HSI Health Sciences Investigations Journal

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ISSN Online 2704-4890 | ISSN Print 2720-7609

Online first publication

Original Research Article

HSI Journal (2025) Volume 7 (Issue 2):1247-1253. https://doi.org/10.46829/hsijournal.2025.12.7.2.1247-1253

Open Access

Prevalence of central nervous system disorders and patterns of medication use at a tertiary hospital in Ghana: A descriptive study

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Received June, 2025; Revised October, 2025; Accepted November,2025

Abstract

Background: Central nervous system (CNS) disorders contribute significantly to global morbidity and mortality, with a disproportionate burden observed in low- and middle-income countries. In sub-Saharan Africa, the impact of these conditions is amplified by limited diagnostic capacity, inadequate pharmacological management, and systemic healthcare constraints.

Objective: This study aimed to determine the prevalence and patterns of medication use for CNS disorders at a tertiary hospital in Ghana.

Methods: A retrospective descriptive study was conducted using secondary data from patient records at the Cape Coast Teaching Hospital between June 2021 and November 2022. Medical records were reviewed to identify cases diagnosed with CNS disorders and pharmacological agents prescribed for their management. Data on CNS disorders and medication use prevalence were analysed and reported as counts and percentages.

Results: Out of 15,894 patient records reviewed, 1,128 cases (7.1%) involved CNS disorders. The majority of patients were male (52.8%) and above 45 years of age. Vascular disorders were the most prevalent (54.9%), with stroke accounting for 88.9% of cases. Structural and seizure disorders followed, accounting for 19.6% and 17.4%, respectively. Unspecified seizure disorders (62.5%) and epilepsy (32.5%) were the most common seizure types. Pharmacological treatment was limited, with only 13.1% of patients receiving medications. Frequently used drug classes included antibiotics (3.8%), antihypertensives (2.9%), analgesics (2.4%), antipsychotics (1.5%), and statins (0.9%).

Conclusion: The predominance of stroke and the underutilisation of pharmacotherapy underscore critical gaps in the prevention, diagnosis, and management of CNS disorders. These findings highlight the need for improved access to diagnostic tools and essential medications, as well as for policy reforms to enhance the National Health Insurance Scheme coverage for CNS therapies.

Keywords: CNS disorders, neurological disorders, pharmacotherapy

Cite the publication as Mozu IE, Frimpong YA, Cobbold CC, Djochie RD et al. (2025) Prevalence of central nervous system disorders and patterns of medication use at a tertiary hospital in Ghana: A descriptive study. HSI Journal 7 (2):1247-12533. https://doi.org/10.46829/hsijournal.2025.12.7.2.1247-1253

INTRODUCTION

The Central Nervous System (CNS) is the most intricate organ system in the human body [1], and disorders affecting it have profound consequences for affected individuals and their communities. CNS disorders represent a major public health challenge, contributing to long-term disability, reduced quality of life and increased healthcare costs [2,3]. Recent estimates indicate that over one-third of the global population is affected by neurological conditions, making them the leading cause of disability worldwide [4]. A 2024 study further revealed that

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more than 3 billion people live with a neurological disorder [5]. The burden of CNS disorders disproportionately affects low- to middle-income countries (LMICs) where over 80% of related deaths occur [4]. In sub-Saharan Africa, neurological disorders are highly prevalent, with significant implications for healthcare systems and economic productivity [6]. Conditions such as stroke often lead to long-term disability, reducing workforce productivity and increasing dependency ratios. In Ghana, a 16-year review of neurological disorders carried out at the country's largest medical centre documented a wide spectrum of conditions consistent with regional trends [7]. Earlier studies identified stroke, epilepsy and movement disorders as the commonest CNS disorders [8]. However, such epidemiological data remain scarce in many parts of sub-Saharan Africa, highlighting the need for further research to assess disease prevalence and inform public health strategies.

