

Original Research Article

Changing Trends in Intensive Care Unit Admissions in Africa: Insights from the Rivers State University Teaching Hospital (RSUTH)

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Abstract: Background: Intensive care units (ICUs) are vital for managing life-threatening conditions. In many developing countries, critical care delivery is constrained by bed and equipment shortages, insufficient skilled personnel, and cost. Admission patterns have also changed with increase in prevalence of non-communicable diseases. Mortality rates in African ICUs remain high, about 30% in Nigeria and 60% in Kenya. Rivers State University Teaching Hospital (RSUTH) ICU faces staffing shortages and inconsistent application of admission criteria. Characterizing the local epidemiology of ICU admissions at RSUTH is essential to guide resource allocation, improve patient outcomes, and strengthen critical care delivery. **Objective:** To evaluate the pattern of ICU admission in RSUTH over a 31-month period. **Methods:** This retrospective cohort study reviewed all patients admitted to RSUTH's 8-bed mixed medical-surgical ICU from June 2023 through January 2026. Following Ethical approval, data was extracted from the admission and discharge register and nurses' records. Data obtained included patients biodata, diagnosis, interventions received and outcome. Data analysis was done using appropriate statistical methods. **Results:** 367 patients were admitted, with a mean age of 47.9 ± 19.8 years and a male preponderance (52.6%). Neurological conditions accounted for the highest indication for ICU admission (34.9%), while renal conditions were the least (1.9%). Forty two percent (42.5%) had invasive mechanical ventilation, while 41.1% had inotropic support. Duration of stay ranged from 1 hour to 32 days, with a mean of 6.5 ± 5.3 days. One hundred and eighty-one (49.3%) of the patients were transferred from the ICU to another ward of the hospital, while 159 (43.3%) died while in the ICU. **Conclusion:** This review shows that neurological conditions dominate ICU admissions at RSUTH, with a mortality of 43.3%, highlighting need for enhanced critical care resources to reduce mortality in this resource-limited setting.

Keywords: Intensive Care Unit, Admissions, Pattern and RSUTH.

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INTRODUCTION / BACKGROUND

The Intensive Care Unit (ICU) plays a crucial role in modern healthcare, providing advanced support and close monitoring for patients with life-threatening conditions that require specialised care beyond the capacity of general wards [1]. Intensive care is a continuum of care for patients admitted from various sources, requiring frequent assessment of vital signs, invasive haemodynamic monitoring, intravenous medications and fluid management, and ventilatory and nutritional support to ensure safe and effective outcomes for patients with recoverable clinical conditions [2].

Intensive care medicine is still evolving in developing countries, and many tertiary hospitals in

Nigeria have established critical care facilities to care for critically ill patients. Critical care remains a major challenge in these settings, where health needs often outweigh available resources. Unfortunately, most critical care facilities are still in their early stages of development [3, 4].

Globally, patterns of ICU admissions vary considerably with disease prevalence, available medical infrastructure, and referral systems [4, 5]. In developed countries, non-communicable diseases, including cardiovascular disorders and multi-organ failure, are the leading causes of ICU admission [6].

Conversely, in many low- and middle-income countries—including Nigeria— infectious diseases,

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obstetric complications, and trauma remain leading contributors [6]. Although this pattern may be changing with lifestyle shifts and the westernisation of the diet in most developing economies, the African continent is currently experiencing a double burden of rising rates of Non-Communicable diseases (NCD) alongside the ongoing battle against infectious diseases and an ageing population [7]. As a result, the demand for critical care is higher than ever before. Furthermore, most intensive care units in Nigeria are located in urban centres, with none in rural areas to serve most of the population. Understanding these local patterns is essential for designing evidence-based interventions, improving patient outcomes, and optimising the utilisation of limited critical care resources [8].

