

Original Research Article

Outcomes of Elderly Patients Admitted into the Intensive Care Unit in a Tertiary Hospital in Nigeria: A 3-Year Retrospective Review

Osayomwanbo Osaheni^{1*}, Chisor-Waballi Nkasobi²

¹Consultant Anaesthesiologist, Intensive Care Lead at University of Benin Teaching Hospital, Benin City, Nigeria and Senior Lecturer College of Medicine University of Benin, Edo State Nigeria

²Consultant Anaesthesiologist, Intensive Care Lead River State University Teaching Hospital, Port Harcourt, Lecturer Faculty of Clinical Sciences, Rivers State University, Port Harcourt, Nigeria

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Abstract: Background: Elderly patients have continuously been admitted into intensive care. Ageing comes with its peculiarities and health challenges and outcomes. With the current focus on elder-friendly initiatives, it is necessary to examine the outcome of elders who are admitted into the intensive care unit. The information gained will be useful in policy and planning. **Method:** This retrospective, single cohort study collected data from all patients aged 60 years and older admitted into the intensive care unit of the University of Benin between January 2021 and December 2023 (3 years) were extracted and reviewed. **Results:** There were 195 admissions with a mean age of 70 years. About half (51.8%) of the patients admitted were males. Hypertension was the most common comorbidity (6.2%) followed by diabetes coexisting with hypertension (5.1%). Most of the elderly patients were admitted for sepsis within the review period (19.5%), followed by craniotomies (19.0%). The length of stay ranged from 1 to 63 days with the majority staying between 1 to 6 days while 39.0% were mechanically ventilated. The mortality rate was 66.7% (130/195). **Conclusion:** Most of the patients in the review period had hypertension and diabetes as comorbidities. Sepsis, post-operative care, and post-cardiac arrest care were the main reasons for patient admission into the Intensive Care Unit. Prevention and early management of Various Causes of Cardiac Arrest Are Recommended.

Keywords: Intensive Care, Elderly Patient, Outcome.

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INTRODUCTION

The elders will constitute one-fifth of the world's population (1.4 billion) by the year 2030 and 22% of the world's population by the year 2050. Eight percent of these populations are in low- and middle-income countries [1, 2]. In Nigeria by 2025, adults aged 60 years or older are expected to be 6.4 million, while in sub-Saharan Africa it is expected to be 67 million [1].

The health of elders is of global concern, particularly in resource-constrained countries and patient care settings. The ageing population should be of concern since almost every human will transition to an elder in the spectrum of life and will have to cope with the decline in physiological function resulting in comorbidities that could require advanced care in the intensive care unit.

Elderly patients requiring intensive care are a subset of patients that contribute substantially to resource utilization and are impacted by adverse intensive care outcomes [3]. Documenting the outcomes following admissions into the ICUs and their outcomes will provide insights into the required care and the effectiveness of healthcare systems. Although intensive care provides a comprehensive, continuous spectrum of care for patients admitted from various sources to ensure optimal and safe outcomes, mortality does occur at different rates in different countries. In Nigeria, the mortality rate in the general ICU population is 35.1% [4]. For comparison, Uganda, Tanzania, and Kenya mortality reports were 2.9%, 40.1%, 41.1%, and 53.6% respectively [5].

The mortality rate often varies amongst patient populations and concerning the characteristics of ICU. The standards for admitting elderly patients with short-life expectancies to ICUs are controversial because of the

*Corresponding Author: Osayomwanbo Osaheni

Consultant Anaesthesiologist, intensive care lead at University of Benin Teaching Hospital, Benin City, Nigeria and Senior Lecturer College of Medicine University of Benin, Edo State Nigeria

limited number of ICU beds and resources, high costs of care, and negative outcomes. Analyzing and understanding factors associated with these outcomes will help in healthcare improvement and planning by local and national healthcare initiatives. The data obtained in the elderly patient population can serve as a benchmarking and quality enhancement enabling healthcare institutions to assess their performance against regional and international standards. The information obtained will invariably enhance targeted quality improvement initiatives, allowing for the development and implementation of focused interventions, resource allocation strategies and informed policy-making [6].