Delayed diagnosis and poor prognosis of CNS disorders are exacerbated by limited public awareness [9]. Even when diagnosed early, management is complex and often requires multidisciplinary approaches, including surgery, rehabilitation and pharmacotherapy. Pharmacological interventions play a crucial role in mitigating secondary damage, modulating neurotransmission, and managing symptoms [10]. However, in Ghana, challenges such as limited treatment options, drug unavailability, and high medication costs hinder optimal care [8]. Understanding drug prescription patterns for CNS disorders can help evaluate adherence to guidelines, identify gaps in drug access, and optimise therapeutic strategies. This study aimed to determine the prevalence of CNS disorders reported at the Cape Coast Teaching Hospital, a major tertiary facility serving central and western Ghana, and to analyse the pharmacological agents used to manage them. Local data are essential for shaping healthcare policies, providing guidance for clinical training, and directing future research within the sub-region.

MATERIALS AND METHODS

Study design and setting

This was a descriptive study that employed a retrospective cross-sectional design and was conducted in the internal medicine, surgery, and accident and emergency (A&E) departments of Cape Coast Teaching Hospital (CCTH). The study used secondary data (electronic patients' health records) of patients who reported to the hospital between June 2021 and November 2022. The Cape Coast Teaching Hospital is a 400-bed tertiary care facility located in Cape Coast, the capital of the central region of Ghana. Cape Coast has a population of approximately 200,000 [11]. The hospital is the largest in the region and also serves as the main referral centre for the western and central parts of the country.

Study population and sampling

This study included all patients with CNS disorders who reported to CCTH between June 2021 and November 2022 at the Internal Medicine, Accident and Emergency or Surgical departments. This approach aligns with existing literature, which indicates that the majority of CNS disorders are managed within internal medicine, accident and emergency and surgical units [12]. The census method was employed in this study, in which all members of the population were included.

Inclusion and exclusion criteria

Data of all patients who visited the Cape Coast Teaching Hospital for treatment with CNS-related disorders between June 2021 and November 2022 were eligible for this study. Patients with missing key data, such as diagnosis, demographic and treatment details or duplicated records were excluded.

Data Analysis

Data were reviewed in Microsoft Excel 2021 for missing values, duplicates, and inconsistencies, and any missing or incomplete data were excluded from the analysis. Data analysis was conducted with IBM SPSS Statistics version 27. Categorical variables (e.g., gender, insurance status) were summarised as frequencies and percentages, while continuous variables (e.g., age) were reported as mean ± standard deviation (SD) for normally distributed data or median with interquartile range (IQR) for non-normally distributed data. Summary statistics were used to describe the study population. Data were analysed and reported as counts and percentages to describe the prevalence and patterns of CNS disorders and medication usage.

RESULTS

From June 2021 to November 2022, a total of 15,894 cases were recorded at the Cape Coast Teaching Hospital, of which 7.1% (n = 1,128) were central nervous system (CNS) disorders. The majority of patients were male (52.0%), and most were aged 45 years or older (Table 1).

The most prevalent CNS disorders were vascular disorders (54.9%), followed by structural disorders (19.6%) and seizure disorders (17.4%) (Figure 1). Among vascular disorders, stroke (88.9%) was the most common diagnosis. Structural disorders primarily included unspecified seizures (62.5%), epilepsy (32.5%), hydrocephalus (18.8%), diffuse brain injury (17.4%), and traumatic brain injuries (16.0%). Among seizure disorders, unspecified seizures (62.5%) were most frequent, followed by epilepsy (32.5%) and status epilepticus (4.5%) (Table 3). Structural disorders refer to CNS conditions with identifiable anatomical abnormalities such as hydrocephalus, traumatic brain injury, or neoplasms. In some cases, seizures were documented under structural disorders when a structural lesion was the primary diagnosis. In contrast, the seizure disorder category included cases where seizures were the main presenting complaint without imaging-confirmed structural pathology. This classification overlap reflects clinical practice and documentation patterns in the hospital. Pharmacotherapy was documented in 13.1% (n = 148) of

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cases, while the majority (86.9%, n = 980) received no pharmacological treatment (Table 4). The most commonly prescribed medications were antibiotics (3.9%, n = 44), antihypertensive agents (2.7%, n = 31), analgesics (2.3%, n = 26), antipsychotics (1.5%, n = 17), and statins (0.9%, n = 10). Among seizure disorder cases, anticonvulsants were prescribed in 31.3% (n = 10), indicating low but documented use of antiseizure medications (Table 5).

