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ORIGINAL RESEARCH

Indications and Outcomes of Medical Intensive Care Admissions in a Nigerian Tertiary Hospital

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Abstract

Background: The demand for intensive care is rising in many developing countries with specialties requiring specialized intensive care services. Medical conditions constitute a substantial proportion of demands for intensive care.
Objectives: To determine the patients' characteristics and outcomes of medical indications for intensive care unit (ICU) admissions in a Nigerian tertiary hospital.
Methods: A retrospective descriptive study was conducted at the Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, Southwest Nigeria. The data of all patients aged 16 years and above managed from 2010 to 2019 were extracted from the general ICU admissions book. The age, sex, indication for admission, need for mechanical ventilation, length of stay in the ICU and outcome of care were retrieved for analysis.
Results: There were 255 patients with medical conditions, constituting 12.6% of all (3,213) ICU admissions during the study period. The male-to-female ratio was 1.3:1.0 and the age range was 16 to 89 years. The most common indication for admission was neurological illnesses (56.7%). Stroke accounted for 40.4% of all medical ICU admissions. The mean length of ICU stay was 4.9±5.95 days. A larger proportion of patients (75.0%) who had mechanical ventilation died compared to 25.0% who survived (p = 0.001).
Conclusion: Neurological disorders, especially stroke, were the most common indications for ICU admission. Many medical conditions had high mortality rates and outcomes were notably poor for mechanically ventilated patients.

Keywords: Critical Illness, Intensive Care, Mechanical Ventilation, Medical Indications, Stroke.

Introduction

The Intensive Care Unit (ICU) is a specialised hospital unit that manages critically ill patients using advanced medical and nursing care, monitoring, and multiple modalities of physiological organ supports. [1] The operation of the ICU presents a challenge to healthcare providers, especially in low-income countries like Nigeria, due to the paucity of skilled personnel and equipment. The United Kingdom (UK) guidelines on admission to an ICU include the need for advanced respiratory and two or more organ support. [2] Adequate provision of these services is essential for the survival of critically ill patients.

The scope of ICU admissions is on the increase in many developing countries with associated mortality based on patient pathology and quality of hospital care. Age, decisions in the timing of interventions, availability of bed spaces, facilities for organ support, and appropriate staffing ratio determine the likely outcome of patients admitted into the ICU. [3,4]

Most studies on ICU admissions reported on general cases [5,6] and obstetrics. [7,8] The few studies by Oke, [9] Unal *et al*., [10] and Dunser *et al.* [11] showed that neurological diseases, haemodynamic instability and infections were the most common medical indications for ICU admissions respectively.

There is a dearth of studies on medical indications and outcomes of admissions into the ICU in the last one or two decades in sub-Saharan Africa, to the best of the authors' knowledge. In addition, few studies have shown the association between ventilatory support and length of ICU stay, and how they impacted patient care and outcomes, hence the need for this study in a Nigerian setting. This study aimed to describe the medical indications and outcomes of ICU admissions in a Nigerian tertiary level facility with a focus on their relevance and findings which may benefit hospital administrators, policy makers and health planners.

Methods

This study was a retrospective, descriptive study spanning a decade (1st January 2010 to 31st December 2019) conducted at Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, Southwest Nigeria. This tertiary hospital is a 700-bed capacity hospital, and the ICU is a 7-bed General ICU with a physician anaesthetist, critical care nurse and general nurses, and facilities for mechanical ventilation and mobile X-ray, providing organ support services to all kinds of critically ill patients. Patients are monitored in the ICU until they are fit for discharge to the wards.

The data of all adult patients aged 16 years and above, primarily admitted by the medical team into the general ICU, were extracted from the ICU register into a spreadsheet and were reviewed. The register contained information on age, sex, indications for ICU admissions, need for mechanical ventilation, length of ICU stay and outcome of care (discharged to the ward or died in the ICU). All the variables, including the missing ones, were analysed.

Data analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 23. Simple frequencies, proportions, and percentages were presented in tables. Proportions of categorical variables (sex and indications for ICU admissions) were compared using the Pearson Chi-squared test while the Student's t-test was used to compare mean values of continuous variables (age and length of ICU stay). *P* values less than 0.05 depicted statistical significance.

Ethical considerations

Ethical approval for the study was obtained from the Institution Research and Ethics Committee (Approval number; ERC/2022/07/07).

Results

There were 255 adult patients with medical conditions requiring ICU services during the study period. These constituted 12.6% of all (3,213 patients) ICU admissions during the study period. Table I shows the relationship between patients' characteristics, need for ventilatory support, length of ICU stay and patients' outcomes.