Similarly, by examining the outcome patterns, data can be generated that can help healthcare systems identify healthcare disparities and enhance the overall quality of critical care, especially in resource-limited settings. Globally, it would provide a lens through which to view the common indications for ICU admission of the elderly and offer opportunities to identify modifiable risk factors and potential points of intervention along the continuum of care.

The main goal of this study is to determine the treatment outcomes of elderly patients admitted to a tertiary hospital ICU in Western Nigeria between January 2021 to December 2023 (3 years). The objectives are to determine the social demographic characteristics of elders admitted into the ICU; to identify the primary reasons for admission of elderly patients into the ICU; to determine the comorbidities associated with elders admitted into the ICU and finally to determine the average length of stay in the ICU.

MATERIALS AND METHODS

This retrospective study was carried out at the University of Benin Teaching Hospital, Benin City, Nigeria which is a tertiary hospital with a mixed patient intensive care unit. Only documented records of patients above 60 years who were admitted into intensive care between January 2021 to December 2023 were reviewed. For each patient, available information on the age (in years), sex, indication for ICU admission, comorbidity (as indicated by the admitting physician in the patient's record), the outcome of interest (died, survived), and length of stay were collected on a data collection sheet. These data were analyzed after cleaning using IBM SPSS version 22.

RESULT

A total of 195 patients aged 60 years and older were admitted into the University of Benin Teaching Hospital (UBTH) ICU between March 2018 and July 2023. The demographic characteristics of these patients are summarized in Table 1: The mean age of the patients was 70 ± 7.38 years (range: 60-92 years). Of the 195 patients, 101 (51.8%) were male and 94 (48.2%) were

female. The proportion of males and females that died was the same (65: 33.3%). Although, more males survived than females (36:18.5%; 29:14.9%; $P > 0.05$).

Overall, 130 (66.7%) died while 33.3% (65 patients) survived: Those that were aged 60 – 69(66: 61.1%) had the highest incidence. The distribution of ventilated versus non-ventilated patients admitted to the ICU shows that out of the 195 patients, 76 (39.0%) required mechanical ventilation during their ICU stay. Conversely, 119 patients (61.0%) did not require mechanical ventilation however, the proportion of patients that died while ventilated to that of elders not ventilated was 61(31.3%); 69(35.4) versus 15(7.7%); 50(25.4); $P = 0.001$.

The comorbidities of the patients are detailed in Table 2. Hypertension was the most common comorbidity. It was present in 12(6.2%) patients (9;75.0% died, 3; 25.0% survived. $P > 0.05$), followed by hypertension coexisting with diabetes mellitus in 10(5.1%) patients (7; 70%, died, 3; 30% survived. $P > 0.05$). Other significant comorbidities included hypertension with heart failure (5, 2.6%; 5, 100% died), A greater proportion of patients did not have any comorbidity (143, 73.0%; 92:64.3% died, 51:33.7% survived).

The primary admitting diagnoses of patients in the ICU are shown in Table 3. Sepsis was the most frequent primary diagnosis, accounting for 38(19.5%; 34, 89.5% death), followed by craniotomy 37(19.0%; 26: 70.3% died), patients that had explorative laparotomy for various abdominal diseases were 20(10.3%. 11:55.0% died) and 18(9.2%, 13:72.2% did not survive) patients had traumatic brain injury (TBI). Complicated cerebrovascular accident accounted for 11(5.6%), patients and 7(63.6%) death. Pulmonary embolism 9(4.6%) patients had pulmonary embolism (4, 44.4 survived). Post cardiac arrest patient was 7(3.6%) 3, 42.9 survived.

The number of days spent in the ICU by the elderly patients varied significantly, as summarized in bar chart 1. The length of ICU stay ranged from 1 day to 63 days, with the majority of patients staying between 1 and 6 days. Specifically, 31 patients (15.9%) stayed for 2 days, and 10 patients (5.1%) stayed for 5 days. This shows that the majority of patients (70.8%) spent between 1 and 6 days in the ICU. This relatively short length of stay is reflective of either rapid recovery and discharge or early mortality. A significant number of patients 6 (3.8%) stayed up to 10 days or less. A smaller portion of patients (2.6%) required extended ICU care, staying between 14 to 63 days.

Chart 2 shows the number of days spent and the proportion of patients that died or survived and were transferred to the ward for continuation of care. The majority of the patients died within 8 days of admission.