In degenerative disorders, analgesics (15.4%) and supplements (7.7%) were the most frequently used pharmacological agents. For seizure disorders, common treatments included analgesics (3.1%), antibiotics (3.6%), antihypertensive agents (2.5%), and anticonvulsants (5.1%). Structural disorders were primarily managed with analgesics (5.0%) and antibiotics (4.5%). Among vascular disorders, the most commonly prescribed medications were analgesics (1.1%), antibiotics (2.7%), anticoagulants (1.0%), antihypertensive agents (4.2%), and statins (1.5%), likely due to comorbid conditions involving dyslipidemias.

Table 1. Demographic characteristics of patients

Variable	Frequency (%), n = 1128
Sex	
Male	541 (52.0)
Female	587 (48.0)
Age (years)	
Child (0-16)	207 (18.4)
Young adults (17-30)	109 (9.7)
Middle-age adults (31-45)	162 (14.4)
Old-age adults (above 45)	650 (57.6)
Insurance Status	
Insured	882 (78.2)
Non-Insured	246 (21.8)

Table 2. Distribution and prevalence of CNS disorders

Department	CNS Cases	All Cases	Prevalence
Internal Medicine	478	2854	16.7%
Neurosurgery	242	2656	9.1%
Accident and Emergency	408	9256	4.4%
Total	1128	15894	7.1%

Table 3. Specific distribution of disorders

Disorder	Frequency	Percent
Vascular Disorders		
Stroke (unspecified)	550	88.9
Subdural haemorrhage	29	4.7
Epidural haemorrhage	9	1.5
Hypertensive encephalopathy	7	1.1
Subarachnoid Haemorrhage	7	1.1
Vascular Dementia	5	0.8
Cerebral infarction	3	0.5
Intracerebral Haemorrhage	3	0.5
Intracranial Haemorrhage	2	0.3
Benign intracranial hypertension	1	0.2
Increase intracranial pressure	1	0.2
Ischemic optic neuropathy, right eye	1	0.2
Traumatic haemorrhage of cerebrum	1	0.2
Structural Disorders		
Hydrocephalus	41	18.6
Diffuse brain injury	38	17.2
Traumatic brain injury	35	15.8
Benign neoplasm of the pituitary gland	17	7.7
Intracranial space-occupying lesion	12	5.4
Benign neoplasm of brain	9	4.1
Benign neoplasm of meninges	6	2.7
Brain death	6	2.7
Cerebral palsy	5	2.3
Lumbar spina bifida with hydrocephalus	5	2.3
Malignant neoplasm of brain	5	2.3
Vertigo of central origin	5	2.3
Spina bifida	4	1.8
Obstructive hydrocephalus	3	1.4
Cerebellar ataxia in diseases classified elsewhere	2	0.9
Congenital hydrocephalus	2	0.9
Disorders of hypoglossal nerve	2	0.9
Encephalocele	2	0.9
Focal brain injury	2	0.9
Injury of cervical spinal cord	2	0.9
Injury of nerves and lumbar spinal cord at abdomen, lower back and pelvis level	2	0.9
Injury of nerves and spinal cord at neck level	2	0.9
Intracranial injury	2	0.9
Other diseases of spinal cord	2	0.9
Anencephaly	1	0.5
Cerebrospinal fluid leak	1	0.5
Circumscribed brain atrophy	1	0.5
Encephalopathy	1	0.5
Holoprosencephaly	1	0.5
Injury to spinal cord	1	0.5
Neurofibromatosis	1	0.5
Sequelae of injury of spinal cord	1	0.5
Spinal and epidural anaesthesia-induced headache during labour and delivery	1	0.5
Traumatic cerebral oedema	1	0.5
Seizure Disorders		
Unspecified seizures	120	61.2
Epilepsy	66	33.7
Status epilepticus	9	4.6
Post traumatic seizures	1	0.5