Table I: Patients' characteristics, need for ventilatory support, length of ICU stay and outcome

Characteristics	*Outcome*		*p-value*
	Died (n = 149)	**Survived (n = 106)**	
Age (years)			
<65	97 (65.1)	83 (78.3)	0.018
≥65	52 (34.9)	23 (21.7)	
Sex			
Male	86 (57.7)	59 (55.7)	0.826
Female	63 (42.3)	47 (44.3)	
Ventilated			
Yes	75 (50.3)	25 (23.6)	0.001
No	74 (49.7)	81 (76.4)	
Length of stay			
<7 days	130 (87.2)	83 (78.3)	0.037
8-14 days	15 (10.1)	13 (12.3)	
15-21 days	1 (0.7)	7 (6.6)	
22-28 days	1 (0.7)	0 (0.0)	
>28 days	2 (1.3)	3 (2.8)	

Figures in parentheses are percentages of the total in the respective columns.

The age of the patients ranged from 16 to 89 years, and the mean age was 51.0±19.77 years. The male-to-female ratio was 1.3: 1.0. The indications for ICU admission included neurological disorders (144, 56.5%), respiratory disorders (44, 17.2%), cardiovascular diseases (25, 9.4 %), and haematological conditions (16, 6.3%). The data of 21 (8.2%) cases were missing as shown in Table II. Overall, stroke (103, 40.4%) was the most common medical indication for ICU admission and the most frequent neurological problem as shown in Table III. Pulmonary embolism, heart failure and haemoglobinopathy were the most common respiratory, cardiovascular and haematological indications for ICU admissions respectively as shown in Tables IV, V and VI.

Table II: Indications for ICU admissions by disease groups, need for ventilatory support and outcome

Disease group	*Ventilatory Support*		*Outcome*		*Total*
	No	**Yes**	**Survived**	**Died**	
	n = 155	**n = 100**	**n = 106**	**n = 149**	
Neurology	81 (52.3)	63 (63.0)	50 (47.2)	94 (63.1)	144 (56.5)
Respiratory	27 (17.4)	17 (17.0)	23 (21.7)	21 (14.1)	44 (17.2)
Cardiovascular	19 (12.3)	6 (6.0)	12 (11.3)	13 (8.7)	25 (9.8)
Haematology	13 (8.4)	3 (3.0)	7 (6.6)	9 (6.0)	16 (6.3)
Endocrinology	3 (1.9)	2 (2.0)	1 (0.9)	4 (2.7)	5 (2.0)
Missing data	12 (7.7)	9 (9.0)	13(12.3)	8 (5.4)	21 (8.2)

Figures in parentheses are percentages of the total in the respective columns.

During the first week of ICU admission, 36.6% (78 out of 213 cases who spent a week or less in the ICU) of the patients required ventilatory support. The overall mortality rate was 58.4% (149/255) and 100/255 patients (39.2%) had ventilatory support. Among the 100 who received ventilatory support, 75 (75.0%) died while only 25 (25.0%) were transferred to the wards alive. (p = 0.001). Table VII shows there was more mortality in patients that were aged less than 65 years in all specialties when compared with the geriatric age group (≥65 years) but lacked statistical significance.

Table III: Neurological disorders and outcomes

Disease conditions	*Ventilatory Support*		*Outcome*		*Total*
	No n = 81	**Yes n = 63**	**Discharged n = 50**	**Died n = 94**	
Stroke	52 (64.2)	51 (81.0)	25 (50.0)	78 (83.0)	103 (71.5)
CNS Infections	11 (13.6)	3 (4.8)	6 (12.0)	8 (8.5)	14 (9.7)
Encephalopathy	7 (8.6)	5 (7.9)	8 (16.0)	4 (4.3)	12 (8.3)
Status epilepticus	8 (9.9)	2 (3.2)	7 (14.0)	3 (3.2)	10 (6.9)
Guillain Barre Syndrome	1 (1.2)	0 (0)	1 (2.0)	0 (0.0)	1 (0.7)
Others	2 (2.5)	2 (3.2)	3 (6.0)	1 (1.0)	4 (2.8)

Figures in parentheses are percentages of the total in the respective columns.

Table IV: Respiratory disorders and outcome

Disease conditions	*Ventilatory support*		*Outcome*		*Total*
	No (n = 27)	**Yes (n = 17)**	**Discharged (n = 23)**	**Death (n = 21)**	
Pulmonary embolism	16 (59.3)	6 (35.3)	10 (43.5)	12 (57.1)	22 (50.0)
Aspiration pneumonitis	3 (11.1)	3 (11.1)	3 (13.0)	3 (14.3)	6 (13.7)
Severe asthma	3 (11.1)	0 (0.0)	1 (4.3)	2 (9.5)	3 (6.8)
Acute Respiratory Distress Syndrome	0 (0.0)	3 (11.1)	2 (8.7)	1 (4.8)	3 (6.8)
Others	5 (18.5)	5 (29.4)	7 (30.4)	3 (14.3)	10 (22.7)

Figures in parentheses are percentages of the total in the respective columns.