Mortality rates in the intensive care units of most African countries remain high [9-11], compared with those in developed countries. Documented ICU mortality rates exceed 25% in Ethiopia¹², 31.3% in Nigeria¹³, 35% in Tanzania¹⁴, and approach 60% in Kenya [15].

In evaluating admission patterns in Nigeria, Onyekwulu *et al.*, [16], found that postoperative cases across the various surgical specialties accounted for 49.3% of all ICU admissions, followed by neurosurgical admissions (41.2%), while medical admissions accounted for 9.4% of all ICU admissions. Similarly, in another study conducted at a different centre within the same city, neurosurgery accounted for most admissions to the facility. Trauma-related cases accounted for about 39.4% of the total admissions [17]. (Samuel *et al.*,). Mato *et al.*, [18], found that the highest proportion of admissions (48.7%) was from the Department of Obstetrics and Gynaecology, and the lowest from Ophthalmology and Anaesthesia (0.1%). Postoperative cases made up 62.1% of total admissions, with post-caesarean section (CS) contributing 65.7% of these.

Findings from an Ethiopian study conducted in a teaching hospital on admission patterns showed that the most common specific diagnoses at ICU admission were myocardial infarction 96 (19%), followed by heart failure 56 (11.1%), ARDS 46 (8.9%), septic shock 37 (7.3%) and HIV infection 25 (5%) of all admissions [18].

In a previous study of mortality and morbidity in the RSUTH intensive care unit, 44% of admitted patients had medically related illnesses, with cerebrovascular disease the commonest diagnosis, while 53% had surgically related illnesses, with intestinal obstruction the commonest surgical diagnosis [13].

In Nigeria, challenges such as limited ICU beds, inadequate equipment, insufficiently trained personnel, and a lack of funds to pay bills, as most patients have no insurance, have constrained the efficiency of critical care delivery [17].

The Rivers State University Teaching Hospital Intensive Care Unit

The Rivers State University Teaching Hospital (RSUTH), formerly known as Braithwaite Memorial Specialist Hospital (BMSH), is a government-run tertiary health facility in Old GRA, Port Harcourt. Established in 1925, RSUTH evolved from a nursing home into a teaching hospital with 571 beds and several specialised departments, including Surgery, Paediatrics, Obstetrics and Gynaecology, Radiology, and Anaesthesia, among others [19]. The hospital is accredited for residency training and is affiliated with the College of Medical Sciences at Rivers State University [19]. The hospital's critical care unit was established ten years ago, but services were limited to monitoring and care in a high-dependency unit, as no patients were ventilated during the three years it operated. It was closed for several years due to renovation needs and a lack of manpower, and reopened three years ago. During this period, patients requiring critical care were referred to the University of Port Harcourt Teaching Hospital.

The current ICU, reopened three years ago, started as a five-bed ICU with an isolation cubicle and has recently been upgraded to eight beds. The unit is a general ICU and operates as an open ICU. It is equipped with modern mechanical ventilators, multi-parameter monitors, and invasive arterial, central venous and pulmonary artery pressure measurement devices, as well as point-of-care machines for serum electrolytes and blood gas analysis. It can provide level three care according to the London Department of Health [20].

However, the shortage of skilled personnel has remained a major challenge. Although we have written guidelines and protocols for ICU admission, they are sometimes disregarded. Some patients who do not meet the admission criteria are admitted, while others who do meet them are sometimes not admitted due to a lack of funds. It is therefore important to evaluate the epidemiology and characteristics of ICU admissions at this institution.

MATERIALS AND METHODS

A retrospective review of all patients admitted to the ICU at RSUTH over a thirty-month period (from June 2023 to Jan 2026) was undertaken.

Study Population

All patients admitted to the critical care unit of the Rivers State University Teaching Hospital during the period under review.

Data Collection and Analysis

Data were obtained from the ICU admission and discharge registers, as well as the nurses' handover records. The admission and discharge registers recorded the patient's name, hospital number, sex and age; the date of admission; the diagnosis on admission; the date of discharge; the destination of discharge; the need for

both invasive and non-invasive ventilation; the need for inotropes; central line passage and site; the need for transfusion and tracheostomy insertion; and the patient’s outcome.

