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A Narrative Review of Brain Tumour Epidemiology, Surgical Management, and System-Level Challenges in Kenya (2000-2024)

Authors: Ben Ojakapeli[1,2]

Affiliations:
1. School of Medicine, Moi University, Eldoret, Kenya
2. Department of Surgery, Trans-Nzoia County Referral Hospital, Kitale, Kenya

Corresponding author: Ben Ojakapeli. Email: ben.ojakapeli@gmail.com

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ABSTRACT

Background*:* Brain tumours represent a significant health challenge worldwide, with a disproportionate impact in resource-limited settings. This narrative review highlights what is known about the epidemiology, surgical management, and systemic challenges associated with brain tumour care in Kenya. **Methods*:*** This narrative review was based on a comprehensive search of peer-reviewed publications, institutional reports and national statistics. The search, conducted from 2000 to 2024, utilized key databases including, PubMed, Google Scholar, African Journals Online (AJOL) and Web of Science, with search terms like ("brain tumours" OR "brain tumors") AND Kenya AND ("epidemiology" OR "neurosurgery" OR "challenges"). The analysis was qualitative, focusing on synthesizing patterns and themes related to epidemiology, surgical care and healthcare system barriers. **Results*:*** The literature, primarily composed of retrospective hospital-based series, indicates that in Kenya, adults represent a higher proportion of cases (71.8%) than children (28.2%). The most common adult tumours are meningiomas and gliomas, while gliomas and medulloblastomas are common in paediatric patients. Surgical intervention is a cornerstone of management, with outcomes often limited by the extent of resection and a lack of access to adjuvant therapies. Key challenges identified included delayed patient presentation, shortage of neurosurgical specialists (39 neurosurgeons in 2022), and limited access to essential infrastructure like imaging, intensive care units, and radiotherapy centers, most of which were concentrated in urban areas. **Conclusion*:*** Brain tumour care in Kenya is hindered by a shortage of neurosurgical personnel, delayed patient presentations, and a lack of equitable access to diagnostic and therapeutic resources. While surgical intervention is effective, its impact is limited by systemic challenges. To improve care, it is necessary to invest in infrastructure, decentralize neurosurgical services, enhance capacity building for healthcare professionals, and increase public awareness.

Keywords: Brain tumours, Kenya, Neuro-oncology, Health services accessibility, East Africa

INTRODUCTION

Cancer has been a monumental global health challenge, with a significant and disproportionate impact in low-and middle-income countries (LMICs). According to recent estimates, there were approximately 20 million new cancer cases and 9.7 million deaths in 2022 alone (2). Central Nervous System (CNS) tumours are among the most lethal malignancies, causing substantial morbidity and mortality (3).

Brain tumors, characterized by the abnormal proliferation of cells within the brain or its surrounding structures, can be primary (originating in the CNS) or secondary (metastatic from other body parts) (4,5). Their diverse histological types, ranging from benign to highly malignant, contributes to the complexity of their clinical presentation, treatment, and prognosis (6). This necessitates a comprehensive understanding of their epidemiology, treatment modalities, and the systemic challenges faced in their management. In resource-limited settings like Kenya, understanding these factors is crucial for effective public health planning, resource allocation, and policy development.

This narrative review synthesizes Kenyan literature published between 2000 and 2024 to describe the epidemiology, surgical management, and systemic challenges of brain tumour care.

METHODS

This narrative review was carried out by synthesizing information from published peer-reviewed publications, institutional reports, and national health statistics on brain tumours in Kenya. The review aimed at combining and analysing existing information about the case proportions and histological types of brain tumours, the impact of surgery on patient outcomes, and the barriers and limitations within the Kenyan healthcare system.

A comprehensive search of literature published between 2000 and 2024 was performed across multiple databases, including PubMed, Google Scholar, African Journals Online (AJOL) and Web of Science. The search strategy used a combination of keywords and Boolean operators: ("brain tumours" OR "brain tumors" OR "brain cancer" OR "CNS tumours" OR "CNS neoplasms") AND Kenya AND ("epidemiology" OR "prevalence" OR "incidence" OR "neurosurgery" OR "glioblastoma" OR "meningioma" OR "astrocytoma" OR "medulloblastoma" OR "treatment outcomes" OR "management") AND ("resource-limited settings" OR "low-income country" OR "Sub-Saharan Africa").

The inclusion criteria were: original research articles, systematic reviews, meta-analyses, short communications, institutional reports and theses; studies that reported data from Kenya; publications that discussed the epidemiology, surgical management or systemic challenges; publications between 2000 and 2024. In addition, selected international or LMIC-focused studies outside of Kenya were included when they provided directly relevant context to the Kenyan setting. The exclusion criteria were: publications that did not directly address relevant neurosurgical challenges.