Discussion

This study demonstrated that neurological disorders constituted the highest indications for medical ICU admission and also with the highest mortality of 62.2%. Also, younger age group and mechanical ventilation were associated with higher mortality. The findings from the present study also revealed that the male-to-female ratio of patients with medical conditions admitted into the ICU was 1.3:1 and this was comparable to other studies. [12, 13] In the present study, 70% of admitted cases were less than 65 years of age, similar to the 66.9% in a Lagos study. [12] Further, a majority of the patients who died spent fewer days in the ICU (seven days or less) in contrast to what was reported by Eze *et al.* [14] This could be attributed to poor health-seeking behaviour and delayed presentation of most patients.

Table V: Cardiovascular disorders and outcome

Disease conditions	*Ventilatory support*		*Outcome*		*Total*
	No (n = 19)	**Yes (n = 6)**	**Discharged (n = 12)**	**Death (n = 13)**	
Heart failure	9 (47.4)	3 (50)	7 (58.3)	5 (28.5)	12 (48.0)
Cardiogenic shock	2 (10.5)	2 (33.3)	1 (8.3)	3 (23.1)	4 (16.0)
Postcardiac arrest	1 (5.3)	1 (16.7)	2 (16.7)	0 (0.0)	2 (8.0)
Acute Myocardial Infarction	3 (15.8)	0 (0.0)	2 (16.7)	1 (7.7)	3 (12.0)
Others	4 (21.0)	0 (0.0)	0 (0.0)	4 (30.7)	4 (16.0)

Figures in parentheses are percentages of the total in the respective columns.

Table VI: Haematological disorders and outcome

Disease conditions	*Ventilatory support*		*Outcome*		*Total*
	No (n = 13)	**Yes (n = 3)**	**Discharged (n = 7)**	**Death (n = 9)**	
Haemoglobinopathy	10 (76.9)	2 (66.7)	7 (100.0)	5 (55.6)	12 (75.0)
Haematological Oncology	2 (15.4)	1 (33.3)	0 (0.0)	3 (33.3)	3 (18.7)
Others	1 (7.7)	0 (0.0)	0 (%)	1 (11.1)	1 (6.3)

Figures in parentheses are percentages of the total in the respective columns.

Table VII: Age difference in the mortality rates in different disease groups

Disease group	*Died*	*Alive*	X^2	*p-value*
Neurological disorders (n = 144)				
<65 (years)	60 (41.7)	35 (24.3)	0.554	0.457
≥65 (years)	34 (23.6)	15 (10.4)		
Respiratory disorders (n = 44)				
<65 (years)	14 (31.8)	19 (43.2)	0.759	0.303
≥65 (years)	7 (15.9)	4 (9.1)		
Cardiovascular disorders (n = 25)				
<65 (years)	7 (28)	10 (40)	2.4938	0.202
≥65 (years)	6 (24)	2 (8)		
Haematological disorders (n = 16)				
<65 (years)	8 (50)	6 (37.5)	0.000	1.0
≥65 (years)	1 (6.2)	1 (6.2)		
Others (n = 26)				
<65 (years)	7 (26.9)	12 (46.2)	1.267	0.190
≥65 (years)	5 (19.2)	2 (7.7)		

Figures in parentheses are percentages of the total in the respective columns.

The patients tend to present at the hospital in the terminal phase of their illnesses coupled with delayed admission processes into the ICU due to financial constraints since patients or their relatives pay out-of-pocket. In the present study, it is possible to infer that patients who survived the first few days of ICU admission had a probability of a good outcome. Therefore, it is imperative to pay more attention to details in patients' management in the first few days of ICU admission for a likely better outcome.

