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## The pattern of Deaths in the Accident and Emergency Units of Ekiti State University Teaching Hospital

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### ABSTRACT

**Background:** Death is common in accidents and emergency units (AEU), and its causes vary. Some are brought-in-dead (BID) with unknown causes and contribute to hospital mortality statistics. This study aimed to determine the causes and patterns of death in the AEU of the Ekiti State University Teaching Hospital, Ado Ekiti, Nigeria

**Methods:** This was a 5-year retrospective study of all patients who died in the AEU of

Ekiti State University Teaching Hospital, including those brought in dead. The information needed was extracted from the case notes and entered into SPSS version 23 for analysis.

**Results:** A total of 7,682 patients were observed during the study period, with 275 deaths representing a mortality rate of 3.6%. One hundred and fifty-six (56.7%) patients were BID. The mean age was 50.8 years. Most deaths (n=233, 84.7%) were from non-traumatic causes, with stroke and heart failure being the most common causes. Head injury (3.3%) was the most common traumatic cause of death. The median interval from presentation to death was 5 hours (IQR 3 – 6). Most patients (n=54, 45.4%) died within the first 8 hours of admission. None of the patients underwent an autopsy. Hypertension and diabetes were the most common co-morbid conditions reported.

**Conclusion:** Brought-in-dead patients were the most commonly recorded death pattern in AEU at the Ekiti State University Teaching Hospital, and the overall mortality rate was 3.6%. Non-traumatic causes are the leading causes of death.

**Keywords:** Accident and emergency, Brought in dead, Mortality rate, Trauma, Non-trauma, Cardiopulmonary resuscitation .

## 1.0 INTRODUCTION

The accident and emergency unit (AEU) is the entry point of care for adult patients with acute trauma, gynaecological, medical, and surgical emergencies. Patients presenting to the accident and emergency department form the bulk of inpatient admissions to the hospital. Thus, this is the first point of call for patients presenting to the hospital in an emergency state. These patients present either in a critically ill state or as Brought in Dead (BID) [1]. Patients brought in dead (BID) often contribute to the mortality statistics in hospital AEU [2]. And the cause of death at the time of presentation is often unknown.

Multiple factors contribute to deaths in AEU, including the severity of illness, time of presentation, the competence of the managing team, facilities provided by the institution, and timeliness of attending to the patients. The causes of death vary from center to center. However, trauma is one of the leading causes of death in most centres [3]. Chronic medical conditions also lead to deaths in AEU. Many of these deaths can be prevented if patients are presented on time in the emergency rooms. The availability of pre-hospital care also plays a significant role in determining the eventual outcome of patients managed in the AEU, as it will allow the patients to have initial stabilizing care. The outcomes of patients managed in the AEU provide an idea of the efficiency of the primary care providers. These outcomes are usually direct indicators of the standards and quality of care provided in the institution [4, 5].

There has been no study from our centre on the causes and patterns of death in the accident and emergency department. Therefore, this study aimed to determine the causes and patterns of deaths in the AEU of the hospital. The information gathered will be helpful in future planning and policy formulation.

## 2.0 METHODOLOGY

This was a retrospective, descriptive review of deaths at the AEU of Ekiti State University Teaching Hospital (EKSUTH) Ado Ekiti, Nigeria between January 1, 2015, and December 31, 2019. The accident and emergency department of Ekiti State University Teaching Hospital (EKSUTH) is a 36 bedded ward partitioned into triage, red, yellow, and green zones. It has direct access to the hospital gates. It is usually headed by a consultant from

the surgery department who supervises the medical officers and other staff of the department. The accident and emergency department has a staff strength of 9 doctors, 18 nurses, 6 porters, 7 health assistants, and a secretary. The department's admission, discharge, and transfer records were reviewed during the study period, and the total number of patients seen, and death cases were recorded. All patients brought in dead and those who died after arrival in the accident and emergency before discharge or transferred to the ward from 1 January 2015 to 31 December 2019 were included in the study. The case notes of the death cases were requested from the health information record department of the hospital and reviewed to extract the following information: date of admission, duration of symptoms before presentation, working diagnosis, managing specialty(ies), the interval between admission in accident and emergency and death, specialty review before death and interval between specialty review and death, specialty admission to the ward or not, constraints in patients care, cardiopulmonary resuscitation before death and duration, clinical cause of death (primary and secondary), and autopsy findings.

