

Mortality Pattern in Intensive Care Unit: Experience at Abakaliki Southeastern Nigeria

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Abstract

Background: An intensive care unit (ICU) is a special unit of a hospital that provides intensive treatment for patients with severe or life-threatening illnesses and injuries, which require constant care and close monitoring with life support equipment. The mortality rate is still very high in most ICUs especially in the developing countries due to late presentation of patients, unavailability of well trained staff and lack of life support equipment. There has not been any previous study on the mortality pattern in ICU of Alex Ekwueme Federal University Teaching Hospital Abakaliki (AEFUTHA). It is against this background that we embarked on this retrospective descriptive hospital based study of the mortality pattern in ICU of a Tertiary Hospital in Abakaliki, South-eastern Nigeria. **Method:** This is a retrospective descriptive hospital based study. The admission and discharge registers of the ICU ward were used to extract information on biodata, diagnosis, duration and outcome of all admissions from January to December 2019 (12 months). **Results:** A total of 174 (male 113, female 71) patients were admitted over the 12 months period with mean age of 46.31 ± 12.28 years. Seventy-one (40.8%) of the patients died from predominantly stroke, acute abdomen, trauma, sepsis, renal failure, acute diabetic complications and cancer in descending order. Acute diabetic complications had 100% case fatality rate, followed by stroke (71%), renal failure (62.5%), cancer (60%), sepsis (55.5%), acute abdomen (34%) and trauma (23%). The mean duration of ICU admission was 4.2 days for the non-survivors and 6.3 days for survivors. **Conclusion:** The ICU mortality rate was high and constituted of mainly stroke, acute abdomen and trauma which are essentially preventable. Female sex, medical diagnosis and ICU admission duration of less than 6 days were associated with higher ICU mortality.

Keywords

Pattern, Mortality, Intensive Care Unit, Abakaliki, South-Eastern Nigeria

1. Introduction

An intensive care unit (ICU) is a special unit or ward of a hospital or health care facility that provides intensive treatment medicine. It is also known as an intensive therapy unit, intensive treatment unit (ITU) or critical care unit (CCU). The patients treated here are those with severe or life-threatening illnesses and injuries, which require constant care, close supervision from life support equipment and medication in order to ensure survival. They are staffed by highly trained physicians (intensivists) and nurses who specialize in caring for critically ill patients. ICU is also distinguished from general hospital wards by a higher staff-to-patient ratio and access to advanced medical resources and equipment that is not routinely available elsewhere. Common conditions that are treated within ICUs include acute neurological, cardiac, respiratory and other life-threatening conditions. The trend in the developed countries is to have separate and dedicated ICUs for different subspecialties like cardiac, neurological, renal, trauma and neonatal ICUs [1]. In the developing countries, a general ICU is still tenable due to scarce resources [2]. Despite above emergency preparedness and advances in medicine available in ICUs, the mortality rate is still very high in most centres especially in the developing countries due to late presentation of patients, unavailability of well trained staff and lack of life support equipment.

The average ICU mortality rate reported in the US ranges from 8% to 19%, or about 500,000 deaths annually while in France, it is about 15% [3] [4].

In Africa and other developing countries, the ICU mortality is higher.

In Tanzania Africa, a study in 2014 reported a mortality rate of 41.4% [5]. A study in Enugu southeastern Nigeria reported a mean yearly admission rate of 153 with male to female ratio of 2:1 and mortality rate of 34.6% in 2015 [6]. Another study in Jos Northcentral Nigeria reported an overall mortality of 42.8% [7]. There has not been any study on the pattern of mortality in ICU of Alex Ekwueme Federal University Teaching Hospital Abakaliki (AEFUTHA), a tertiary health centre in Ebonyi state, Southeastern Nigeria. It is against this background that we embarked on this retrospective descriptive hospital based study of the mortality pattern in ICU of a Tertiary Hospital in Abakaliki, South-eastern Nigeria.

2. Methodology

This was a retrospective and descriptive study that was undertaken in the ICU of Alex Ekwueme Federal University Teaching Hospital Abakaliki, a tertiary hospital in Abakaliki southeastern Nigeria. The ICU has 6 beds dedicated to the in-

patient management of medical and surgical patients with severe or life-threatening illnesses and injuries, which require constant care, close supervision from life support equipment and medication in order to ensure survival. It is manned by the anaesthetic team, the admitting subspecialty team, the nursing staff and other support staff. The nurses run three shift duties per day and each patient is solely attended to by one or two nurses in a shift. The patients were admitted from emergency rooms, wards or postoperatively from the theatre. Basic life support monitoring and therapeutic equipment like patient cardiac monitors, piped oxygen delivery system and ventilators are available for patients need.

