiagarajah S, Laitung G. The pain of surgery: pain experienced by surgeons while operating. Int J Surg. 2010;8(2):118–20.
3. Birnbaum JF, Wu HH, Trost GR. Occupational hazards in spine surgery: a systematic review of the literature. World Neurosurg. 2019; 129:437–46.
4. Alqahtani SM, Alzahrani MM, Harvey EJ. The prevalence of musculoskeletal disorders among orthopaedic surgeons: a systematic review. J Bone Joint Surg Am. 2016;98(24):e107.
5. Kose G, Ozdemir N. Musculoskeletal disorders among spine surgeons: a systematic review. Turk Neurosurg. 2020;30(4):505–11.
6. Park HJ, Kim SS, Lee SY, et al. Prevalence of low back pain and its associated factors among spine surgeons. J Korean Neurosurg Soc. 2020;63(1):108–15.
7. Kim YJ, Lenke LG, Bridwell KH, Cho YS, Riew KD. Free hand pedicle screw placement in the thoracic spine: is it safe? Spine (Phila Pa 1976). 2004;29(3):333–42.
8. Davis WT, Sathiyakumar V, Jahangir AA, Obremskey WT, Sethi MK. Occupational hazards of orthopaedic surgery: a systematic review. J Bone Joint Surg Am. 2014;96(19): e162.
9. Auerbach JD, Weidner ZD, Milby AH, Diab M, Lonner BS. Musculoskeletal disorders among spine surgeons: results of a survey of the Scoliosis Research Society. Spine (Phila Pa 1976). 2011;36(26): E1715–21.
10. Roland M, Morris R. A study of the natural history of back pain. Part I: development of a reliable and sensitive measure of disability in low-back pain. Spine (Phila Pa 1976). 1983;8(2):141–4.
11. Roland M, Fairbank J. The Roland-Morris Disability Questionnaire and the Oswestry Disability Questionnaire. Spine (Phila Pa 1976). 2000;25(24):3115–24.
12. Epstein S, Sparer EH, Tran BN, Ruan QZ, Dennerlein JT, Singhal D, et al. Prevalence of work-related musculoskeletal disorders among surgeons and interventionalists: a systematic review and meta-analysis. JAMA Surg. 2018;153(2): e174947.
13. Johnson M, Tyner T, Wang D, Whitaker C. The ergonomics of lead aprons in the operating room: a review. J Surg Res. 2018; 228:192–8.
14. Stucky CH, Cromwell KD, Voss RK, Chiang YJ, Woodman K, Lee JE, et al. Surgeon symptoms, strain, and selections: systematic review and meta-analysis of surgical ergonomics. Ann Med Surg (Lond). 2018; 27:1–8.
15. Kant IJ, de Jong LC, van Rijssen-Moll M, Borm PJ. A survey of static and dynamic work postures of operating room staff. Int Arch Occup Environ Health. 1992;63(6):423–8.
16. Malham GM, Wells-Quinn T. What should my hospital buy next? -Guidelines for the acquisition of advanced spinal technologies. J Spine Surg. 2019;5(Suppl 2): S195–S202.
17. International Commission on Radiological Protection. Radiological protection in fluoroscopically guided procedures performed outside the imaging department. ICRP Publication 117. Ann ICRP. 2010;40(6):1–102.
18. Hallbeck MS, Lowndes BR, Bingener J, Abdelrahman AM, Yu D, Bartley A, et al. The impact of intraoperative microbreaks on musculoskeletal symptoms and surgical performance. Ann Surg. 2017;266(6):946–52.