The obtained data were entered into IBM SPSS version 23 for analysis. Descriptive statistics were performed using univariate statistical methods. The results are presented in prose, tables, and charts. Ethical approval for the study was obtained from the ethical review committee of the hospital.

## 3.0 RESULTS

A total of 7,682 patients were seen at the accident and emergency and 275 deaths were recorded, representing 3.6% of the total number of patients seen during the study period. These deaths included 156 (56.7%) brought in dead (BID) and 119 (43.3%) who died after admission in the accident and emergency.

### 3.1 Age and Biodata

There were 179 (65.1%) males and 96 (34.9%) females with a male-to-female ratio of 1.9:1. The age range was 15 – 100 years and the mean age in years was  $50.8 \pm 19.9$  SD. Table 1 shows the age distribution.

The occupations before the time of death of the patients were grouped into ten (10), as shown in Table 2. Most (68, 28.7%) of the patients were self-employed. Only 35 (29.1%) patients presented at the emergency department within 4 hours of symptom onset (Table 3).

**Table 1.** Age Distribution

Age (years)	Frequency	Percent
< 20	11	4.0
20-30	40	14.5
31-40	41	14.9
41-50	45	16.4
51-60	28	10.2
61-70	42	15.3
71-80	39	14.2
81-90	9	3.3
91-100	4	1.5
Not documented	16	5.8
<b>Total</b>	<b>275</b>	<b>100.0</b>

**Table 2.** Occupation at the Time of Death

Occupation	Frequency	Percent
Civil servant/Employee	35	12.7
Teaching/Lecturing	6	2.2
Trading/Business/Self-employed	68	24.7
Retired/Unemployed	32	11.6
Artisan	19	6.9
Student/NYSC	28	10.2
Driving/Motorcyclist	16	5.8
Clergy	4	1.5
Farming	20	7.3
Professional	9	3.3
Not documented	38	13.8
<b>Total</b>	<b>275</b>	<b>100.0</b>

**Table 3.** Duration of Symptoms Before Presentation

Duration (hours, days)	Frequency	Percentage (%)
<1 hour	13	4.7
1-4 hours	22	8.0
5-8 hours	7	2.5
9-12 hours	2	.7
13-24 hours	17	6.2
2-4 days	26	9.5
5-7 days	14	5.1
>7 days	19	6.9
Not documented	155	56.4
<b>Total</b>	<b>275</b>	<b>100</b>

### 3.2 Managing Teams

One hundred and ninety-one (69.5%) patients were seen and attended to by only emergency room doctors before death, while 84 (30.5%) were reviewed by specialty teams before death. Thirty-six (42.9%) of these 84 patients were managed by the various surgical teams combined and 47 (55.9%) were managed by the medical team. The Obstetrics and Gynaecology team managed only 1 (1.2%). The General Surgery unit managed most surgical patients (n=21, 58.3%). The Neurosurgical team managed 10 (27.8%) patients, 2 (5.6%) by the Oral and Maxillofacial team, while the Urology and Orthopaedics teams managed 1 (2.8%) patient each. Fifteen (5.5%) of the total recorded patients were co-managed by more than one unit.

### 3.3 Co-morbidities

Co-morbid history of the cases was documented in 137 (49.8%); 70 had no pre-existing co-morbidity while 67 had pre-existing co-morbidities. Hypertension and Diabetes were the most common comorbid conditions recorded. Twenty-seven patients had Hypertension while 14 were Diabetic. Eleven patients had hypertension co-existing with either diabetes, peptic ulcers, or a previous stroke.