The admission and discharge registers of the ICU ward was used to extract information on biodata (age, sex), admitting diagnosis, duration of ICU admission and patients' outcome of all admissions from January to December 2019 (12 months). The diagnoses were made by consultants (Specialists) in different subspecialties with additional confirmatory laboratory investigations as required. The data were analyzed with Statistical Package for the Social Sciences (SPSS) version 25. The categorical variables were presented as proportions and percentages while numerical variables were presented as means and standard deviations. Ethical approval was not sought as there were no ethical issues in the study. Chi-square was used to test for statistical significance and p-value of <0.05 as significant.

3. Results

A total of 174 (male 113, females 71) patients were admitted over the 12 months period with mean monthly admission of about 15 and male to female ratio of about 2:1. The age range was 3 - 95 years and mean age of 46.31 ± 12.28 years. The details of age and sex distribution and monthly pattern of admission were presented in **Table 1** and **Figure 1**.

Seventy one (40.8%) of the patients died (non-survivors) while others (survivors) were either transferred to the general wards, transferred to other centers or discharged home. **Acute abdomen, trauma, stroke**, sepsis, renal failure, cancer and acute diabetic complications were the most prevalent reasons for ICU admission while **Stroke, acute abdomen, trauma**, sepsis, renal failure, acute diabetic complications and cancer were the most identified cause of mortality in descending order (**Table 2** and **Table 3**).

Acute diabetic complications (Diabetic ketoacidosis, and Hyperosmolar hyperglycemic state) had 100% case fatality rate, followed by stroke (71%), renal failure (62.5%), cancer (60%), sepsis (55.5%), acute abdomen (34%) and trauma (23%). Medical disorders constituted about 37% of the admission and 55% of mortality (**Figure 2**). The mean duration of ICU admission for the patients that died (non-survivors) was 4.2 days while for those discharged (survivors) was 6.3 days. The details of admission and mortality patterns were presented in **Table 2** and **Table 3** respectively.

Female sex, medical diagnoses and less than 6 days duration of ICU admission

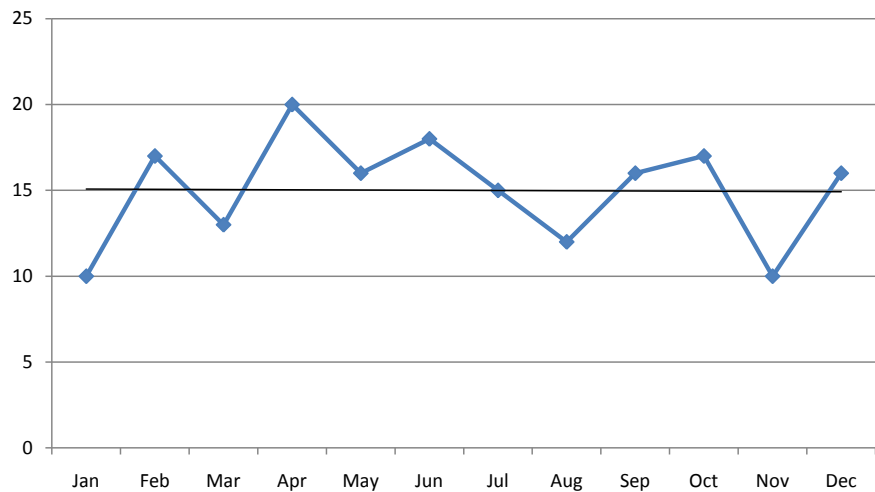


Figure 1. Monthly admission pattern (n = 174).

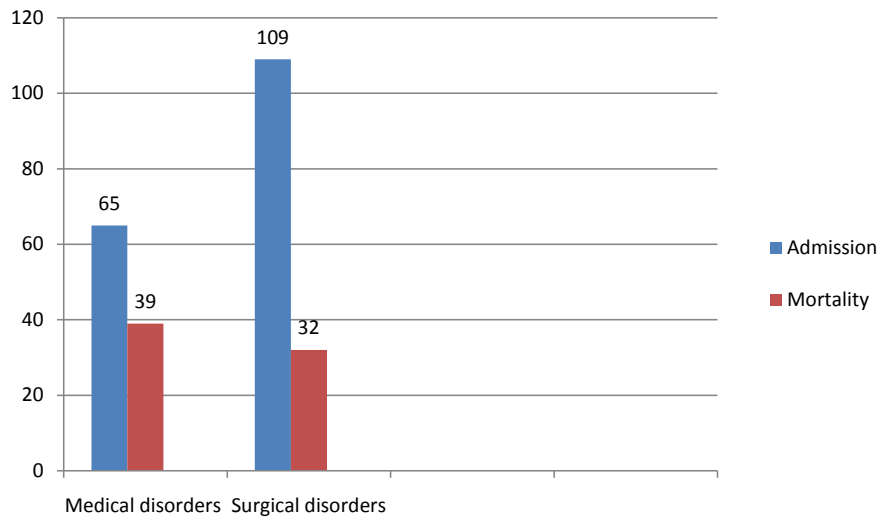


Figure 2. Cause of admission and mortality by specialty (N = 174, n = 71).

