

CLINICAL PROFILES OF ADOLESCENTS ADMITTED INTO THE INTENSIVE CARE UNIT AT THE UNIVERSITY COLLEGE HOSPITAL, IBADAN

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Abstract

Background & Objectives: The care of the critically ill adolescent in resource-constrained settings such as Nigeria until a few years ago was in the adult ICU (AICU). This care is provided mainly by adult intensivists with input from the paediatricians. In the last couple of years, however, paediatric critical care units managed by paediatric intensivists have gradually been established in Nigeria. This study looked at the clinical characteristics of adolescents managed in the adult ICU before the establishment of Paediatric ICU in our centre.

This study was carried out to outline the clinical profiles and outcomes of adolescent patients admitted into the adult ICU.

Methods: This retrospective study was conducted on adolescents admitted over 5 years (2018 to 2022).

Results: The adolescent population comprised 113(38.6%) of the children and adolescents admitted. The male and female distribution was 65.5% and 34.5% respectively. The mean age was 14.3 ± 2.8 years. The most common indication for admission was post-surgical excision of intracranial tumours (22.1%). Meningitis with raised intracranial pressure accounted for 17.7% and Haemoglobinopathy with complications (Sepsis, Acute Chest Syndrome, Shock) constituted 10.6%. A third of the adolescent population required ventilation. Amongst ventilated patients, mortality was recorded in 44.1%. Mortality was significantly higher in ventilated than non-ventilated patients ($p=0.01$). The overall mortality rate was 36.3%.

Conclusion: The provision of critical care to the adolescent population is important, especially amongst those who require ventilatory support as they are at high risk of mortality.

Keywords: Adolescents; Critical Care; Ventilation

INTRODUCTION

The World Health Organization (WHO) defines an adolescent as between 10 and 19 years of age.¹ Adolescence is a transition period where the individual undergoes physical, emotional, behavioural, and social changes and lasts roughly a decade. Adolescents are usually described as the healthiest and strongest population however they can develop major illnesses that require critical care. In Nigeria, the care of critically ill adolescents is usually provided in the adult intensive care unit (AICU/ICU) as paediatric intensive care units (PICU) are limited in number. The AICU in developing countries has limitations in providing adequate critical care to admitted patients. Some of these limitations would include inadequate number of trained personnel, inadequate nurse-to-patient ratio, lack of monitoring equipment, and frequent power outages. All these increase the morbidity and

mortality of the adolescent requiring critical care.

In the United Kingdom, the common indications for admission of adolescents into the ICU have been reported as following surgery and respiratory conditions. Neurological and respiratory illnesses in adolescents were the commonest indications for intensive care in the United States of America.²

The indications for adolescent critical care differ in Low- and Middle-Income countries (LMIC). In Thailand, amongst older adolescents, the acute conditions requiring critical care were septic shock and infection.³ Septic shock was also reported as the commonest indication for admission amongst children and adolescents in Ethiopia.⁴ In Northern Nigeria, Abubakar et al⁵ reported that the commonest indication for Paediatric admissions into the ICU was surgical accounting for 69.5%.

This study was therefore undertaken to outline the characteristics and outcomes of adolescents

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admitted into the AICU of the University College Hospital, Ibadan.

METHODS

Study Design and Setting

This was a retrospective study of all adolescents admitted into the AICU of the University College Hospital (UCH) Ibadan between 2018 and 2022. The AICU is a 10-bed unit manned primarily by intensivists with paediatricians providing input where necessary. Critically ill patients from different parts of the hospital are admitted to the AICU for intensive care. The UCH also has a 4-bed PICU, however, this study was conducted before its establishment.

The adolescent patients admitted during this period were identified using the ward register and their admission notes were obtained. Data on the anaesthesia technique used were retrieved from the patient's record and analysed. All eligible patients were recruited into the study.

Ethical Considerations

The protocol for the study was approved by the UI/UCH Ethical Review Committee with the ethical approval number UI/EC/24/0585.