### 3.4 Specialty Review and Admission before Death

Specialty teams reviewed eighty-six (72.3%) of the 119 admitted cases before death. Seventy-one (82.6%) were non-trauma cases, and 15 (17.4%) were trauma cases. The remaining 33 (27.7%) admitted cases died before various specialty teams could review them. Fourteen (16.3%) patients reviewed by the specialty teams had been admitted and awaiting transfer to the ward before they died. In comparison, 83.7% of patients were still being evaluated at the accident and emergency at the time of death. The median interval from the time of presentation to the accident and emergency and death was 5 hours (IQR, 3 – 6), while the median interval from the time the specialty teams reviewed the patients to death was 6 hours (IQR, 4 – 6). Most patients (n=54, 45.4%) died within the first 8 hours of admission in the accident and emergency. Seventeen patients (14.3%) spent 2 days and above, while 102 patients (85.7%) spent less than two days in the AEU before their death. Table 4 shows the interval between admission and death. Table 5 shows documented constraints in the management of 29 patients, which delayed treatment, admission, and transfer to the ward.

**Table 4.** Correlation Between Time of Review and Death

	SPECIALTY REVIEW BEFORE DEATH	Total		
		Yes	No	
		< 1 hour	1	13
INTERVAL BETWEEN ADMISSION IN A&E AND DEATH	1 - 4 hours	7	16	23
	5 - 8 hours	15	2	17
	9 - 12 hours	12	2	14
	13 - 24 hours	34	0	34
	2 - 4 days	15	0	15
	5 - 7 days	1	0	1
	>7 days	1	0	1
<b>Total</b>		<b>86</b>	<b>33</b>	<b>119</b>

**Table 5.** Management Constraints

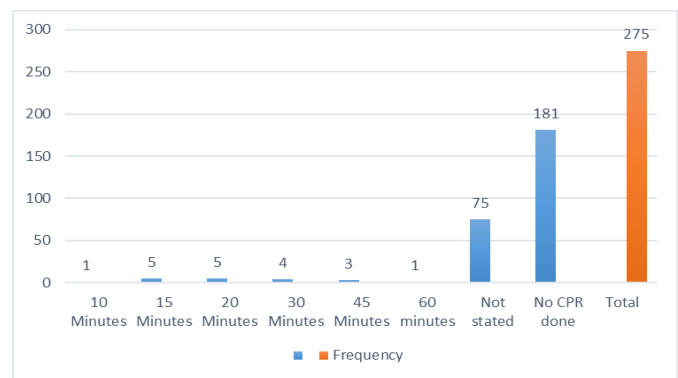
Constraints	Frequency	Percent
Financial constraint	17	58.6
No bed space in HDU	2	7.0
Non-availability of blood	2	7.0
Unconscious patient with no details of medical information	1	3.4
Difficult intubation	1	3.4
Declined surgery	1	3.4
Details of history unknown	4	13.8
Unavailability of ICU	1	3.4
<b>Total</b>	<b>29</b>	<b>100.0</b>

Forty-two (15.3%) of the deaths were trauma related while 233 (84.7%) were not trauma related. More males died from trauma than females (M: F = 7.4:1). The death ratio was also higher in males in the group of the non-trauma deaths (M: F = 1.5:1). Fifteen of the trauma-related deaths were reviewed by the surgical teams. At the same time, 27 were managed by the accident and emergency casualty officers alone. Of the 233 non-trauma deaths, 21 (9.0%) were managed by the surgical teams, 47 (20.2%) by the medical team, and only 1 (0.4%) was managed by the obstetrics and gynaecology team. The remaining 164 (70.4%) were seen only by casualty officers in the accident and emergency, most of whom were brought dead (n=134, 57.5%). Twenty-two (14.1%) of the patients who were brought in dead, died from trauma.

The most common causes of death were stroke (5.5%), head injury (3.3%), heart failure (3.3%), shock (2.9%) and intestinal obstruction (2.5%). Diabetes, chronic liver disease, sepsis, and upper gastrointestinal tract bleeding were the causes of death in 5 (1.8%) patients each.