Ethical Approval: Ethical approval was obtained from the hospital's ethics committee.

RESULTS

Between June 2023 and January 2026, 367 patients were admitted to the RSUTH ICU. Ages ranged from 0.25 to 98 years, with a mean age of 47.9 ± 19.8 years, indicating a wide age distribution spanning paediatric and geriatric populations. 193 patients (52.6%) were male, while 174 (47.4%) were female (Table 1).

Table 1: Sociodemographic characteristics of patients admitted into RSUTH ICU (June 2023 – January 2026)

	Range	Mean \pm SD
Age	0.25 – 98	47.9 \pm 19.8
	Frequency	Percentage
Gender		
Male	193	52.6
Female	174	47.4

Annual admissions were highest in 2024, at 146 patients (39.8%), followed by 2025, with 120 patients (32.7%). Only 4 patients (1.1%) were admitted in 2026, reflecting the limited observation period (January only). The monthly distribution was relatively evenly spread, with peaks in June (12.8%) and July (12.3%), and the lowest admissions occurred in May (3.3%) and February (4.9%). (Table 2).

The highest frequency of ICU admissions at RSUTH occurred in June and July 2024, with 21 (5.7%) and 20 (5.5%) patients, respectively. The lowest frequencies were recorded in September and October 2024, with 2 (0.5%) and 3 (0.8%) patients, respectively (Figure 1).

Table 2: Distribution of ICU admissions by month and year

	Frequency	Percentage
Year		
2023	97	26.4
2024	146	39.8
2025	120	32.7
2026	4	1.1
Month		
January	25	6.8
February	18	4.9
March	31	8.4
April	33	9.0
May	12	3.3
June	47	12.8
July	45	12.3
August	39	10.6
September	32	8.7
October	28	7.6
November	32	8.7
December	25	6.8

