Mortality Patterns in the Accident and Emergency Unit of Rivers State *University* Teaching Hospital

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Abstract
The Accident and Emergency Department (AED) is the primary entry point into health institutions, providing insights into disease burden, patient outcomes, and quality of care. This study assessed the mortality pattern in the AED of Rivers State University Teaching Hospital (RSUTH). This was a retrospective review of mortality records from both the Children Emergency Room (CHER) and Adult Emergency Unit (AEU) of RSUTH between January and December 2024. Data on patient demographics, causes of death, and duration of stay before death were extracted from medical records and nurses' registers. The results show that out of 5,035 admissions during the study period, 588 patients (11.7%) died, comprising 90 (15%) in CHER and 498 (85%) in AEU. The male-to-female ratio was 1.2:1, with 53% male deaths. Mortality was highest among patients aged 60–79 years (33%), followed by 40–59 years (31%) and 20–39 years (12.5%). Cardiovascular diseases were the leading causes of death (32%), followed by infectious diseases (26%) and other non-communicable diseases (24%). Chronic kidney disease accounted for most deaths related to sugar-related conditions (11%). Most deaths occurred within 24 hours of admission (46.2%). Patients with cardiac-related diseases had the highest fatality risk, being 16 times more likely to die compared with other conditions. Mortality in the AED of RSUTH was substantial, with cardiovascular diseases as the leading cause and middle-aged to elderly patients most affected. The high proportion of deaths within 24 hours highlights the need for early intervention and improved emergency care services. The study recommended among others that, healthcare system should be strengthened through strengthening emergency response systems which will enhance the capacity of healthcare personnel through targeted training.

Keywords: Accident, Emergency, Department; Length of Stay; Mortality

Introduction
The Accident and Emergency Department (AED) plays a pivotal role in providing urgent medical care and serves as an important source of information on disease burden, patient outcomes, and healthcare system performance. At Rivers State University Teaching Hospital (RSUTH), the AED comprises the adult Emergency Unit (AEU) ant the Children's Emergency Room (CHER), both of which manage diverse emergency presentations daily.
Despite its critical importance, mortality in AED remains a significant public concern. Understanding these mortality patterns provides essential evidence for policy formulation, system strengthening, and improving patient outcomes. Previous studies in Nigeria have reported varying mortality rates influenced by delayed presentation, underlying comorbidities, inadequate pre-hospital care, and the burden of communicable and non-communicable diseases (Akhiwu et al., 2002; Olusegun-Joseph et al., 2021; Eze et al., 2020; Ugare et al., 2012).

Aim of the Study
The aim of the study was to assess the mortality pattern in the Accident and Emergency Department of RSUTH from January to December 2024.

Specific Objectives
a.   To determine the mortality rate in the Adult and Children Emergency Units of RSUTH.
b.   To describe the demographic characteristics (age and gender) of patients who died in the AED.
c.   To identify the major causes of mortality in the AEU and CHER.
d.   To assess the length of hospital stay prior to death among patients.
e.   To compare mortality risks across major disease categories.

Materials and Methods
This descriptive, retrospective study reviewed all mortality cases recorded in the AEU and CHER of Rivers State University Teaching Hospital (RSUTH) from January to December 2024.

Study Population
The study population comprised all patients admitted into the AEU and CHER during the study period. A total of 5,035 admissions were recorded.

Sample Size
The sample size consisted of all patients who died while on admission in the AEU and CHER between January and December 2024. A total of 588 mortality cases met the inclusion criteria.

Data Collection
Data were extracted from patients' case notes and the mortality register, including demographic information, causes of death, and length of stay before death.

Data Analysis
Data were analysed using simple descriptive statistics (SPSS version 23) and presented as frequencies and proportions.

Results
    The findings of this study are presented in alignment with the study objectives.