Medical disorders constituted 12.6% of all ICU admissions in the present study. This is contrary to 9% and 18.5% in two different Nigerian tertiary hospital studies. [12, 15] The variation in the reported figures in the aforementioned studies may be related to the increase in the duration of study of five and 18 years respectively which flows with our study of 10 years period. This probably shows that the longer the duration of study, the higher the number of cases for medical ICU admissions. The prevalence of neurological cases of 56.5%

in the present study, was in tandem with 53.8% reported by Poluyi *et al.* [12] There is an increase in the incidence of stroke in developing countries with a decline in developed countries. [16] Stroke was the most common reason for ICU admission accounting for 40.4% of admissions in the present study. This is contrary to cardiovascular diseases (63.4%) reported to be the leading medical indication for ICU admission in Jos, Nigeria. [17] A sedentary lifestyle, consumption of processed foods rich in cholesterol and salt, increased prevalence of cardiovascular risk factors, insufficient neurological services, high health-care cost, inaccessibility and high cost of radio-imaging techniques could all contribute to this observation. [18,19]

From the finding in this study, nervous system infections came after stroke as the next prominent neurological indication for ICU admissions. Greenberg in his study had earlier noted that infections of the central nervous system are a frequent cause of ICU admissions. [20]

Furthermore, 49.5% of stroke patients were mechanically ventilated in the present study, similar to the study by Backhaus *et al.* which revealed 47.8% of stroke patients requiring mechanical ventilation in Germany. [21] Khassawneh *et al.* concluded that the need for 23.4% of stroke patients in the ICU to be mechanically ventilated was one of the major independent predictors of mortality. [22] A mortality rate of 75.0% was found among patients who were ventilated in the present study. This was contrary to 45% reported by Pelosi *et al.* [23] The difference might be due to the use of the Glasgow coma scale (GCS) and a more definitive simplified acute physiology score to determine which patient needed to be ventilated, unlike in the present study where only GCS was used. Furthermore, this technical disparity may be due to patients' delayed presentation, a lack of funds for admission, frequent power outages, ventilator-associated complications, high cost of care in the ICU, and insufficient staff-to-patient ratio.

In the present study, 27.3% of patients with pulmonary embolism had respiratory distress requiring mechanical ventilation and a mortality of 54.5%. This was contrary to 47.1% reported in the study done by Bahloul *et al.* [24] The overall mortality rate among patients admitted into ICU in the present study was 58.4%; this is similar to 55% reported in another Nigerian tertiary institution. [14] Only 8% of cases were medical disorders with a high mortality of 83.3% in the study by Ilori and Kalu. [25] This observation generally implies that the mortality rate of admitted ICU cases in Africa is higher than reported in developed countries. In Tanzania, [26] a mortality rate of 41.4% was reported when compared to 32.4% in Israel [27] and 18.4% in Singapore. [28] This discrepancy might be due to delayed presentation of patients, differences in the level of ICU care, availability of medical supplies and skilled staff, lack of an emergency medical care system (EMS), inadequate well-equipped integrated monitors, unavailability of medications and the high cost of ICU care in low and middle-income countries. [29, 30]

Also, we observed overall higher mortality rate in younger patients admitted to the ICU. This is contrary to the study by Unal *et al.* [10] where geriatric patients had higher mortality. The finding in the present study might be attributed to an increased number of younger age groups hospitalized in the ICU and the majority in this group had mortality from neurological problems which constituted the bulk of patients. Nonetheless, higher mortality in all the specialties seen in the younger patients when compared with the older ones was not statistically significant.

Limitations

These are related to the retrospective design of the study and the paucity of relevant data retrievable from ICU nurses' documentations and death certificates and challenges encountered in the retrieval of patients' case notes. The ICU registers typically lacked the

details of how diagnosis and indications for ICU admissions were arrived at.

Conclusion

Stroke is the leading neurological and overall medical indication for ICU admission followed by pulmonary embolism. Both conditions were associated with high mortality rates. Mortality for the majority of the medical conditions was high and more significant in the younger age group than the geriatrics. The majority of those who required mechanical ventilation had a bad outcome. Prompt presentation, accurate diagnosis with neuroimaging, early admission and proper monitoring could help reduce mortality associated with stroke. There may be a need to create a separate fully equipped ICU dedicated to medical cases with an adequate and skilled workforce. There is a need for adequate funding and maintenance of the ICU to help increase the survival rate of critically ill patients.

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Authors' Contributions: AOE, OSO, IAO, AOI and KMA conceived the study. AOE, OSO, IAO, AAO, OAF and KMA reviewed the literature. AOE, OSO and IAO analysed the data. All the authors interpreted the data. AOE drafted the manuscript. All the authors revised the draft for sound intellectual contents and approved the final draft.
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Erratum

In the article titled **"Hysterosalpingogram findings among women with infertility in Ogun State, Nigeria"** published in Annals of Health Research 2017; 3(2): 75-81, the authors were listed as Olatunji AA, Jagun OE, Toyobo OO, Ashaolu OA and **Adekoya OA**.

Our attention has been drawn to the error in one of the names and we wish to correct the names of the authors listed on the article as "Olatunji AA, Jagun OE, Toyobo OO, Ashaolu OA and **Adekoya AO**".

-Editor-in-Chief