Table 4. Distribution of drugs used in managing CNS disorders (I)

Drugs	Frequency	Percent (%)
NA	980	86.9
Antibiotics	44	3.9
Antihypertensive agents	31	2.7
Analgesics	26	2.3
Antipsychotic	17	1.5
Statins	10	0.9
Anticoagulants	6	0.5
ACTs	3	0.3
Diuretics	3	0.3
Hypoglycaemic agents	3	0.3
Supplements	3	0.3
Steroids	1	0.1
Sympathomimetic agents	1	0.1

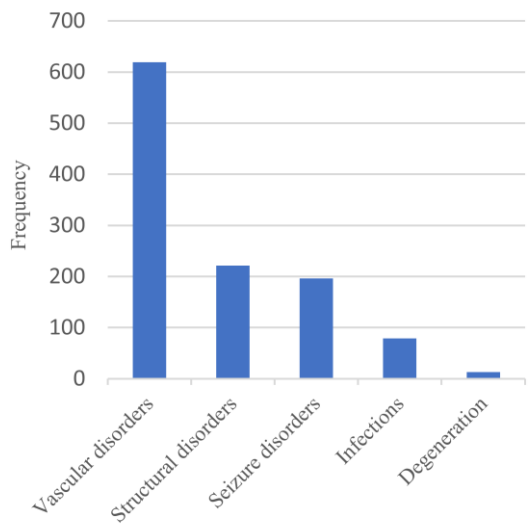

Figure 1: Distribution of disorders of the nervous system

Table 5. Distribution of drugs used in managing CNS disorders (II)

	Frequency	Percent
Infections		
Antibiotics	10	76.9
Antipsychotic	2	15.4
Steroids	1	7.7
Seizure disorders		
Anticonvulsants	10	31.3
Antibiotics	7	21.9
Analgesics	6	18.8
Antihypertensive agents	5	15.6
ACTs	2	6.3
Hypoglycaemic agents	1	3.1
Statins	1	3.1
Structural disorders		
Analgesics	11	44.0
Antibiotics	10	40.0
Antipsychotic	2	8.0
Antihypertensive agents	1	4.0
Supplements	1	4.0
Vascular disorders		
Antihypertensive agents	26	34.7
Antibiotics	17	22.7
Statins	9	12.0
Analgesics	7	9.3
Anticoagulants	6	8.0
Diuretics	3	4.0
Antipsychotic	2	2.7
Hypoglycaemic agents	2	2.7
ACTs	1	1.3
Supplements	1	1.3
Sympathomimetic agents	1	1.3

DISCUSSION

In this present study, central nervous system (CNS) disorders accounted for 7.1% of all medical cases at the Cape Coast Teaching Hospital, with vascular disorders, particularly stroke, being the most prevalent, followed by seizure and structural disorders. Despite this substantial burden, pharmacological treatment was notably underutilised, with only 13.1% of patients receiving medication. These findings highlight significant gaps in diagnosis and management, particularly in resource-limited settings. The 7.1% prevalence of CNS disorders observed in our study aligns with previous reports from Ghana [8] and reflects a growing neurological disease burden in sub-Saharan Africa. In contrast, studies in India and the UK have reported crude or lifetime prevalence rates ranging from 2.6% to 6% [13,14], while Uganda reported a significantly higher rate of 14.3% [15]. This variation is likely driven by differences in diagnostic capabilities, population age structures, and access to healthcare services. Our findings reinforce the need for improved surveillance and reporting systems to better estimate the true burden of neurological diseases in Ghana and comparable contexts.