The Mortality Rate
A total of 5,035 patients were admitted into the Accident and Emergency Department during the study period, comprising 1,246 admissions in the Children Emergency Room (CHER) and 3,789 in the Adult Emergency Unit (AEU). Of these, 588 patients (11.7%) died while on admission in the AED. Male deaths accounted for 53% (309 deaths) while females accounted for 47% (279 deaths), giving a male-to-female mortality ratio of 1.2:1. The gender distribution of mortality for 2024 is illustrated in Figure 1.
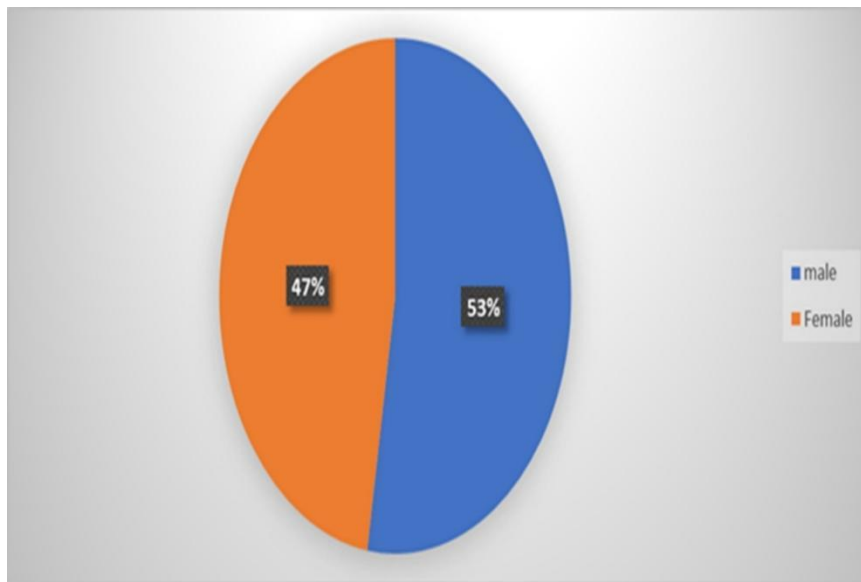
Figure 1: Gender Distribution of Mortality in the Emergency Department

Age Distribution of Mortality

The highest number of deaths recorded in the Accident and Emergency Department occurred among patients aged 60–79 years, accounting for 193 cases (33%). This was followed by the 40–59 years age group with 182 deaths (31%), and the 20–39 years group with 74 deaths (13%). Other age categories in descending order of mortality were: 80–99 years (41 deaths; 7%), 29 days–11 months (37 deaths; 6.3%), 1–4 years (33 deaths; 5.6%), 10–19 years (17 deaths; 2.9%), 5–9 years (9 deaths; 1.5%), and 100+ years (2 deaths; 0.3%). These details are presented in Table 1 and illustrated in Figure 2.

Table 1: Admission and Mortality in the Emergency Department (Jan. to Dec., 2024).

| Admission				Mortality		
Age Group	CHER	AEU	Total Admission	CHER	AEU	Total Deaths (%)
0 – 28 days	36	0	**28**	0	0	**0 (0)**
29 days – 11months	365	0	**342**	37	0	**37 (6.4)**
12 months – 59 months	417	0	**385**	33	0	**33 (5.6)**
5 – 9 years	198	0	**182**	9	0	**9 (1.5)**
10 -19 years	230	116	**313**	11	6	**17 (3)**
20- 39 years	0	923	**806**	0	74	**74 (12.5)**
40 – 59 years	0	1285	**1138**	0	182	**182 (31)**
60 – 79 years	0	1248	**1143**	0	193	**193 (33)**
80 – 100 years	0	217	**182**	0	43	**43 (7)**
Total	**1246**	**3789**	**5035**	**90**	**498**	**588**
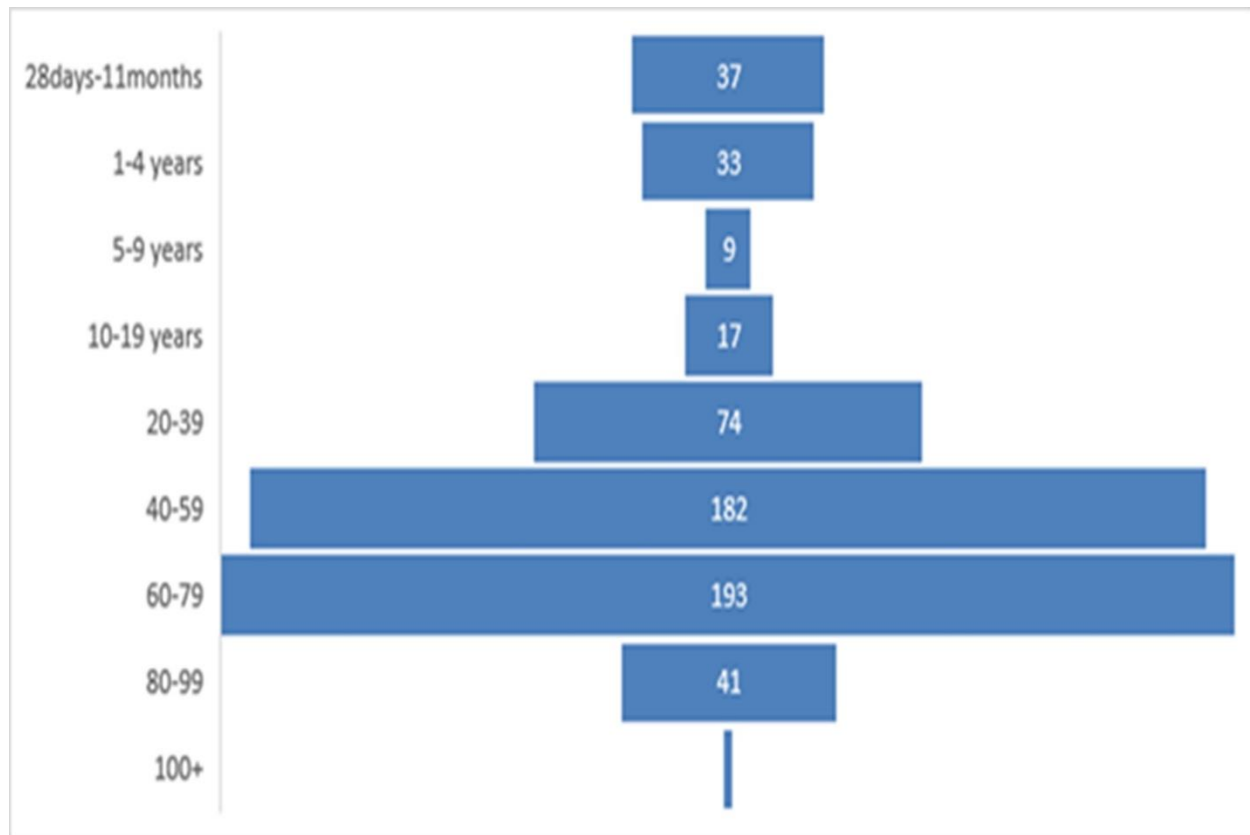
Figure 2: Age Distribution of Deaths in the Emergency Department