The included studies were primarily retrospective hospital-based case series and observational studies, which were analysed qualitatively to identify common patterns and themes.

RESULTS

Epidemiology and Tumour Characteristics

The analysis of hospital-based case series revealed that adults account for a greater proportion of brain tumour cases than children (7). A retrospective study at Kenyatta National Hospital (KNH) from 2016 to 2019 found that out of 312 cases, 71.8% were adults and 28.2% were children and adolescents (7).

Regarding sex distribution, females (58.2%) were found to have a higher proportion of brain tumours compared to males (41.8%) in another study (8).

The most common histological types vary by age group. In adults, meningiomas and gliomas are the most frequent types (7). Meningiomas were the most common benign tumour (36%) and glioblastomas the most common malignant tumour (15.5%) (7). In the paediatric population, gliomas and medulloblastomas were identified as the most common types (7) (Table 1).

Surgical intervention remains a cornerstone of brain tumour management in Kenya, often combined with adjuvant therapies like radiotherapy and chemotherapy when available (9). The gold standard for diagnosis is the histological examination of a biopsy or resected specimen (3).

A study at Kenyatta National Hospital found that patients with gliomas who underwent radical surgery with or without radiotherapy had a 25% two-year survival rate, whereas those who received only debulking surgery without radiotherapy had a 7% two-year survival rate (10). In Eldoret, the majority of patients with astrocytomas underwent surgery, with a median Karnofsky performance status of 50 post-operatively, indicating that while outcomes may be suboptimal, surgical intervention is crucial (11).

The outcomes of brain tumour surgeries in resource-limited areas are influenced by several factors:

1) Tumour type and grade: High-grade tumours, like glioblastomas, are associated with a poorer prognosis (11).

2) Extent of resection: Complete resection is associated with better outcomes, but this may not always be feasible due to tumour location and accessibility. The most common recurrent brain tumours following surgical resection are craniopharyngiomas, meningiomas, medulloblastomas and hemangioblastomas (9).

3) Access to adjuvant therapies: Limited access to radiotherapy and chemotherapy affects overall survival rates. According to a 2017 study, Kenya

has four public radiotherapy centres, all in urban centres, with only one centre offering all of radiotherapy, surgery and chemotherapy (12).

4) Postoperative Care: A 2023 study reported that Kenya has 598 intensive care unit (ICU) beds, with the majority located in private and mission hospitals, limiting access to the general population (13). This limited number of ICU beds means that patients' recovery may be affected post-surgery.

Systemic Challenges in Brain Tumour Care

The management of cancers presents significant challenges globally, and these are amplified in low-and middle-income countries like Kenya. These challenges span the entire continuum of care (14) (Table 2).

Delayed patient presentation: A key barrier is the significant delay between symptom onset and patient presentation to a healthcare facility, often due to a lack of awareness, financial constraints, or reliance on alternative medicine (8,14). This results in patients presenting with advanced disease that is more difficult to treat.

Neurosurgical Workforce: A severe shortage of specialised healthcare professionals is a major obstacle. As of 2022, there were 39 neurosurgeons and 40 residents in training for a population of over 50 million, a ratio far below global recommendation (15). There is also a notable scarcity of other essential specialists, including neuro-oncologists, neuroradiologists, and neuropathologists.

Infrastructure and Technology: The availability of critical infrastructure and equipment is a major concern.

1. *Diagnostic Imaging:* Access to advanced imaging like MRI and CT scans is limited, particularly outside of major urban centres, leading to diagnostic delays (16).
2. *Intensive care units:* The country has a limited number of intensive care unit (ICU) beds (13,17).
3. *Radiotherapy:* The number of functional public radiotherapy centres is limited and all are concentrated in major cities (12). This makes access to essential post-operative care geographically challenging and economically prohibitive for many patients.

Table 1: Case Proportions and Histological Types from Hospital-Based Case Series

Parameter	Findings	Source (Study, Period, n)
Proportion in adults	71.8%	Gesaka et al., 2016-2019, n=312 (7)
Proportion in paediatrics	28.2%	Gesaka et al., 2016-2019, n=312 (7)
Sex distribution	Females: 58.2%, Males: 41.8%	Magoha et al., 2005-2016 (8)
Commonest benign tumour	Meningioma (36%)	Gesaka et al., 2016-2019, n=312 (7)
Commonest malignant tumour	Glioblastoma (15.5%)	Gesaka et al., 2016-2019, n=312 (7)

Note- All figures derived from retrospective, hospital-based series in Kenya. Percentages reflect proportions of reported cases rather than population-based incidence or prevalence.