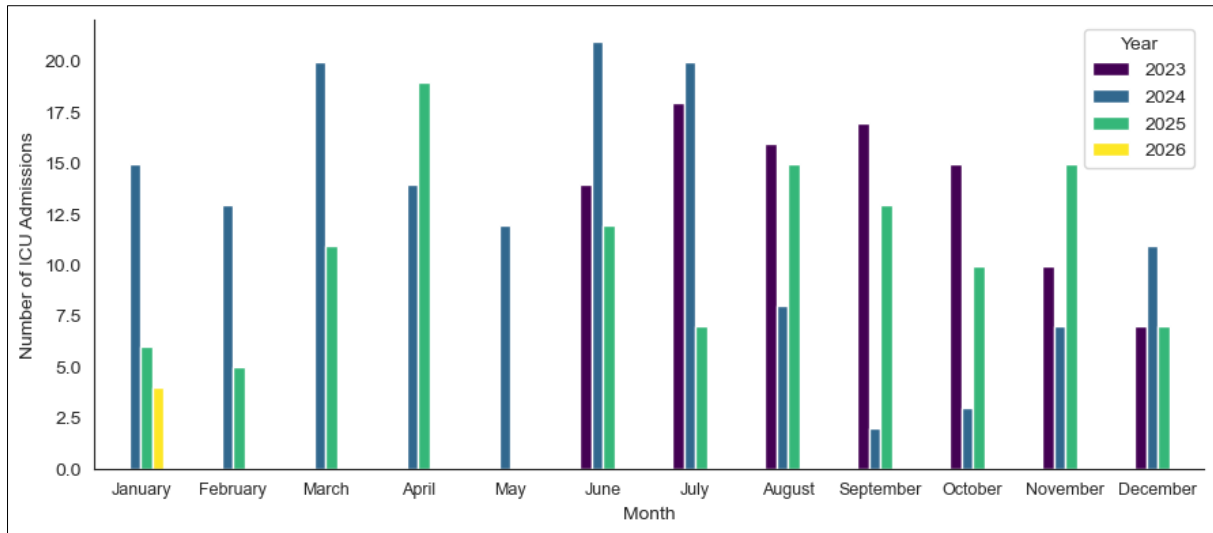


Figure 1: ICU admissions by month and year

Patients admitted to the RSUTH ICU had a mean length of stay of 6.5 ± 5.3 days, ranging from 0.04 days (1 hour) to 32 days. Regarding respiratory support, 156 patients (42.5%) required invasive ventilation, and 24 (6.5%) received non-invasive ventilation. Inotropic support was administered to 151 patients (41.1%), and 146 (39.8%) had central line cannulation. Invasive pressure monitoring was relatively uncommon, performed in 34 patients (9.3%). Blood transfusions were given to 96 patients (26.2%), whereas nebulisation therapy was used in 28 patients (7.6%). Procedures such as tracheostomy and dialysis were infrequent, performed in 8 (2.2%) and 10 (2.7%) patients, respectively. (Table 3)

Neurological conditions, including cerebrovascular accident, subdural haemorrhage and traumatic brain injury, were the most common

indications for ICU admission (128; 34.9%). 7 (1.9%) were admitted to the ICU for renal conditions and complications, such as acute kidney injury and hepatorenal syndrome (Figure 2).

181 (49.3%) of the patients were transferred out of the ICU to another ward in the hospital, while 159 (43.3%) died in the ICU. 2 (0.5%) of the patients were referred from the ICU to the University of Port-Harcourt Teaching Hospital (UPTH). (Figure 3)

Figure 4 shows the mean duration of ICU stay by admission indication. Patients with renal conditions had the longest mean stay at 11.0 days, followed by those admitted for trauma (8.0 days). Patients admitted for haematological (4.8 days), sepsis/infectious (3.3 days), and other conditions (3.0 days) had the shortest mean stays.

Table 3: Clinical characteristics among ICU patients

	Range	Mean \pm SD
No. of days on admission	0.04 – 32	6.5 \pm 5.3
	Frequency	Percentage
Ventilation		
Invasive	156	42.5
Non-Invasive	24	6.5
None	187	51.0
Inotropic Support		
Yes	151	41.1
No	216	58.9
Central Line Cannulation		
Yes	146	39.8
No	221	60.2
Invasive pressure monitoring		
Yes	34	9.3
No	333	90.7
Blood Transfusion		
Yes	96	26.2
Nil	271	73.8

	Range	Mean ± SD
Nebulization		
Yes	28	7.6
No	339	92.4
Tracheostomy		
Yes	8	2.2
No	359	97.8
Dialysis		
Yes	10	2.7
No	357	97.3