Causes of Mortality in the Adult Emergency Unit (AEU)
The five most frequent causes of death in the Adult Emergency Unit (AEU) were: cardiovascular diseases (CVD), 93 cases (19%, most frequent among the 40–79 years age group, accounting for 84%); retroviral disease (RVD)-related conditions, 46 cases (9.2%, predominantly among the 20–59 years age group, 67%); sepsis, 43 cases (8.6%, most common among patients aged 60–79 years, 56%); cerebrovascular accident (CVA), 39 cases (7.8%, mainly between ages 40–79, 90%); and hyperosmolar hyperglycemic state (HHS), 34 cases (6.8%, with 70% occurring in the 40–79 years age group). Details of the causes of death in the AEU are presented in Table 2.

Table 2: Causes of Deaths in the Adult Emergency Unit (AEU) from Jan. – Dec., 2024

Causes of Deaths	10-19yrs	20-39yrs	40-59yrs	60-79yrs	80-100yrs	Total
Cardiac- related Deaths						
Cardiovascular Diseases	2	2	39	39	11	**93**
Cerebrovascular Accident	0	3	18	17	1	**39**
Congestive Cardiac Failure	1	1	5	9	1	**17**
Hypertensive Heart Diseases	0	0	3	4	2	**9**
Repeat Stroke	0	2	0	3	1	**6**
Hepatitis B	0	0	2	1	0	**3**
Heart Failure	0	0	0	2	1	**3**
Cardio pathology	0	1	2	0	0	**3**
Hypertension	0	2	2	4	1	**9**

Hypotension	0	0	1	1	0	**2**
Acute Confusional State	0	0	0	1	0	**1**
Transient Ischemic Attack	0	0	1	0	0	**1**
Unconsciousness	0	0	1	0	0	**1**
Diabetes-related Diseases						
Hyperosmolar Hyperglycemic State	0	6	13	11	4	**34**
Diabetic Foot Ulcer	0	0	10	6	0	**16**
Hyperglycemia	0	3	4	3	1	**11**
Hypoglycemia	0	1	2	4	0	**7**
Diabetes Mellitus	0	0	0	5	0	**5**
Infectious Diseases						
Retroviral Diseases (RVD)- HIV	2	16	15	9	4	**46**
Pulmonary Tuberculosis	0	2	5	2	0	**9**
Sepsis	0	6	12	29	8	**55**
Respiratory Tract Infection	0	0	2	0	0	**2**
Community Acquired Pneumonia	0	0	0	1	0	**1**
Pulmonary Ulcer disease	0	0	2	0	1	**3**
Non-communicable Diseases						
Chronic Kidney Diseases	0	1	11	7	2	**21**
Head Injury	0	4	4	3	2	**13**
Severe Anemia	1	3	1	6	1	**12**
Acute Kidney Injury	0	3	1	3	0	**7**
Chronic Liver Diseases	0	1	1	3	0	**5**
Pleural Effusion	0	0	2	2	0	**4**
Acute Gastritis	0	0	3	1	0	**4**
Brain Injury	0	1	2	1	0	**4**
Breast Cancer	0	1	1	2	0	**4**
Intestinal Obstruction	0	0	3	2	0	**5**
Upper gastrointestinal bleeding	0	1	1	2	0	**4**
Bladder Cancer	0	0	0	2	0	**2**
Intra-abdominal Tumor	0	1	2	0	0	**3**
Acute coronary syndrome	0	0	0	1	1	**2**
Peptic Ulcer Disease	0	0	2	0	1	**3**
Gun Shot	0	0	1	1	0	**2**
Space Occupying Lesion	0	0	0	2	0	**2**
Meigi's Syndrome	0	0	1	0	0	**1**
Tetanus	0	1	0	0	0	**1**
Metastasis	0	0	0	1	0	**1**
Nephropathy	0	0	1	0	0	**1**
Septic Shock	0	1	1	0	0	**2**
Encephalopathy	0	0	1	0	0	**1**