A greater proportion died within the second day (27, 13.8%)

Table 1: Demographic characteristics of the study population

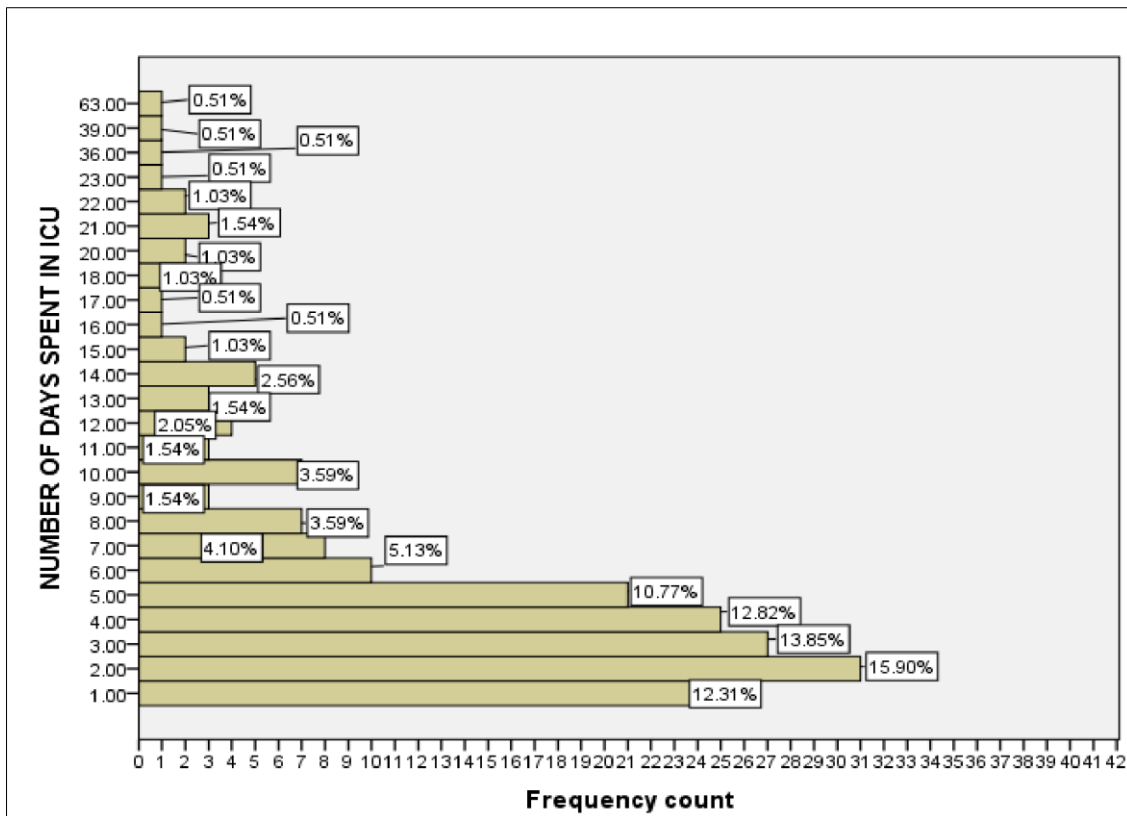
Characteristic	Number of Patients (n=195) Count, percent	Outcome		P value
		Died Count, percent	Survived Count, percent	
Age (years)				
60-69	108(55.4)	66(61.1)	42(38.9)	0.17(Exert)
70-79	65(33.3)	46(77.8)	19(29.2)	0.17(Exert)
80-89	18(9.2)	14(77.8)	4(22.2)	0.17(Exert)
≥90	4(2.1)	4(100)	-	0.17(Exert)
Gender				
Male	101(51.8)	65(33.3)	36(18.5)	0.48
Female	94(48.2)	65(33.3)	29(14.9)	0.48
Ventilated	76(39.0)	61(31.3)	15(7.7)	0.001
Not ventilated	119(61.0)	69(35.4)	50(25.4)	0.001
Overall Mortality	195(100)	130(66.7)	65(33.3)	