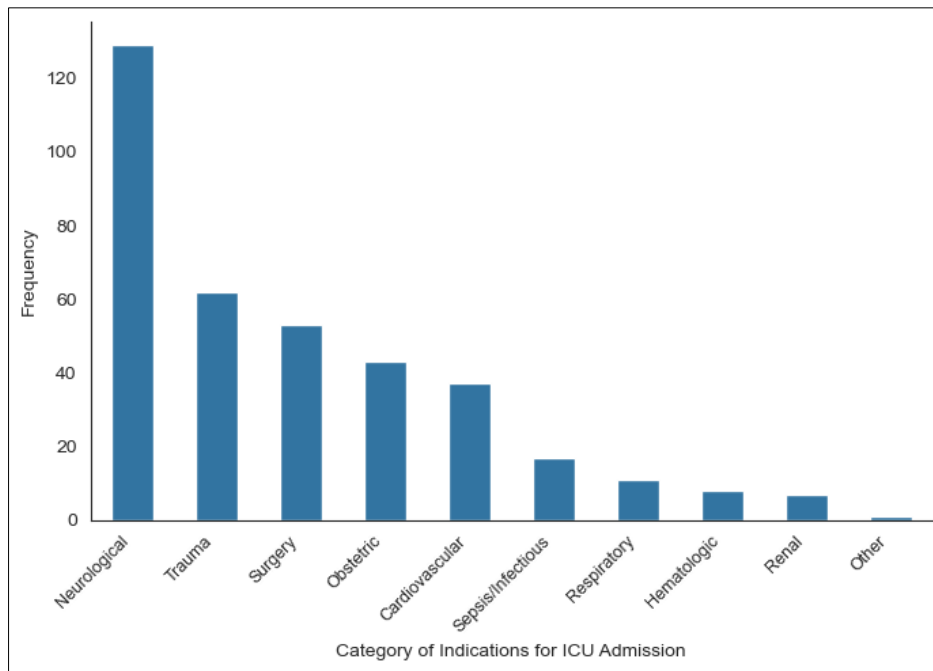


Figure 2: Indications for ICU admission

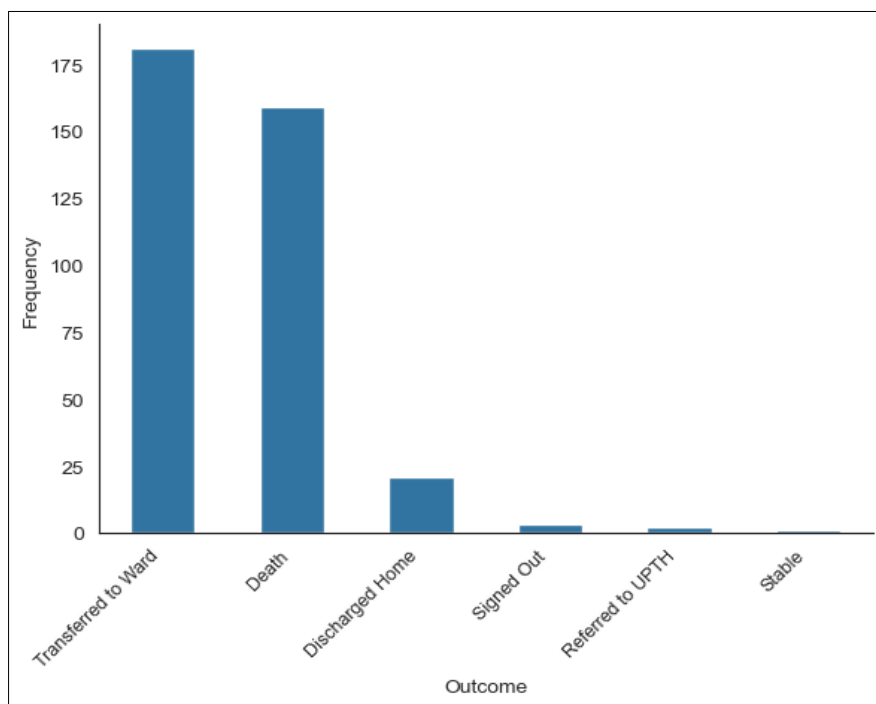


Figure 2: Distribution of outcomes for ICU patients at RSUTH

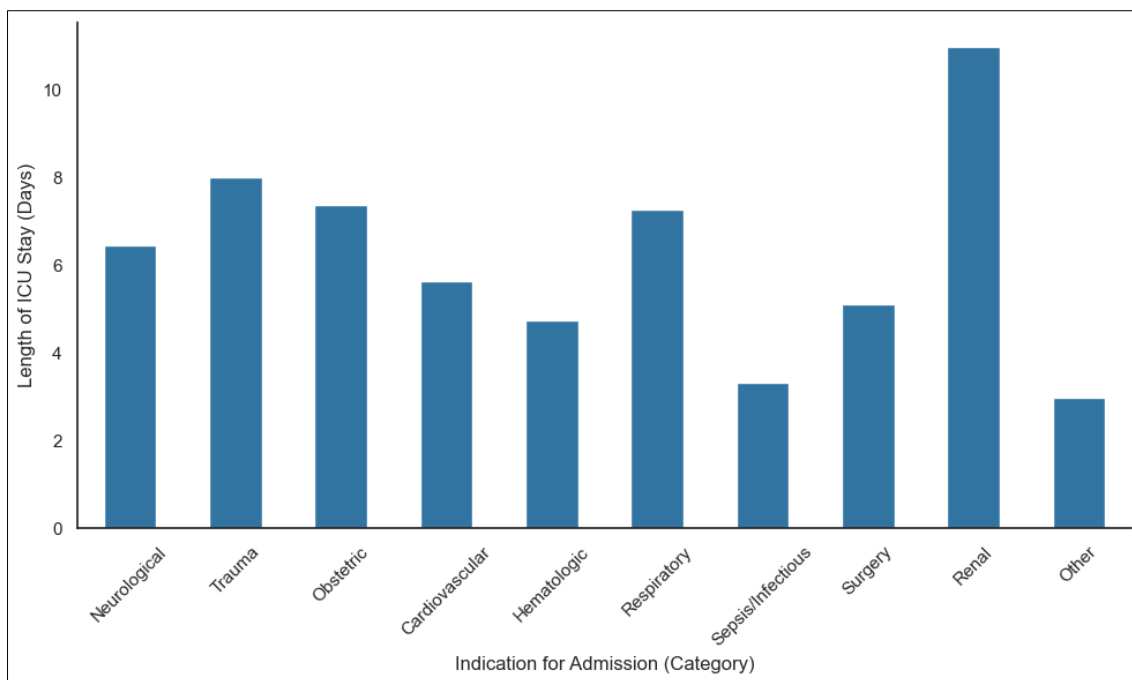


Figure 4: Distribution of length of stay in the ICU by indication for admission

Table 4 presents the binary logistic regression analysis of the association between length of ICU stay and patient outcome (death vs transferred/discharged). Length of ICU stay was a significant predictor of

outcome ($p = 0.001$). Each additional day of admission was associated with a 7.2% increase in the odds of death (OR = 1.072, 95% CI: 1.028–1.117).

Table 4: Relationship between length of admission and outcome

	B	p-value	OR	95% C.I. for OR	
				Lower	Upper
No. of days on admission	0.069	0.001	1.072	1.028	1.117
Constant	-0.720	<0.001	0.487		

A multivariate logistic regression was performed to adjust for confounders. Length of ICU stay remained significantly associated with mortality, with each additional day increasing the odds of death by approximately 9.6% (OR = 1.096, $p < 0.001$). Inotropic support (OR = 4.154, $p < 0.001$) and dialysis (OR = 11.612, $p = 0.034$) were independently associated

