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Original Research Article

Pattern and outcomes of neurosurgical interventions in Ado-Ekiti, Nigeria: a retrospective study

Oluwamuyiwa Adeniyi Dada*

Department of Surgery, Faculty of Clinical Sciences, College of Medicine, Ekiti State University, Ado-Ekiti, Ekiti State, Nigeria

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***Correspondence:**
Dr. Oluwamuyiwa Adeniyi Dada,
E-mail: muyiwadada15@yahoo.com

ABSTRACT

Background: Neurosurgical practice in resource-limited settings is often shaped by a high burden of trauma and delayed presentation. This study evaluated the indications, procedures, and outcomes of neurosurgical interventions in Ado-Ekiti, Nigeria.
Methods: This was a retrospective hospital-based study which covered an 18-month period from July 2024 to December 2025. A total of 86 patients who underwent neurosurgical procedures were included. Data on socio-demographic characteristics, clinical indications, types of procedures, postoperative complications, and outcomes were analyzed.
Results: Most patients were males (67.4%), with the highest proportion aged 18-40 years (39.5%). Over half presented through the emergency unit (53.5%). Traumatic brain injury was the most common indication for surgery (34.9%), followed by spinal cord compression (16.3%) and intracranial tumors (14.0%). The most frequently performed procedures were burr hole drainage (23.3%) and laminectomy (23.3%), followed by craniotomy (20.9%). Postoperative complications were observed in 39.5% of patients, with surgical site infection (10.5%) and seizures (8.1%) being the most common. At discharge, 62.8% of patients improved, while mortality was 14.0%. Good recovery on the Glasgow Outcome Scale was recorded in 46.5% of cases. No statistically significant association was found between procedure type and mortality outcome (χ^2=1.79, p=0.878).
Conclusions: Neurosurgical interventions in Ado-Ekiti are predominantly driven by trauma-related conditions, with generally favorable outcomes. Improving early presentation and perioperative care may further enhance patient outcomes.

Keywords: Craniotomy, Laminectomy, Neurosurgical interventions, Spine surgery, Surgical outcomes traumatic brain injury

INTRODUCTION

Neurosurgical disorders represent a significant and growing global health burden, particularly in low- and middle-income countries where access to specialized care remains limited. Recent estimates suggest that a substantial proportion of the global population lacks access to safe, timely, and affordable neurosurgical services, resulting in preventable morbidity and mortality.[1-3] Conditions such as traumatic brain injury, intracranial tumors, spinal cord compression, and hydrocephalus constitute major indications for neurosurgical intervention worldwide.[4]

In sub-Saharan Africa, the demand for neurosurgical services has increased steadily, driven largely by the rising incidence of trauma, rapid urbanization, and limited preventive strategies.[5,6] Nigeria, the most populous country in Africa, faces significant challenges in delivering neurosurgical care, including a shortage of trained personnel, inadequate infrastructure, delayed presentation, and financial constraints.[7-9] These factors contribute to

disparities in outcomes when compared with high-income countries.

Despite these challenges, there has been gradual expansion of neurosurgical services across tertiary institutions in Nigeria, accompanied by increasing documentation of clinical patterns and outcomes.[10,11] Previous studies in Nigeria and other West African settings consistently report traumatic brain injury as the leading indication for neurosurgical intervention, followed by neoplastic and spinal pathologies.[12,13]

Despite the gradual expansion of neurosurgical services in Nigeria, data from many emerging neurosurgical centers in South-Western Nigeria remain limited. Institution-specific studies are important for understanding local disease burden, surgical patterns, and outcome challenges. This study therefore aimed to evaluate the indications, procedures, and outcomes of neurosurgical interventions in Ado-Ekiti, Nigeria.

METHODS

Study design and setting

This retrospective observational study was conducted at the Ekiti State University Teaching Hospital, Ado-Ekiti, Nigeria, a tertiary referral center providing neurosurgical services to Ekiti State and surrounding regions. The study covered an 18-month period from July 2024 to December 2025.