Data Collection Procedure

Each patient's record was reviewed in detail and data retrieved for analysis included the age, gender, diagnosis at admission, indications for ICU admission, length of stay in ICU, interventions (such as mechanical ventilation and blood transfusion), and outcome of management. All paediatric age group patients who were admitted to the AICU of University College Hospital, Ibadan during the study period were included, while those who died on arrival or died within two hours of admission were excluded. Data were presented in rates and percentages. Statistical analysis was performed using SPSS version 26. The association between clinical variables and outcomes was tested

using the Chi-square test. The level of significance was set at a $P \leq 0.05$.

RESULTS

A total of 1398 patients were admitted to the ICU during the study period. The paediatric age group up to 19 years accounted for 293 (20.9%) of the total population. 113 adolescents (10- 19 years) comprised 38.6% of the paediatric population. There were 76 (65.5%) males and 39 (34.5%) females making it a male-to-female preponderance of 1.8 to 1.

Our policy is to admit all patients with post-surgical intracranial tumour excision into the AICU. This made it the most common indication for admission at 22.1% (All of these patients had general anaesthesia and endotracheal intubation during surgery). The second most common indication was head injury (17.7%). Meningitis with raised intracranial pressure was the most common medical condition (11.5%). Other common cases were adolescents with haemoglobinopathy with complications (10.6%), Sepsis (9.0%), and Pneumonia with respiratory failure (5.3%). Airway Management was assessed for all ventilated patients and the airway management was uneventful.

Patients requiring intervention for haemodynamic instability accounted for 27 (23.8%). 66% of the adolescent population required ventilation. Amongst ventilated patients, mortality was recorded in 45.5%. Mortality was significantly higher in ventilated than non-ventilated patients ($p=0.016$). (Table 1). Over one-third of the patients spent 3 to 14 days in the intensive care unit while 25.7% spent less than 48 hours (Table 2). Among 68 patients who spent between 3 to 14 days in the intensive care unit, 21 (30.9%) people died while among 29 patients who spent less than 48 hours, 14 (48.3) died. (Table 3).

Immediate post operative haemodynamic parameters were reviewed. The mean blood

pressure was 106.3 ± 11.8 mmHg, heart rate was 102 ± 14.6 bpm and oxygen saturation was $99.2 \pm 0.9\%$.

DISCUSSION

This study evaluated the pediatric population's admission pattern into the AICU, Indication for admission, treatment outcomes, and associated factors. A total of 113 patient charts were available for data collection. In this study, the mean age of the admitted patient was 14.3 ± 2.8 years, the male-to-female ratio was 1.8:1. The preponderance of male: females were also similar to a study done by Teshager et al who discovered a 1.7:1 in male: female ratio. the majority of paediatrics admitted were aged between 10 years and 19 years. This is in line with a study conducted by Wood et al in the United Kingdom where the age range of the patients was between 12 and 19 years¹. A similar study conducted by Iyoha et al in Nigeria showed differences from ours. They found out that $>90\%$ of the patients admitted to the PICU were babies and infants.⁶ Despite such discrepancies, our study found no statistically significant mortality rate associated with age.

22.1% of adolescents were admitted into the AICU with a medical condition of meningitis with raised intracranial pressure. Edae et al found acute kidney injury (14.2) as the commonest indication for admission in their study while meningitis (12.3) was the second most common indication. In a study by Mohammed and Mengistu, The vast majority of PICU admissions were due to medical problems (80.5%), and out of this infectious diseases accounted for 50% of the cases. In a study done by Haftu et al the causes of admission into the PICU differed from our study, non-infectious disease accounts for 66.5% of the population. Another study by Abebe et al in general ICU of Jimma University specialized hospital where 34.7% were trauma cases, The highest percentage, 69.5%, of trauma patients were admitted for head injuries.