Table 2: Key Systemic Challenges in Brain Tumour Care in Kenya

Category	Specific Challenge	Source (Year, Data Point)
Patient presentation	Delayed presentation leading to advanced disease	Magoha et al., 2022 (8)
Neurosurgical Workforce	39 neurosurgeons for >50 million people	John 2022 (15)
Diagnostic Imaging	Limited access to MRI and CT scans	Shakir et al., 2024 (16)
Adjuvant therapies	Limited access to radiotherapy centres	Makau-Barasa et al., 2017 (12)
ICU beds	598 intensive care unit beds across the country, mostly in private facilities	Mwangi et al., 2023 (13)

DISCUSSION

Quality of Cited Studies

The available literature on brain tumours in Kenya is valuable but has significant limitations that affect the generalizability of its findings. The majority of studies are retrospective, single-institution case series (7–10). This methodology is prone to selection bias, as it only reflects the patient population seen at specific facilities, primarily major referral hospitals. The data, therefore, represents the proportion of cases treated at these centres rather than the true population-based incidence or prevalence, which is largely unknown due to a lack of a

national cancer registry. The lack of standardized data collection across different studies also limits our ability to compare outcomes and trends over time.

Tying Conclusions to Results

Our review of the literature demonstrates a clear link between the identified systemic challenges and patient outcomes. The finding that patients present late, as described by Magoha et al.(8) and Shakir et al.(14), directly corresponds to the data on poor survival rates, as late-stage tumours are more difficult to treat successfully. The limited two-year survival rate for gliomas reported by Mwang'ombe and Ombachi (10), even with surgery, is not only a reflection of the tumour's aggressive nature but is also a direct consequence of the inadequate access to adjuvant therapies like radiotherapy (12). Similarly, the scarcity of neurosurgeons and ICU beds, documented by John (15) and Mwangi et al. (13) respectively, provides a plausible explanation for the high mortality burden and the limited scope of surgical interventions available to many patients.

Regional Comparison

Comparison with neighbouring East African countries reveals similar patterns. For example, a retrospective cohort in Arusha, Tanzania of 39 primary brain tumour patients reported only about 25.6% gross tumour resections and low use of adjuvant therapy (approximately 28.2%), with high short-term (30-day) and 1-year mortality (18). In Ethiopia, brain tumours comprise only about 3% of diagnosed childhood cancers in Addis Ababa, likely reflecting diagnostic constraints (19). These similarities suggest that systemic barriers to comprehensive management of brain tumours are widespread in the region, highlighting the need for coordinated strategies to strengthen neurosurgical capacity, improve access to adjuvant therapies, and enhance cancer registry reporting across East Africa.

CONCLUSION

This narrative review synthesizes the fragmented but valuable literature on brain tumour care in Kenya. While neurosurgical services at major centres provide a cornerstone of treatment, their impact is severely limited by systemic challenges. The primary issues include a shortage of neurosurgical personnel, delayed patient presentations, and a lack of equitable access to essential infrastructure like advanced imaging, ICU beds, and radiotherapy facilities. These factors combine to create a significant burden on the healthcare system and result in suboptimal patient outcomes.

Limitations of this Review

The limitations of this review are a direct result of the nature of the available data. First, the scarcity of local data from Kenya forced a reliance on a small number of studies, most of which are descriptive and retrospective. Second, the absence of a national cancer registry or population-based studies means that we cannot report accurate incidence or prevalence rates. Instead, this review relies on case proportions from specific hospital series, which may not be representative of the entire country. Additionally, because this is a narrative review, the synthesis may be influenced by selection bias, despite efforts to use a broad search strategy. Finally, due to the heterogeneity of the studies, a formal meta-analysis was not feasible, and the synthesis of findings is qualitative.

Recommendations

Based on the findings of this review, we recommend a multi-pronged approach to improve brain tumour care in Kenya:

1) Capacity Building: To directly address the workforce shortage, there is a clear need for increased support for the training of neurosurgeons, neurologists, neuro- oncologists, neuroradiologists, neuro- pathologists and specialized nurses (20).

2) Infrastructure Investment: Targeted investment in diagnostic and therapeutic infrastructure, particularly the decentra- lization of neurosurgical services to regional centres, would alleviate the burden on major hospitals and improve accessibility for patients in remote areas (21). The government should also regulate the prices of chemotherapy and radiotherapy so that the public can afford them (20).

3) Public Health Campaigns: Creating public awareness campaigns could reduce delayed patient presentations by educating the population on the importance of seeking early medical attention for neurological symptoms.

4) Research: To better inform policy, a national cancer registry or large-scale, population-based studies are needed to accurately determine the incidence and prevalence of brain tumours in Kenya. Research should also focus on assessing the outcomes of different therapeutic approaches for brain tumours and identifying modifiable risk factors. For instance, Fisher et al. (22) and Ohgaki (23) have reported that environmental exposures, genetic predispositions, and infection-related factors may influence brain tumour development, but further research is needed to elucidate these associations in the

Kenyan context.

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