Study population and patient recruitment

The study population comprised all patients who underwent neurosurgical interventions within the stated period. Patients were identified and consecutively recruited through a review of operative registers, neurosurgical unit records, and hospital medical records. A total of 86 patients who had cranial or spinal surgical procedures and met the study criteria were included.

Inclusion criteria

Patients were included if they underwent any neurosurgical procedure, whether elective or emergency, during the study period and had complete clinical, operative, and postoperative records available for review.

Exclusion criteria

Patients managed non-operatively, those with incomplete or missing records, and those who underwent minor procedures not requiring formal neurosurgical intervention were excluded.

Data collection

Data were extracted retrospectively using a structured proforma designed for the study. Information obtained included socio-demographic characteristics such as age, sex, residence, and referral source, as well as clinical presentation, diagnosis, and indications for surgery. Details of preoperative evaluation, intraoperative findings, and the specific neurosurgical procedures performed were recorded. Postoperative complications and treatment outcomes at discharge were also documented. Clinical diagnoses were based on documented history, physical examination findings, and available neuroimaging, including computed tomography and magnetic resonance imaging where available.

Outcome measures

The primary outcome measure was treatment outcome at discharge, categorized as improved, unchanged, deteriorated, or death. Functional outcome was further assessed using the Glasgow Outcome Scale. Secondary outcomes included the pattern of neurosurgical indications, the types of procedures performed, and the occurrence of postoperative complications.

Statistical analysis

Data were coded and analyzed using SPSS version 23.0 (IBM Corp., Armonk, NY, USA). Continuous variables were summarized using means and standard deviations, while categorical variables were expressed as frequencies and percentages. The association between type of neurosurgical procedure and patient outcome, defined as survival or mortality, was assessed using the chi-square test or Fisher's exact test where appropriate. A p value of less than 0.05 was considered statistically significant.

Ethical considerations

Ethical approval for this study was obtained from the Ethics and Research Committee of the Ekiti State University Teaching Hospital, Ado-Ekiti. The study was conducted in accordance with accepted ethical standards for retrospective research. Patient confidentiality was maintained throughout, and no identifying information was included in the analysis.

RESULTS

A total of 86 patients underwent neurosurgical interventions during the study period.

Socio-demographic characteristics

The socio-demographic profile of the patients is summarized in Table 1. The majority of patients were males (58, 67.4%), giving a male-to-female ratio of approximately 2.1:1. The most represented age group was 18-40 years (34, 39.5%), followed by 41-60 years (25, 29.1%). Pediatric patients (0-17 years) accounted for 14.0%, while those older than 60 years constituted 17.4% of the study population. Most patients resided in urban areas (49, 57.0%), while 37 (43.0%) were from rural

settings. Over half of the patients (46, 53.5%) presented through the emergency unit, whereas 24 (27.9%) were referred from outpatient clinics and 16 (18.6%) from other hospitals.

Table 1: Socio-demographic characteristics of patients (n=86).

Variable	Category	Frequency	Percentages
Age group (years)	0-17	12	14.0
	18-40	34	39.5
	41-60	25	29.1
	>60	15	17.4
Sex	Male	58	67.4
	Female	28	32.6
Residence	Urban	49	57.0
	Rural	37	43.0
Referral source	Emergency unit	46	53.5
	Outpatient clinic	24	27.9
	Other hospitals	16	18.6

Clinical indications for surgery

The clinical indications for neurosurgical intervention are presented in Table 2. Traumatic brain injury (TBI) was the most common indication, accounting for 30 cases (34.9%). Spinal cord compression was the second most frequent indication (14, 16.3%), followed by intracranial tumors (12, 14.0%). Hydrocephalus and degenerative spine disease accounted for 10 (11.6%) and 11 (12.8%) cases, respectively. Congenital anomalies were relatively less common (5, 5.8%), while other indications, including intracranial abscesses and hematomas, constituted 4 cases (4.6%).

Table 2: Clinical indications for neurosurgical intervention (n=86).