Table 1. Age and sex distribution.

Age range	Male (%)	Female (%)	Total (%)
0 - 9	2 (1.15)	3 (1.72)	5 (2.87)
10 - 19	10 (5.75)	5 (2.87)	15 (8.62)
20 - 29	14 (8.05)	7 (4.02)	21 (12.07)
30 - 39	16 (9.20)	10 (5.75)	26 (14.94)
40 - 49	26 (14.94)	9 (5.17)	35 (20.11)
50 - 59	13 (7.47)	5 (2.87)	18 (10.34)
60 - 69	15 (8.62)	12 (6.90)	27 (15.52)
70 - 79	16 (9.20)	7 (4.03)	23 (13.22)
80 - 89	1 (0.57)	2 (1.15)	3 (1.72)
90 - 99	0 (0.00)	1 (0.57)	1 (0.57)
Total	113 (64.94)	61 (35.06)	174 (100)

Table 2. Cause of admission (n = 174).

Disease	Male (%)	Female (%)	Total (%)
Acute abdomen	33 (18.97)	14 (8.04)	47 (27.01)
Trauma/injury	34 (19.54)	9 (5.17)	43 (24.71)
Stroke	16 (9.19)	15 (8.62)	31 (17.81)
Sepsis	4 (2.30)	5 (2.87)	9 (5.17)
Renal failure	4 (2.30)	4 (2.30)	8 (4.60)
Cancer	4 (2.30)	1 (0.57)	5 (2.87)
DKA/HHS	1 (0.57)	3 (1.72)	4 (2.30)
Others	17 (9.77)	10 (5.75)	27 (15.52)
Total	113 (64.94)	61 (35.06)	174 (100)

DKA-Diabetic ketoacidosis, HHS-Hyperosmolar hyperglycemic state.

Table 3. Cause of death (n = 71).

Disease	Male (%)	Female (%)	Total (%)
Stroke	12 (16.90)	10 (14.08)	22 (30.98)
Acute abdomen	9 (12.68)	7 (9.86)	16 (22.54)
Trauma/injury	8 (11.27)	2 (2.81)	10 (14.08)
Sepsis	1 (1.40)	4 (5.63)	5 (7.04)
Renal failure	3 (4.22)	2 (2.81)	5 (7.04)
DKA/HHS	1 (1.40)	3 (4.22)	4 (5.63)
Cancer	2 (2.81)	1 (1.40)	3 (4.22)
Others	2 (2.81)	4 (5.63)	6 (8.45)
Total	38 (53.52)	33 (46.48)	71 (100)

DKA-Diabetic ketoacidosis, HHS-Hyperosmolar hyperglycemic state.

were statistically associated with increased mortality while old age was not associated with increased mortality (**Table 4**).

4. Discussion

This is the first study on the mortality pattern in ICU of Alex Ekwueme Federal University Teaching Hospital Abakaliki. A total of 174 patients were admitted over the study period of 12 months with a mean monthly admission of 15 patients. The above monthly admission number is similar to a 5 year retrospective study in Enugu which reported monthly admission of 13 patients [6] though higher than another study in Calabar both in Nigeria which reported monthly admission of 7 patients [8]. The Calabar study was conducted in a 3 bedded ICU while this study was conducted in a 6 bedded ICU which when corrected for the number of beds approximates to 14 patients per month which is similar to monthly admission of this study. The similarity of mean monthly ICU admission

Table 4. Determinants of mortality (n = 174).

Variables		Non-survivors	Survivors	p-value
Sex	male	38	75	<0.05
	female	33	28	
Age	<50 yrs	36	66	>0.05
	≥50 yrs	35	37	
Duration of admission	<6 days	13	48	<0.05
	≥6 days	58	55	
Specialty	medical	39	26	<0.05
	surgical	32	77	
Diagnosis	Acute abdomen	16	31	
	Trauma	10	33	
	Stroke	22	9	
	Sepsis	5	4	
	Renal failure	5	3	
	Cancer	3	2	
	DKA/HHS	4	0	
Others	7	21		

DKA-Diabetic ketoacidosis, HHS-Hyperosmolar hyperglycemic state.

number may be that these hospitals are all tertiary public hospitals with probably similar ICU admission criteria.

There is male preponderance of about 2:1 sex ratio. This is similar to other studies in Africa [5] [6] [7] [9]. The reason for male preponderance of ICU admission is that majority of the admission were from trauma related condition and stroke which are more common in male folks. Also the culture of preference for male folks in most African societies may have a contributory role as families make extra efforts to ensure their survival [10].