**3.5 Cardiopulmonary Resuscitation**

Ninety-four (34.2%) patients received cardiopulmonary resuscitation (CPR) at the time of cardiac arrest, while 181 (65.8%) did not. The duration of CPR was not documented in 75 of the 94 patients who received CPR. Figure 1 shows the duration of each CPR before the patients were confirmed dead. None of the patients had an autopsy done.



**Figure 1.** Duration of CPR

**4.0 DISCUSSION**

Deaths can occur in AEU, and this usually results from trauma or non-traumatic emergencies. The number of patients brought in dead (BID) in this study was significantly high, accounting for 56.7% of the total deaths. Thus making BID the leading form of death in the AEU at the Ekiti State University Teaching Hospital. There is no global average incidence of patients brought in dead to the hospital, probably because most patients brought in dead to the hospitals are usually not recorded as hospital deaths and as such does not attract any medical responsibility from the hospital [6, 7]. Several reported incidences of BID are much lower than we found in our study. The reasons for this could be that people’s attitudes towards prompt presentation at the hospital when ill varies from place to place. Ekere et al. [4] reported an incidence of 10.4%. Chukuezi in Orlu, Imo State, Nigeria reported 19.93% [8]. While Verner N. Orish et al., [7] reported 31%. In centers with very well-established emergency pre-hospital care systems, the incidence of patients brought in dead to an accident and emergency is often less than 2% [9]. There is no consensus definition of Brought-in-Dead (BID) or Dead-On-Arrival (DOA)

[9]. However, Bove DG et al defined BID as “people who have died unexpectedly at home, in the street, at work, in traffic, or on their way to the hospital” [10]. BID cases are most often related to prehospital factors and indicate delays in promptly providing adequate health care [5, 11, 12]. Many patients in our environment do not seek hospital care early enough when they are ill. Instead, they use alternative treatment options, which usually include herbal medications, self-medication, faith, and spiritual healing. However, these patients die in the hospital dead when the illness becomes severe. Some only present to obtain a death certificate from the hospital to make claims. Most of the BID cases in this study were due to non-traumatic causes (85.9%, n=134), whereas only 14.1% (n=22) were a result of trauma. This agrees with the study by Oluseyi Adegoke *et al.*, [2] who reported cardiovascular disease as the most common cause of BID. While we recorded BID as the leading cause of death in this study, Chukuezi and Nwosu [8] reported BID as the 2nd leading cause of death.

The mean age at death of the patients in this study is 50.8 years, close to the current average life expectancy in Nigeria of 54.44 years [13]. This signifies that at least half of the deaths cannot be considered untimely or premature. The mean age of deaths in the accident and emergency reported in the literature varies and, in most cases depends on several factors including the population of patients studied, whether deaths result from trauma alone, deaths from non-trauma causes, or the overall death rate from both trauma and non-trauma causes. This study’s death rate of 3.6% is consistent with most of the studies reported locally and internationally, with reported death rates of less than 5% [3, 14–19]. However, other studies have reported significantly higher death rates [20–23].

One hundred and thirty-five (49.2%) patients stayed longer than one day at home from the onset of symptoms before presenting to the hospital. Delays in receiving medical attention during emergencies are known to affect outcomes adversely and sometimes result in death. However, the severity of the illness is the ultimate determinant, and early presentation and treatment increase the chances of survival. In our environment, certain factors contribute to delays in hospital presentation. These include poverty, cultural and religious beliefs regarding alternative medical treatment, poor or inadequate transportation, and ignorance.

This study’s leading causes of death were non-trauma emergencies, accounting for 84.7% of all deaths. Stroke and heart failure were the most common non-trauma causes of death. This was not surprising, as hypertension was the most documented comorbid condition recorded in the study, and stroke and heart failure are long-term complications of hypertension. Many studies have also reported non-trauma emergencies as the leading cause of death in the AEU [16, 17, 19, 20, 24] with stroke and other cardiovascular diseases being the most common among the non-trauma causes [2, 14, 16, 18, 20–22], [25]. In general, most previous studies agree that the death rate from trauma is higher in males than in females [8, 26–29]. In this study, the male-to-female death ratio from trauma was 7.4:1. The mortality rate was also higher for males in the non-trauma group (M: F = 1.5:1). Head injury accounted for most of the trauma-related deaths followed by haemorrhagic shock. Both result from road traffic crashes. This corroborates the findings of previous studies that reported road traffic crashes as the most common cause of trauma-related deaths recorded in the AEU [3, 4, 17, 27, 30–33]. Overall, there were more traumatic surgical deaths than non-traumatic surgical deaths.