with markedly higher odds of death. Ventilation status showed a significant overall effect ($p = 0.010$), with patients on non-invasive ventilation having 80.4% higher odds of mortality than those receiving invasive ventilation. Age was not a significant predictor. These results are presented in Table 5.

Table 5: Relationship between length of admission and outcome (Adjusted for cofounders)

	B	Sig.	OR	95% C.I. for OR	
				Lower	Upper
No. of days on admission	0.092	<0.001	1.096	1.046	1.148
Age (years)	0.005	0.459	1.005	.992	1.017
Ventilation		0.01			
Ventilation (Non-invasive vs Invasive)	0.590	0.030	1.804	1.059	3.071
Ventilation (No ventilation vs Invasive)	-1.382	0.081	0.251	.053	1.186
Inotropic Support (Yes vs No)	1.424	<0.001	4.154	2.362	7.303
Dialysis (Yes vs Nil)	2.452	0.034	11.612	1.199	112.488
Constant	-4.658	<0.001	0.009		

DISCUSSION

This study evaluated patterns of intensive care unit (ICU) admissions at RSUTH over a 32-month period to determine whether observable changes have occurred

in patient characteristics, admission indications, resource utilisation, and outcomes. The findings provide important insights into evolving critical care demands in a tertiary hospital in South-South Nigeria.