Diagnosis/indication	Frequency	Percentages
Traumatic brain injury	30	34.9
Intracranial tumors	12	14.0
Hydrocephalus	10	11.6
Spinal cord compression	14	16.3
Degenerative spine disease	11	12.8
Congenital anomalies	5	5.8
Others (abscess, hematomas)	4	4.6

Types of neurosurgical procedures

The distribution of neurosurgical procedures performed is shown in Table 3. Burr hole drainage and laminectomy (including spinal fixation) were the most commonly performed procedures, each accounting for 20 cases (23.3%). Craniotomy was performed in 18 patients (20.9%), while tumor excision accounted for 12 cases (14.0%). Ventriculoperitoneal shunt procedures were carried out in 10 patients (11.6%), and other procedures constituted 6 cases (7.0%).

Table 3: Types of neurosurgical procedures performed.

Procedure	Frequency	Percentage
Craniotomy	18	20.9
Burr hole drainage	20	23.3
Ventriculoperitoneal shunt	10	11.6
Tumor excision	12	13.9
Laminectomy	20	23.3
Others	6	7.0

Postoperative complications

Postoperative complications are detailed in Table 4. The majority of patients (52, 60.5%) had no documented complications. However, complications occurred in 34 patients (39.5%). The most common complication was surgical site infection (9, 10.5%), followed by seizures (7, 8.1%) and postoperative hematoma (6, 7.0%). Cerebrospinal fluid (CSF) leak occurred in 5 patients (5.8%), while new or worsening neurological deficits were observed in 4 patients (4.7%). Re-operation was required in 3 patients (3.5%). It is noteworthy that some patients experienced more than one complication.

Table 4: Postoperative complications (n=86).

Complications	Frequency	Percentage
None	52	60.5
Surgical site infections	9	10.5
CSF leak	5	5.8
Postoperative hematoma	6	6.9
Seizures	7	8.1
Neurological deficits	4	4.7
Re-operation	3	3.5

Percentages are based on total number of patients. Some patients may have more than one complication

Treatment outcomes

Treatment outcomes at discharge are presented in Table 5. A majority of patients (54, 62.8%) showed clinical improvement at discharge. Twelve patients (14.0%) remained unchanged, while 8 (9.3%) deteriorated. The overall mortality rate was 14.0% (12 patients).

Functional outcome assessment using the Glasgow Outcome Scale revealed that 40 patients (46.5%) achieved good recovery, while 16 (18.6%) had moderate disability. Severe disability was observed in 10 patients (11.6%), and 8 (9.3%) were in a persistent vegetative state.

Table 5: Treatment outcomes (n=86).

Outcome variable	Category	Frequency	Percentage
Outcome at discharge	Improved	54	62.8
	Unchanged	12	13.9
	Deteriorated	8	9.3
	Dead	12	14.0
Glasgow outcome score	Good recovery	40	46.5
	Moderate disability	16	18.6
	Severe disability	10	11.6
	Persistent vegetative state	8	9.3
	Death	12	14.0

Association between procedure type and outcome

The association between type of neurosurgical procedure and mortality outcome is shown in Table 6. Overall survival was observed in 74 patients (86.0%), while 12 patients (14.0%) died. Mortality was highest among patients who underwent craniotomy (22.2%), followed by tumor excision and other procedures (16.7% each). Lower mortality rates were observed following burr hole drainage, ventriculoperitoneal shunt, and laminectomy procedures (10.0% each). However, there was no statistically significant association between procedure type and mortality outcome (χ^2=1.79, df=5, p=0.878).

Table 6: Association between procedure type and outcome (n=86).

Procedure type	Survived, N (%)	Died, N (%)	Total (n)
Craniotomy	14 (77.8)	4 (22.2)	18
Burr hole drainage	18 (90.0)	2 (10.0)	20
Ventriculoperitoneal shunt	9 (90.0)	1 (10.0)	10
Tumor excision	10 (83.3)	2 (16.7)	12
Laminectomy	18 (90.0)	2 (10.0)	20
Others	5 (83.3)	1 (16.7)	6
Total	74 (86.0)	12 (14.0)	86

Chi-square (χ^2) = 1.79; Degrees of freedom (df)=5; p value=0.878. No statistically significant association was found between procedure type and mortality outcome (p>0.05).