Most deaths were recorded within the first 8 hours of admission for patients who were alive in the emergency room. Factors that could contribute to this include a late presentation to the hospital, the severity of the illness, the clinical skills and competency of the first team of doctors who attend to the patients, and the quality of available facilities in the hospital. The quality of care received at the accident and emergency is an index of the standard of health care provided by the hospital. Equipping the emergency room with standard facilities significantly helps in reducing mortality rates [34, 35]. However, the severity of illness at presentation and the caliber and experience of the doctors working in the emergency room (ER) have a direct relationship with attendant mortality [36, 37].

Seventy-two patients were still being evaluated in the ER at the time of death and were not admitted to the ward. The reasons for these delays were: - some of the patients were brought in without relatives and had nobody to take responsibility for their treatment. In contrast, others had financial constraints and couldn’t perform baseline investigations. In some cases, there were no free beds available in the ward or high dependency unit (HDU) for admission, so the patients were waiting to be admitted. Some patients were unable to undergo a CT scan. Where



everything is optimal, a patient ordinarily should not stay too long in the accident and emergency before being transferred to the ward or provided with definitive care. One hundred and two patients spent less than two days in the emergency room before their death while 17 patients spent more than two days before death.

Cardiopulmonary resuscitation (CPR) was performed at the time of cardiac arrest in 94 (79%) patients who presented to the ER alive, but the duration of CPR was not documented in 75 patients. Therefore, it was difficult to determine whether these patients received CPR. However, 11 of the 19 patients whose CPR was documented lasted for less than 30 minutes, which might not have been sufficient to revive the patients effectively. These findings show that most doctors working in the emergency room may not be competent in performing CPR.

The recorded causes of death were mainly clinical, as no autopsy was performed for any of the patients, even though many of the deaths qualify to have a coroner's inquest. Most people in our environment refuse autopsies even when the circumstances surrounding the deaths are such that they need to be investigated. The reasons for this refusal are related to religious and cultural beliefs. Therefore, the exact causes of death are unknown, and the issued death certificates might not be representative of the true causes of death. The information/knowledge that could have been obtained from the autopsy was also lost.

This study aimed to determine the causes and patterns of death at the accident and emergency department of Ekiti state university teaching hospital. The study found that patients brought in dead (BID) was the leading type of death with an incidence of 56.7% and, the overall mortality rate recorded was 3.6%. Non-traumatic medical conditions accounted for most of the diagnoses leading to death. For the deaths resulting from trauma, head injury and haemorrhagic shock from road traffic crashes were the predominant causes of death. These findings corroborate those of previous studies.

Another important finding in this study was that more deaths occurred within the first 8 hours of presentation at the AEU. At the time of cardiac arrest, most of the patients had inadequate cardiopulmonary resuscitation. These findings provide insight into the need for proper training in emergency care medicine for doctors employed in accidents and emergency units. In addition, the fact that no autopsy was performed for any of the pa-

tients makes the exact causes of death challenging to ascertain, especially for those brought in dead.

In general, this study certainly added to our knowledge of the pattern of deaths in our AEU. It will be of immense value in planning to improve the quality of services provided at the AEU.

### Conflicts of Interest

The authors declare that there is no conflict of interests.

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### Authors' Contributions

**IAK** assembled the research team, created the study design, contributed to data collection, data analysis tools, analysis of data and writing of manuscript. **MBY** conceived the study idea and contributed to study design.

**AAA** contributed to data collection and helped to input the data into the excel spreadsheet before importing it to SPSS. **CAW** helped in doing literature review. All authors approved the final copy of the manuscript.

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