The present study found that the overall mortality rate of adolescents in the AICU was 36.3%, this is in line with a study by Embu et al in Nigeria where 109 patients died giving a mortality rate of 36.1%. Seifu et al¹¹ in their study also found a mortality rate of 158 (43.8%). In a study by Ankireddys et al¹² out of 600 patients admitted to PICU, 168 patients died bringing the mortality to 28%. This high mortality rate in our study may be explained by resource scarcity and our hospital is the biggest specialized referral hospital where critical patients are admitted from zones, regions, and even from other tertiary and specialized hospitals. However, studies in developed countries have found very low mortality rates. A study done by Blessing et al⁶ in India among babies and adolescents found a mortality rate of 2.1%. A 15% mortality rate was also documented by Costa et al in Brazil in a tertiary care 15-bed PICU that receives both clinical and surgical cases but does not attend to trauma patients¹³. The reason for the low mortality rates in these studies is likely because they uphold the international standard of one intensive care nurse/bed/shift producing high-quality care with a high-intensity physician staffing resulting in lower mortality and shorter hospital and ICU stays¹⁴.

The determinants of the AICU outcome from previous studies done by Abhulimhen-Iyoha et al, Vincent et al, Mohammed et al, and Labelle et al^{6, 15-17} were based on the seriousness of the condition at admission, patient age, presence of comorbidities, the quality of pre-hospital and emergency trauma care; factors reported during the PICU admission like the use of mechanical ventilation, and ventilator-related respiratory complications. In our study, mortality was recorded in the majority of patients (15/34; 44.1%) who were ventilated. The need for mechanical ventilation was an independently associated factor for mortality in the PICU ($p < 0.01$). In line with this study are studies done in Ethiopia; Seifu et al¹¹ found that the mortality rate among patients on mechanical

ventilation was 67.94% ($p < 0.001$). Basnet et al¹⁸ also found a 68% mortality among patients placed on the ventilator ($p < 0.01$). however, in a study by Ballot et al in South Africa where most patients (471/529; 89%) were intubated and ventilated, binary logistic regression analysis showed no association between the outcome and ventilation. Mortality was high for patients who had 2–7 days and 3-14 length of stay in the ICU, but it was not significantly associated with mortality. This, however, opposes a study done in Ayder referral hospital which found that mortality was higher in patients who stayed greater than 28 days¹⁵ This discrepancy might be attributed to the fact that most patients who stayed in the AICU for 2 weeks or less were on mechanical ventilation in our study, which we found it to be a statistically significant associated factor for PICU mortality. The possible limitation of our study is that it is retrospective and done in a single study setting. The study needs to be conducted in multi-centre for the future.

CONCLUSION

The mortality rate at the PICU was 36.3%. Meningitis and haemoglobinopathy were the common causes of death, and the largest death happened in less than 14 days of admission. The need for mechanical ventilation is associated with mortality in the PICU. Our implication is that a dedicated ICU for children, an early PICU, equipping the PICU with both experts and material resources, and prompt management for primary presenting disease as well as co-existing diseases are crucial to improve adolescent care in the ICU.

Acknowledgment: None

Funding Source: Self-sponsored

Ethics Approval: This study was approved by the institutional ethics Review Committee of University College Hospital and the College of Medicine, University of Ibadan (UI/UCH Ethics committee – UI/EC/24/0585). Voluntary and

informed consent of the participants was obtained.

Conflicts of Interest: The authors have no conflicts of interest.

Table 1: Association between Ventilation use and outcome

Ventilation		Outcome		Total	p-value
		Discharged	Dead		
Yes	Number ventilated	36	30	66	0.016
	Frequency	54.5%	45.5%	100	
No	Number ventilated	36	11	47	
	Frequency	76.6%	23.4%	100	

P value > 0.05

Table 2: Length of Stay

Duration	Frequency(n)	Percentage (%)
≤48hours	29	25.7
3-14 days	68	60.2
15-30 days	9	8.0
≥1 month< 6 month	2	1.8
>6 months	5	4.4
Total	113	100

Table 3: Duration between Duration of Admission and Outcome

Duration of admission (Days)	Outcome		
	Discharged	Died	
≤48hours	15 (51.7)	14(48.3)	29
3-14 days	47 (69.1)	21 (30.9)	68
15-30 days	5 (55.5)	4 (44.5)	9
≥1 month< 6 months	1 (50)	1 (50)	2
>6 months	4 (80)	1 (20)	5

Table 4: Admission Outcome

	Frequency(n)	Percentage (%)
Discharged	72	63.7
Died	41	36.3
Total	113	100.0

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