The demographic profile of patients in this study showed a slight male predominance (52.6%) and a relatively young mean age of 47.9 years, with a wide age range spanning paediatric to geriatric populations. This pattern aligns with reports from other Nigerian and sub-Saharan African ICUs, where younger populations constitute a significant proportion of critically ill patients [14-21]. This contrasts with high-income settings, where ICU populations are typically older, reflecting differences in disease epidemiology and life expectancy [22].

The outcomes of patients admitted to the intensive care unit depend on the clinical condition on arrival, the level of training and experience of staff, and the resources, infrastructure and capacity of the unit. In this study, the overall ICU mortality rate was 43.3%. This finding is comparable with studies done in Uganda (40.1%) [12], and Tanzania (41.1%) [14]. This is higher than studies conducted in Addis Ababa (39%) and Jimma (37.7%) [23, 24]. However, a study by Ilori *et al.*, at the University of Calabar reported a mortality rate of 32.9% [14], while the findings by Mato *et al.*, [17], from studies done in Port Harcourt were 24.3%. The result of this study was also higher than those reported in studies conducted in Ethiopia (27%) [18], and Scandinavian countries (9.1%) [22]. This discrepancy might be due to the shortage of trained manpower and a lack of training amongst staff, as we had only two consultant anaesthesiologists with an interest in intensive care during the period under review and only one critical care specialist nurse. Other members of staff were nurses undergoing training and new resident doctors. The fact that this is a new unit with most of the staff working in an intensive care unit for the first time, may account for our high mortality rates. There was a lack of necessary dialysis machines, a portable X-ray service, and facilities for bedside ultrasound scans to aid diagnosis and interventions required in the ICU. The lack of facilities for dialysis in the unit was a major factor, as we had greater than 90% mortality for those with renal impairment requiring dialysis. This high mortality rate seen in this study has grave consequences as most of the population being admitted are young, with the mean admission age of 48 years, who belong to the active working age. Ilori *et al.*, [21], have a three-bed critical care unit and evaluated patients for only one year which may account for the difference seen as we had more populations evaluated. Mato *et al.*, [17], possibly had low mortality because most of their patients were stable patients not requiring critical care but admitted due to a lack of bed spaces on the ward.

Neurological conditions, including cerebrovascular accidents, traumatic brain injury, and intracranial haemorrhages, accounted for the highest proportion of ICU admissions (34.9%). This finding underscores a shift towards non-communicable diseases and trauma as leading causes of critical illness, reflecting

the growing burden of hypertension, road traffic accidents, and urbanisation.

Postsurgical referral from the operating room accounted for a good percentage of our admissions. This surgical preponderance has been observed in other general ICUs in similarly less-developed countries [2-7]. Our ICU is equipped with transport ventilators which have eased the problem of transferring patients while being ventilated. However, the distance between the ICU and the theatre remains a challenge; thus, we advocate siting general ICUs near operating rooms to minimise the risks associated with transporting critically ill patients.

Patients admitted to the RSUTH ICU had a mean length of stay of 6.5 ± 5.3 days, ranging from 0.04 days (1 hour) to 32 days, which is similar to that reported in other African countries [8, 9]. Patients with renal conditions had the longest mean admission, staying an average of 11.0 days, followed by trauma (8.0 days). Patients admitted for haematological (4.8 days), sepsis/infectious (3.3 days), and other conditions (3.0 days) had the shortest ICU stays. A multivariate logistic regression, adjusting for confounders, showed that longer ICU admission was significantly associated with increased odds of death, with each additional day on admission raising the odds by 11.5% (OR = 1.115, $p < 0.001$). Notably, patients with renal conditions and trauma had longer ICU stays, likely reflecting the complexity and prolonged recovery associated with these conditions.