Males accounted for a slight majority (52.0%) of CNS cases, deviating from global patterns that often show a higher prevalence among females for certain CNS conditions [16]. This gender difference may reflect lifestyle-related risk factors such as higher rates of alcohol use, smoking, and occupational hazards more prevalent among males in the Ghanaian setting [17]. Importantly, such trends call for gender-sensitive clinical and public health strategies. For example, interventions targeting male health behaviours and timely healthcare-seeking could mitigate risk and improve outcomes. Furthermore, older adults (> 45 years) represented the largest age group affected, underscoring the link between ageing and neurodegeneration [18]. The increasing proportion of elderly patients in Ghana, coupled with inadequate geriatric and neurology services, poses a challenge for health systems. As supported by Sarfo et al. (2016), stroke remains

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the most common neurological condition among older adults in Ghana [8]. This study similarly reports prevalent vascular disorders, with stroke comprising 54.9% of all CNS diagnoses. These findings have clear policy implications that require prioritised investment in chronic disease prevention, particularly hypertension and diabetes control, as a public health strategy.

Despite the high burden, pharmacological treatment was notably lacking, with 86.9% of patients not receiving CNS-specific medication. Several systemic barriers that likely contribute to this deficit include shortages of essential medicines, inadequate diagnostic infrastructure, and gaps in insurance coverage. Although Ghana's National Health Insurance Scheme (NHIS) has expanded healthcare access, it provides limited support for specialised neurological therapies [19]. Instead, treatment patterns were skewed toward managing complications or comorbidities, such as infections or hypertension, rather than the underlying neurological conditions, as evidenced by the predominance of empirical antibiotic use (3.9%) and antihypertensives (2.7%). Moreover, the high rate of unspecified seizure disorders (62.5%) points to significant diagnostic limitations, including limited access to neuroimaging and specialist consultation. These findings emphasise the urgent need to expand NHIS coverage to include essential CNS medications such as antiepileptics and to improve access to neurodiagnostic tools at the regional level. Expanding neurology training programs and equipping tertiary and secondary hospitals with CT/MRI capabilities would enhance early diagnosis and evidence-based treatment planning.

This study reports an apparent underuse of pharmacological agents in the management of CNS disorders. It has been previously reported that limited availability of neurological specialists, fragmented referral systems, and frequent stockouts of CNS-specific medications are significant contributors to the underuse of pharmacotherapies in the management of CNS disorders [20,21]. The absence of treatment guidelines tailored to local resource constraints also hampers rational prescription. For instance, the low prescription rates of anticonvulsants and statins may reflect clinicians' reliance on symptomatic treatment in the absence of diagnostic certainty or specialist input [8]. Furthermore, sociocultural perceptions of CNS disorders, especially epilepsy, are often known to lead to delays in seeking biomedical care. This contributes to late-stage presentations where pharmacological interventions may be deprioritised in favour of supportive or palliative care [22]. Addressing these barriers will require not only financial reform but also the strengthening of clinical protocols, supply chain systems, community health education, and the strategic use of appropriate pharmacotherapies for CNS disorders.

The disease-specific findings and interventions include:
Vascular Disorders (Stroke) - Stroke management in our study included standard agents such as antiplatelet agents, anticoagulants, and statins, in line with international recommendations [15]. However, the overall use of these agents was low, as statins, for instance, were prescribed in only 1.5% of stroke cases, suggesting missed opportunities for secondary prevention. Public health policies must incorporate widespread screening and aggressive management of modifiable risk factors like hypertension, diabetes, and dyslipidemia. Additionally, national campaigns promoting lifestyle modifications could significantly reduce stroke incidence.

Structural and Seizure Disorders - Conditions such as hydrocephalus, traumatic brain injury, and epilepsy were also prevalent. Data on hydrocephalus in Africa remain scarce, but post-infectious etiologies, especially following neonatal meningitis, are commonly implicated [23]. In Ghana, the high cost of neurosurgical care and limited availability of specialists contribute to treatment delays and poor outcomes [24]. A major concern regarding epilepsy is the non-affordability and accessibility of long-term anticonvulsant therapy, considering that financial challenges and stigmatisation lead to poor medication adherence. To address this, policymakers should consider subsidising first-line antiepileptic drugs (e.g., phenytoin, valproate) through the NHIS and invest in community-based education to reduce stigma and improve adherence.