Table 2: comorbidities of the patients

Comorbidity	Number of patients (195) Count, percent	Outcome		P value (Exert)
		DIED Count, percent	SURVIVED Count, percent	
No comorbidity	143(73.0)	92(64.3)	51(33.7)	0.39
Hypertension	12(6.2)	9(75.0)	3(25.0)	0.39
Hypertension with Diabetes Meletus	10(5.1)	7(70.0)	3(30.0)	0.39
Diabetes	4(2.1)	3(75.0)	1(25.0)	0.39
Hypertension with heart failure	5(2.6)	5(100)	-	0.39
COPD	3(1.5)	2(66.7)	1(33.3)	0.39
Others ≤ 1 (0.5%)	18(9.2)	11	7	0.39

Table 3: Indication for ICU Admission (Primary diagnoses at ICU admission)

Primary diagnosis	Number of patient (n=195) Count, percent	Outcome		Primary diagnosis	Number of patients (n=195) Count, percent	Outcome	
		Died Count, percent	Survived Count, percent			Died Count, Percent	Survived Count, Percent
Sepsis	38(19.5)	34(89.5)	4(10.5)	COAD with pneumonia	3(1.5)	2(66.7)	1(33.3)
Craniotomy	37(19.0)	26(70.3)	11(29.7)	Thoracotomy	3(1.5)	3(100)	-
Explorative laparotomy	20(10.3)	11(55.0)	9(45.0)	GIT haemorrhage	3(1.5)	2(66.7)	1(33.3)
Traumatic brain injury	18(9.2)	13(72.2)	5(27.8)	Pneumonia	2(1.0)	1(50.0)	1(50.0)
Cerebrovascular accident	11(5.6)	7(63.6)	4(36.4)	Emergency tracheostomy	2(1.0)	2(100)	-
Pulmonary embolism	9(4.6)	5(55.6)	4(44.4)	Acute respiratory distress	2(1.0)	2(66.7)	-
Post cardiac arrest	7(3.6)	4(57.1)	3(42.9)	Iatrogenic meningitis	2(1.0)	2(100)	-
Massive fluid shift post operatively	7(3.6)	3(42.9)	4(57.1)	Anaphylactic reaction	2(1.0)	1(50.0)	1(50.0)
Polytraumatize from road traffic accident	5(2.6)	1(20.0)	4(80.0)	Myocardial infarction	1(0.5)	0	1(100)
Decompressive laminectomy	5(2.6)	1(20.0)	4(80.0)	Heart failure + shock + sepsis	2(1.0)	2(100)	-
Advance cancer	5(2.6)	5(100)	-				
Hydrocephalus	4(2.1)	1(25.0)	3(75.0)				