Overall, the results demonstrate that neurosurgical practice in this setting is predominantly driven by trauma-related conditions, with burr hole drainage and laminectomy being the most frequently performed procedures. Despite a moderate rate of postoperative complications, the majority of patients experienced favorable outcomes, with nearly two-thirds showing clinical improvement at discharge.

DISCUSSION

Socio-demographic characteristics

This study provides important insight into the pattern and outcomes of neurosurgical practice in a tertiary institution in South-Western Nigeria and reflects broader trends observed across similar resource-limited settings. The predominance of male patients and the concentration within the young adult age group are consistent with findings from previous Nigerian and African studies, where trauma disproportionately affects economically active males.[12,14] This pattern is largely attributed to increased exposure to road traffic accidents and occupational hazards. The high rate of emergency presentations further underscores the acute nature of neurosurgical conditions in this environment.

Clinical indications for surgery

Traumatic brain injury emerged as the leading indication for surgery in this study, accounting for over one-third of cases. This finding aligns with multiple reports from Nigeria and sub-Saharan Africa, where trauma remains the most significant contributor to neurosurgical workload.[5,8] The contribution of spinal pathologies, including spinal cord compression and degenerative disease, reflects an evolving spectrum of neurosurgical conditions, possibly related to improved diagnostic capacity and demographic transitions.[14,15]

Types of neurosurgical procedures

The predominance of burr hole drainage and laminectomy procedures observed in this study is comparable to reports from similar settings, where trauma-related and decompressive procedures constitute the bulk of neurosurgical practice.[16] The relatively lower frequency of complex tumor resections may reflect late presentation, resource limitations, or referral patterns.

Postoperative complications

Postoperative complications were observed in a substantial proportion of patients, with surgical site infection, seizures, and hematoma being the most common. These findings are consistent with previous studies highlighting infection and perioperative complications as major challenges in neurosurgical care in low-resource environments.[17,18] The occurrence of such complications underscores the need for improved perioperative protocols and infection control measures.

Treatment outcomes

Despite these challenges, the majority of patients experienced favorable outcomes, with nearly two-thirds showing clinical improvement at discharge. However, the mortality rate of 14.0% remains higher than rates reported in high-income settings, reflecting disparities in access to timely care, critical care support, and overall health system capacity.[2,19]

Association between procedure type and outcome

The association between type of neurosurgical procedure and mortality outcome was assessed using the chi-square

test. Although variations in mortality were observed across procedure types, with relatively higher mortality following craniotomy (22.2%) compared with other procedures, the association was not statistically significant (χ^2=1.79, p=0.878). This finding suggests that patient outcomes may be more strongly influenced by factors such as severity of disease at presentation, timing of intervention, preoperative neurological status, and perioperative management rather than the specific procedure performed. Similar observations have been reported in previous studies conducted in resource-limited settings.[20]

Limitations

This study was limited by its retrospective design and reliance on hospital records, which may have resulted in incomplete documentation and missing clinical data. Being a single-center study, the findings may not be fully generalizable to other neurosurgical settings in Nigeria or sub-Saharan Africa. In addition, long-term postoperative outcomes could not be assessed because follow-up data were limited.

CONCLUSION

Neurosurgical interventions in Ado-Ekiti are predominantly driven by trauma-related conditions, particularly traumatic brain injury, with spinal pathologies also contributing significantly to the surgical burden. Burr hole drainage and laminectomy were the most commonly performed procedures. Although postoperative complications remain notable, the overall outcomes were generally favorable, with a majority of patients showing clinical improvement at discharge. However, mortality remains higher than rates reported in many high-income settings, reflecting ongoing systemic challenges.

Recommendations

There is a need to strengthen preventive strategies, particularly in reducing the incidence of traumatic brain injury through improved road safety measures and public health interventions. Early referral systems should be enhanced to reduce delays in presentation and intervention.

Investment in neurosurgical infrastructure, including imaging facilities, operative equipment, and intensive care support, is essential to improve outcomes. Efforts should also be made to strengthen infection control practices and perioperative care to reduce complication rates.

Furthermore, expanding neurosurgical training and workforce capacity will be critical in addressing the growing demand for services. Multicenter studies and national registries are recommended to provide broader data for policy development and healthcare planning.

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