This finding differed from a study conducted in Tanzania [14], in which patients who stayed in the ICU for less than four days were 5 times more likely to die than those who stayed four or more days (AOR = 5.58, $p < 0.001$). Our result also differed from the study conducted in Hosanna [25], which reported a mean ICU stay of more than 14 days (OR = 4.113, $p < 0.039$).

This discrepancy might be explained by the late arrival at the ICU, delays in intervention, and the absence of airway management equipment in the hospital's emergency unit. This directly affected outcomes, as some patients had already aspirated prior to admission, increasing mortality. The increased risk of death with a greater number of days spent in our study may be directly tied to a lack of finance, as we experience sponsor fatigue in terms of resources. Most patients pay out of pocket and often cannot afford necessary investigations or prescriptions after the first few days. The lack of bedside radiological equipment to aid diagnosis and improve care may have accounted for the high mortality seen. This may also reflect the severity of illness, the development of complications such as sepsis or multi-organ dysfunction, and the cumulative effects of prolonged critical illness.

The level of organ support required by our patients highlights the high acuity of illness in this study.

A substantial proportion required invasive ventilation (42.5%) and inotropic support (41.1%), indicating significant respiratory and haemodynamic compromise.

Following data analysis, ventilation status and age were not statistically significant predictors in this study. This differed from studies conducted in Ethiopian, which revealed that the need for mechanical ventilation is an independent risk factor for ICU mortality ((AOR: 5.578, $p < 0.001$) [18]. Another study by Adres Estaban *et al.*, [5], found that the overall mortality rate in the intensive care unit was 30.7% (1590 patients) for the entire population, while mortality was 52% (120) in patients who received ventilation because of acute respiratory distress syndrome.

The multivariate analysis further identified inotropic support and dialysis as independent predictors of mortality. The strong association with inotropic support suggests that cardiovascular instability is a major determinant of poor outcome in this population. Similarly, the markedly increased odds of death among patients requiring dialysis highlight the severity of renal dysfunction and its impact on prognosis.

However, the relatively low utilisation of advanced monitoring techniques such as invasive pressure monitoring (9.3%), together with low rates of tracheostomy and dialysis, reflects resource constraints, socio-cultural influences on tracheostomy acceptance, and the cost of these resources and care. Most couldn't afford renal replacement therapy using the CRRT, which is standard for these patients. These findings are typical of resource-limited ICUs, where the full spectrum of critical care interventions may not be readily available [17-24].

Only 26% of the study population was transfused, with most of those transfused being postoperative cases. This differs from the findings of Jean Leau *et al.*, [26], whose ICU transfusion rate was 37.0% (1307/3534). Anaemia is a common problem in critically ill patients and can increase the risk of cardiac-related morbidity and mortality resulting from reduced oxygen-carrying capacity and increased metabolic rates in critical illness [27].

Overall, the findings indicate that although the fundamental patterns of ICU admissions—such as the predominance of neurological and trauma-related cases—remain consistent with previous reports, there is a growing burden of severe, resource-intensive conditions requiring advanced organ support. The persistently high mortality rate and limited use of advanced interventions highlight ongoing challenges in critical care delivery.

These results emphasise the need to strengthen preventive strategies for neurological diseases and trauma, expand ICU capacity and access to advanced

monitoring and organ support, and enhance staff training in critical care interventions.

A major limitation was the lack of records of the patients' vital signs and of evaluations of their physiological status using scoring systems such as APACHE and SOFA.

CONCLUSION

In conclusion, while some aspects of ICU admission patterns at RSUTH remain stable, there is evidence of increasing disease severity and persistently high mortality, indicating that the burden of critical illness is evolving. Addressing systemic and resource-related challenges will be essential to improving ICU outcomes in this setting.

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