Bar chart 1: The number of days spent in the ICU

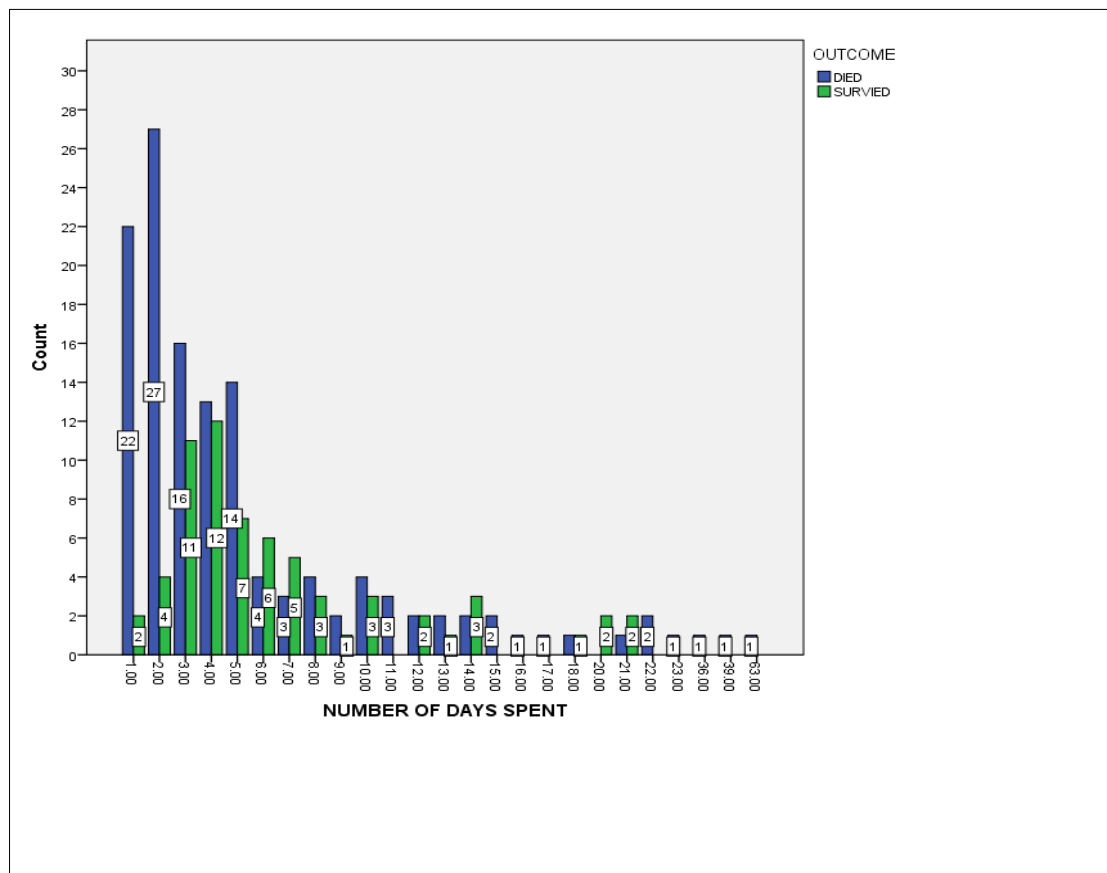


Chart 2: number of days spent and outcome of stay

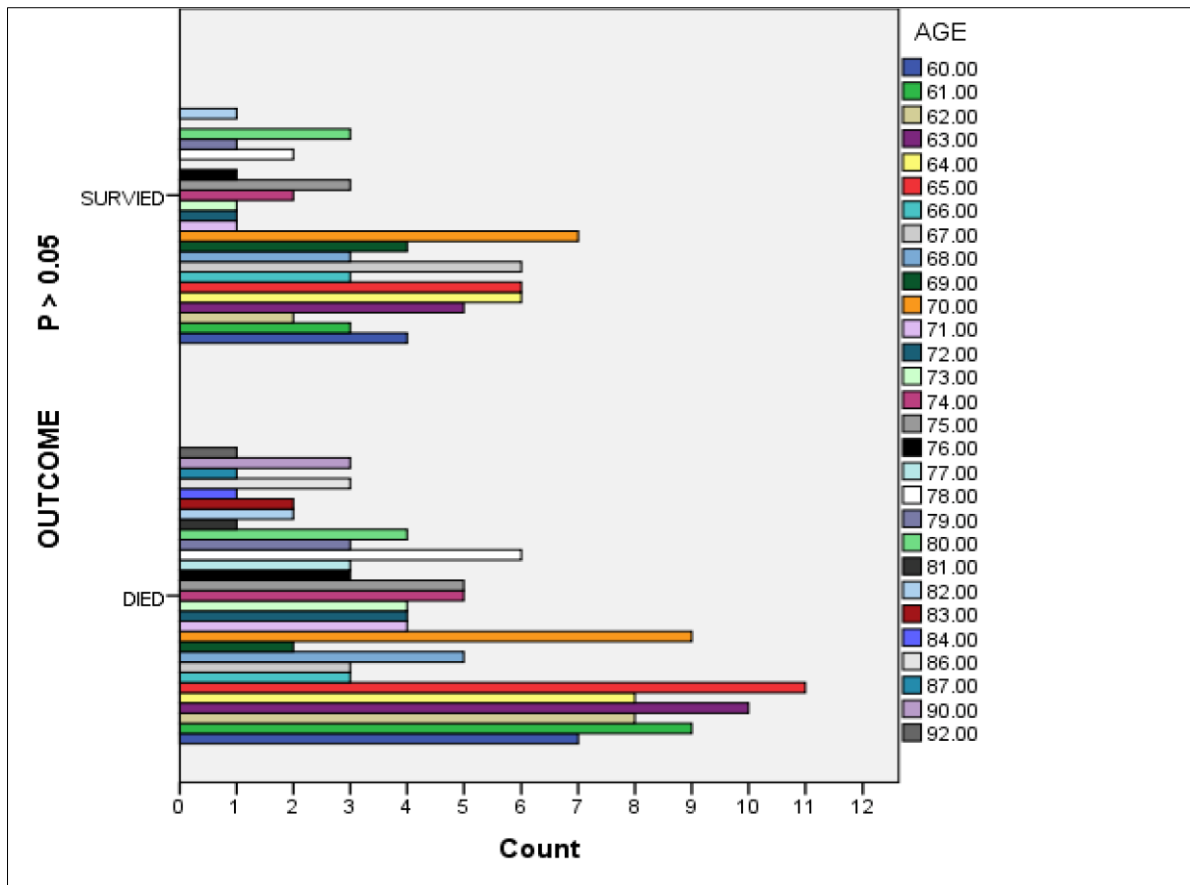


Chart 2: Age and outcome

DISCUSSION

The mortality rate of 66.7% observed in this study is high compared to reported overall ICU mortality rates, which often range between 1 and 51% [7]. In Abuja, Abakaliki, and Enugu Nigeria, the mortality rate reported were, 34.5%, 40.8%, and 46.7% [8–10]. This figure, was lower than the 73% mortality rate observed in a similar cohort study by Lankoande *et al.*, [11], but higher than other reports from Burkina Faso (51.6%, 63%) [12, 13]. In Africa, the ICU mortality rate is high compared to the other developed continents. For example, Abuhassira *et al.*, [14], observed a mortality of 22.1% in the USA, and 29.7% in Australia. However, Isreal overall mortality was 52.3%.

The variation in outcome across different countries can be due to variations in ICU infrastructure, staff availability and training, the indications for ICU admission and the presence of comorbidities. In North America, Oceania, Asia, and Europe, overall ICU mortality rates are relatively lower, reported at 9.3%, 10.3%, 13.7%, and 18.7%, respectively. Uganda, Tanzania, and Kenya were reported as 32.9%, 40.1%, 41.1%, and 53.6% respectively [5]. Mortality rate also depends on the characteristics of the patients and the period of review which could explain the variation across regions in the same country. Tobi and colleagues [15], reported a mortality of 49.6% which contrasts with the 66.7% in this study. The difference reflects the

increasing number of aged adult population over the years [16]. Moreover, the age of patients included in their study was 65 years and above.

There was no significant gender-related difference in the incidence of mortality although, more males were admitted compared to females (101, 51.8%; 94, 48.2%). This finding aligns with previous study [8]. However, it is important to recognize that there may be subtle biological differences, social factors, and healthcare access that could still influence this outcome which this cohort study may have not detected.