The findings of this study underscore the need for a multifaceted response to CNS disorders in Ghana. Key recommendations include:

a) Health System Strengthening: Investment in neurodiagnostic infrastructure and specialist training will reduce diagnostic delays and improve outcomes.
b) Pharmaceutical Access Reform: Expanding NHIS coverage to include essential CNS drugs, especially anticonvulsants and antihypertensives, is critical.
c) Preventive Health Strategies: National programs targeting blood pressure control, maternal-child health (to reduce congenital CNS disorders), and lifestyle risk factors will be central to long-term disease reduction.
d) Research and Surveillance: Prospective cohort studies exploring the etiologies and outcomes of CNS disorders in African populations will provide data for tailored interventions.

This study offers important insights into the burden and pharmacological management of CNS disorders in a tertiary hospital in Ghana, as it focuses on both prevalence and patterns of medication use, an area that remains underexplored in resource-limited settings. By analysing patient data from a major referral centre, the study provides a practical reflection of current clinical and therapeutic practices, particularly in a health system operating under constraints such as limited diagnostic infrastructure and restricted drug availability. Moreover, the findings contribute to health policy discussions by highlighting discrepancies in access to essential CNS medications and identifying potential reforms within the National Health

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Insurance Scheme (NHIS). The study also serves as a baseline for future research and intervention design to improve neurological care in Ghana and similar settings.

However, the retrospective design inherently limits data completeness and accuracy, as it relies on the quality and consistency of medical records, which may contain omissions or misclassifications. Furthermore, the study was conducted at a single tertiary hospital, potentially limiting the generalizability of the findings to other regions or lower-level healthcare facilities nationwide. Diagnostic certainty for CNS conditions was also constrained by limited access to confirmatory tools such as neuroimaging and electrophysiological tests, which may have affected the accuracy of some diagnoses. Additionally, medication use data were extracted solely from hospital records, excluding instances in which patients may have obtained medications externally or used non-conventional therapies, potentially underestimating the true extent of pharmacological interventions. Also, due to variability in documentation, the study could not strictly apply the WHO ICD-11 or similar classification schemes. Hospital electronic health records should adopt standard coding systems to enhance diagnostic precision and comparability across studies. The retrospective nature of the study introduces potential biases, including inconsistent diagnostic coding. Further, the study could not assess disease severity, treatment adherence, or clinical outcomes, which are important for evaluating the appropriateness and effectiveness of therapy.

Conclusion

This study provides evidence of a substantial burden of CNS disorders at a tertiary hospital in Ghana, with stroke and seizure-related morbidity as predominant disease conditions. However, significant treatment gaps persist due to limitations in diagnosis, drug availability, and insurance coverage. Addressing these challenges requires a coordinated approach involving health system reform, improved access to medicines, public health education, and focused research. Strengthening the capacity to manage CNS disorders will be essential in improving neurological health outcomes in Ghana and similar low-resource settings.

DECLARATIONS

Ethical consideration

Ethical clearance was sought from the Institutional Review Boards of the University of Cape Coast (UCCIRB/COHAS/21/41) and the Cape Coast Teaching Hospital (CCTHERC/EC/21/036). Collected data from medical records were de-identified, and all procedures adhered to the principles outlined in the Helsinki Declaration.

Consent to publish

All authors agreed on the content of the final paper.

Funding

None

Competing interest

The authors declare no conflict of interest

Author contribution

RPB, IEM, YAF, CCC, RDD, and KAM contributed to the conception, design, data acquisition, and analysis. YAF, IEM, and RPB drafted and revised the manuscript. RPB, IEM, YAF, CCC, RDD, and KAM reviewed and approved the final manuscript for publication.

Acknowledgement

We gratefully acknowledge the patients and staff of Cape Coast Teaching Hospital for their participation and support.

Availability of data

Data is available upon request to the corresponding author

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