The age range of the patients admitted over the period was 2 - 95 years with mean age of 46.31 ± 12.28 years and its similar to that of other studies in Nigeria [6] [7] [9]. This shows that no age group is exempted from severe or life-threatening illnesses and injuries which are managed in ICU. Also the mean age of about 46years shows that the productive age is mainly affected. Provision and distribution of health resources should be done in a way that all age groups are well represented especially in developing countries where the resources are scarce.

The common reasons for ICU admission were acute abdomen, trauma and stroke. This is similar to other studies which reported preponderance of post-operative patients, and trauma [6] [7] [9] [11]. This may be due to high incidence of trauma from road traffic accidents from poor road maintenance and lack of political will in implementation of road safety measures in developing countries [12]. Also most of the patients present late to the hospital due to ignorance, poverty and inaccessibility of the hospitals, thereby converting most cases to life threatening form [13].

The overall mortality rate was 40.8%. It is very high as 2 out of every 5 ICU

admissions died. This is similar to other studies in Africa which reported 34% - 43% [5] [6] [7] but higher than 8% - 18% reported in the USA and France [3] [4]. This high mortality rate is due to late presentation of patients, availability of limited number of trained staff and lack of adequate life support equipment in most developing countries. Medical conditions constituted 55% of the overall mortality with stroke (31%) as the highest contributor. This is similar to the study in Calabar [8]. Most of the medical cases were severe haemorrhagic stroke with attendant high mortality rate as previously reported in Abakaliki [14] [15]. The case fatality rates of acute diabetic complications was 100%, stroke 71%, renal failure 62.5%, Cancer complications 60%, infective conditions 55.5%, acute abdomen 34% and trauma 23%.

The mean duration of admission for all the patients was 5.29 days (Non-survivors-4.2 days, Survivors-6.3 days) with statistically significant association between shorter duration of admission and higher mortality. This is similar to the report of other local studies [6] [11]. The reason for the shorter mean admission duration of about 4 days for non-survivors is that those with very severe life threatening conditions die early while the survivors are stabilized over more number of days and subsequently admitted to the wards or transferred to other centres for onward treatment.

Female sex, medical diagnosis and admission duration of less than 6 days were statistically associated with higher mortality. This is in keeping with other studies [8] [16]. The sex differences may be related to possible immunological effects of sex hormones [16]. Numerous studies have shown that the immune response, including that associated with sepsis, may be modulated by sex hormones, with women and men treated with estrogens developing a more marked proinflammatory response [17] [18] [19] and having improved cardiac and hepatic function compared with men [20]. These changes are influenced by the female reproductive cycle, [21] and the cytokine response is reversed when older animals with decreased hormonal levels are compared [22]. The medical conditions were associated with higher mortality than surgical cases because most of the medical cases were severe haemorrhagic stroke with attendant high mortality rate as previously reported in Abakaliki [14] [15] while surgical conditions were mainly traumatic and post operative cases with much less case fatality rate. Furthermore, shorter ICU admission is associated with higher mortality because very severe conditions die early while less severe conditions were stabilized over longer period and subsequently transferred to the wards for further treatment.

5. Conclusions and Recommendations

Acute abdomen and traumatic conditions were the predominant reasons for ICU admission in a tertiary hospital in Abakaliki Southeastern Nigeria while medical conditions especially stroke were the predominant cause of mortality. Female sex, medical diagnosis and shorter admission duration of less than 6 days were associated with higher mortality.

There is need for regular training and retraining of health workers and provision of all needed life support equipment in ICU in order to always be ready to offer best evidence based medical care to the numerous patients. There is also need for the regular public health education on primary prevention of stroke which is the most common cause of mortality and also on prevention of road traffic accidents. Furthermore, the government should develop policies that will ensure financial empowerment, accessibility and affordability of healthcare delivery to individuals of low and middle socioeconomic class.

In conclusion, there is need to conduct a multinational multicentre collaborative study on the mortality pattern in ICU across the sub-Saharan Africa subregion in order to have a holistic view of the morbidity, mortality and possible solution.

Limitations

This is a retrospective study with attendant limitations. Some of the data sought for in the admission and discharge registers were incomplete.

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Authors' Contributions

Chukwuemeka O. EZE: designed the study, wrote the introduction, methodology, data collection and analysis, and discussion.

Francis C. OKORO: Data collection and analysis, and discussion.

Thomas NNAJI: Data collection and analysis.

Monday NWOBODO: Data collection and analysis.

Uma KALU: Data collection and analysis.

Richard EWAH: Data collection and analysis.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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List of Abbreviations

ICU-Intensive care unit

DKA-Diabetic Ketoacidosis

HHS-Hyperosmolar hyperglycemic state