On the other hand, the ventilator status outcome was significantly different between the ventilated and non-ventilated patients. Although only 76 (39%) patients required mechanical ventilation due to their critical conditions. A statistically significant proportion of ventilated patients died compared with the unventilated patients. Specifically, 61(31.3%) patients died compared to only 15 (7.7%) who survived. This finding is similar to previous observations that demonstrated poor prognosis amongst critically ill patients who were mechanically ventilated [17, 18]. Elderly patients on mechanical ventilation often have complications requiring respiratory support amidst their frailty which does not make mortality results surprising.

Similarly, there was also a significant difference in mortality rate amongst the non-ventilated patients. Out of the 191 patients, 69 died (35%), while 25% survived ($P=0.001$). Reflecting again an increased risk associated with patients that likely required mechanical ventilation but could not get it. It could also imply that death was from a non-respiratory event. However, limited numbers of effective modern ventilators, limited capacity to provide effective non-invasive ventilation, and high flow nasal oxygenation, abounds in resource-limited settings which could explain this observation [17-19].

The stark contrast between outcomes based on ventilation status highlights vital implications for clinical practice concerning elder care within the ICU where advanced technologies may be scarce or less available than optimal scenarios [20]. This disparity in availability of adequate resources should dictate appropriate triaging principles which should emphasize quality over quantity approaches toward interventions like intubation alongside rigorous ethical considerations surrounding end-of-life discussions regarding futility when necessary [21].

Additionally addressing socio-economic barriers would mean that intensivists are equipped not only with technical expertise but also psychosocial acumen as they deal with the complexity inherent within geriatric critical care contexts. Aiming for holistic management that is focused around individualized patient-centered strategies rather than solely disease-oriented interventions where resource allocation may be more limited due to logistical constraints, especially in the setting of resource constraints.

Sepsis the dominant diagnosis, accounts for the mortality rate of 19.5% ($n=38$) and a survival rate of 10.5%. Sepsis remains one of the indications for intensive care admission [22]. This result compares to the global trend [23]. Sepsis, can be associated with septic shock that is characterized by circulatory, cellular, and metabolic abnormalities, that lead to organ dysfunction and high mortality [24]. Effective management of sepsis involves early identification, rapid initiation of treatment, and continuous monitoring of vital signs and organ function. The high incidence and the low survival rate suggest the need for committed management protocols that may include early recognition, aggressive fluid resuscitation, appropriate antibiotic therapy, availability of antibiogram and prompt availability of microscopy, culture and sensitivity from collected specimens [25]. These results nevertheless, show the complexity and severity associated with sepsis in the setting of low resources where late presentation for treatment is a recurring issue.

Similarly, Surgical intervention: craniotomies and explorative laparotomy account for another significant proportion of mortality after sepsis. Although

two-thirds survived after laparotomy one-third did not survive post-surgical care in the intensive care unit. Collectively, the proportion of patients utilizing intensive care units and the outcome is similar to other reports which show that post-operative care constituted the majority of patients that utilize intensive care units with variable outcomes [4-17]. Surgical intervention has inherent risks involved with the procedures in older adults. Older adults have unique anaesthetic challenges, a slow circulatory system, comorbidities, and delayed recovery from anaesthesia. Exploratory laparotomies patients' statistics balance between survival (55%) and mortality rates (45%) indicating complications from surgery, and comorbidities that are common among elderly populations. Most of the laparotomy were done for perforated duodenal ulcers, colonic tumours, perforated viscus and trauma-related abdominal injuries. Intraoperative massive fluid shift, another surgical condition requiring post-surgical care constituted 3.6 % of cases with 57.1 % survivors. Massive fluid shift includes massive blood loss. Availability of blood and blood products for transfusion is a challenge. Reluctant donors and inadequate facilities for blood product processing are the bane of blood transfusion in low-resource settings.

Traumatic brain injury, a trauma-related event, accounted for 9.2% of cases and a notable mortality rate of 27.8%. Traumatic Brain Injury (18 patients, 9.2%) often results from road traffic, domestic accidents or falls, which leads to significant brain injury and severe neurological impairment [8]. The presence of 18 patients with TBI emphasizes the need for specialized care to manage intracranial pressure, monitor neurological status, and address complications [26]. Efforts that inculcate measures to prevent falls, and reduce road traffic mishaps is needed for the elderly. Furthermore, the incidence of TBI among elders highlights the necessity for neurocritical care and interdisciplinary management. Similarly, polytraumatized patients from road traffic accidents account for one-fifth of survivors and four-fifths of mortality. Timely surgical interventions and multidisciplinary approaches, effective trauma management systems, and public health initiatives aimed at preventing road traffic accidents need to be improved. Vehicle usage and traffic control patterns with adequate advocacy are needed. However, most of the complicated trauma patients were referred from other neighboring states. Polytraumatized individuals from road traffic accidents demonstrate particularly alarming outcomes: only one-fifth survived while four-fifths died following ICU admission. This calls for the need to strengthen trauma care systems including timely surgical interventions and multidisciplinary approaches involving rehabilitation and services post-discharge [27].

These results show that the challenges faced by elderly patients are not just clinical factors alone but structural challenges within and outside the healthcare

systems serving elderly populations. Conditions such as advanced cancer showed an obviously different dynamics where all the five patients that had advanced cancer succumbed while receiving intensive care treatment. All the patients had late-stage cancers with limited curative treatment even under intensive monitoring conditions. It highlights the inherent psychosocial concept that conventional intensive care is the appropriate proximity to the mortuary for those who are potentially not recoverable. Additionally, socioeconomic factors influencing patient outcomes like access to timely medical interventions, palliative care home, financial constraints, of pocket pay for health care services contribute substantially to delay care-seeking behaviour. In the long run overburdened addition of understaffed personnel constrains necessary capacities to render care [20]. Enhancing education on preventive measures against prevalent diseases like sepsis, and accidents, with increased accessibility to early treatment could potentially reduce the mortality rate.

On the other hand, medical conditions like cerebrovascular disease, myocardial infarction, pulmonary embolism, post-cardiac arrest care, heart failure, and chronic obstructive pulmonary disease (COPD, 3:1.5%), also had an impact on intensive care unit admissions outcome [28]. Patients with COPD present with respiratory distress and are at increased risk of complications such as pneumonia and respiratory failure. Heart Failure (6.1%) can contribute to multiple complications, including fluid overload, pulmonary oedema, and reduced cardiac output. It is often requiring intensive monitoring and treatment [29]. ICU management of heart failure involves careful management of fluid balance, use of diuretics, and optimization of cardiac function. Monitoring for signs of worsening heart failure and adjusting treatment plans accordingly are essential for improving outcomes.

The observed mortality rate thus reflects the severity of illness, the complexity and vulnerability of the ICU patient population. The presence of comorbidities such as diabetes mellitus and hypertension are known to complicate survival and increase the risk of mortality leading to poorer outcomes [11]. Ultimately, one-third of the patients, 33.3% survived.

Comorbidities impacted the clinical outcomes of patients admitted to the Intensive Care Unit. A proportion of patients had comorbidity (52 Patients; 26.7%). The prevalence of comorbidities in this study underscores the complexity and vulnerability of the elderly population which exacerbate the severity of illnesses, complicate treatment regimens, and influence overall prognosis [30]. Also, the presence of comorbidities often correlates with increased ICU length of stay, higher mortality rates, and greater healthcare resource utilization. Diabetes Mellitus and diabetes coexisting with hypertension, for example, occurred in 22 Patients (11.3%) [31].

Although comorbidity can explain in part the mortality rate, patient pathology accounts significantly for the observed result. Elderly patients are susceptible to severe complications due to physiological changes associated with aging, in conjunction with the pathology [32]. Majority of patients were admitted with sepsis, pulmonary embolism, craniotomy for tumour removal, evacuation of intracerebral bleed in some with haemorrhagic cerebrovascular disease, and traumatic brain injury, which contributed to increased mortality rates. Seven patients (3.6%) had post-Cardiac Arrest care. Post-cardiac arrest as a primary diagnosis indicates that a significant portion of elders had cardiac arrest. Cardiac arrest is associated with severe outcomes that often require prolonged care to manage complications such as neurological deficits, hemodynamic instability, and multi-organ failure [22]. Intercurrent medical illness and patient pathology can also explain the variation in the length of ICU stay which ranged from 1 day to 63 days. A significant portion of patients had relatively brief ICU stay lasting between 1 and 4 days. This observation compares with other reports [23-33]. The brief stay resulted in more deaths while some elders had acute, rapid recovery.

Similarly, extended ICU Stays beyond 4 days up to 63 days means that a subset of elders had a more prolonged or complex state associated with chronic or progressive illness [34]. Extended ICU Stays: Patients with longer ICU stays are at higher risk of complications such as ICU-acquired infections, muscle deconditioning, and psychological effects. Effective management of these patients requires a multidisciplinary approach to address both their medical and rehabilitative needs.

In summary, the low survival rate among elderly ICU patients reflects the severe nature of their underlying conditions and the complexities involved in their care. The presence of significant comorbidities and pathology further complicates their management and impacts overall outcomes. It is therefore necessary to tailor treatment strategies, effective management of critical conditions, and continuous improvement in ICU care practices to enhance patient survival and quality of care.

Further analysis could provide deeper insights into the reasons behind extended stays and their impact on patient outcomes. Future research is needed to correlate ICU length of stay with specific diagnoses, treatment interventions, and patient outcomes to enhance the development of more tailored management approaches that would improve the overall care for elderly patients in the ICU.

Sepsis, craniotomies for various reasons, and traumatic brain injuries reflect the critical and complex conditions requiring intensive care. The high incidence of these diagnoses highlights the need for a management protocol tailored to the unique challenges of each

condition. Understanding these indications would aid in scarce resource allocation, treatment planning, and improving patient outcomes in the ICU. Continuous evaluation and adaptation of care strategies are essential to address the evolving needs of this patient population. These findings therefore demonstrate the important challenges faced by intensive care providers managing the elderly population within a low-income country.

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Distribution of tasks: conceptualization, data extraction, data analysis, bibliography, critical reading was done collectively.

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