Gastroenteritis	0	1	0	0	0	**1**
Acute Asthmatic Attack	0	1	0	0	0	**1**
Severe Dehydration	0	1	0	2	0	**3**
Back pain	0	1	0	0	0	**1**
End-stage renal disease	0	1	0	0	0	**1**
Cervical Cancer	0	1	0	0	0	**1**
Pulmonary Embolism	0	0	0	1	0	**1**
Sickle Cell Disease	0	2	0	0	0	**2**
Chronic Osteomyelitis	0	0	1	0	0	**1**
Ovarian cancer	0	0	1	0	0	**1**
Liver Carcinoma	0	0	0	1	0	**1**
Acute Diarrhea	0	0	0	1	0	**1**
Benign Prostrate Hyperplasia	0	0	0	1	0	**1**
Neck Trauma	0	2	0	0	0	**2**
Total	**6**	**73**	**180**	**196**	**43**	**498**

The causes of death were broadly categorized into four groups: cardiac-related diseases accounted for 37% (186 cases) of deaths in the AEU; non-communicable diseases (excluding cardiac issues) accounted for 24% (119), infectious diseases accounted for 23% (113 cases) and diabetes-related diseases accounted for 62 (12%), and this shown in Figure 3.
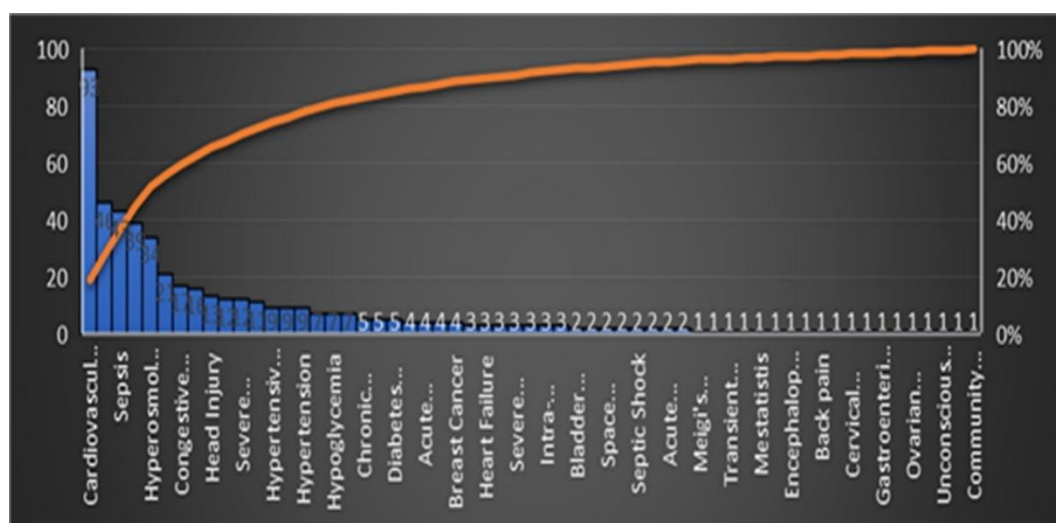

Figure 3: Death Indicators in the Adult Emergency Unit (AEU) for 2024

Causes of Mortality in the Children Emergency (CHER)
The five most frequent causes of death in the Children's Emergency Room (CHER) were as follows: Sepsis accounted for 37 deaths (40.7%), with 84% occurring in children aged 29 days to 4 years. This was followed by bronchopneumonia (9 deaths; 10%), all of which occurred in the same age range. Severe anemia and severe acute malnutrition (SAM) each accounted for 6 deaths (6.7%), also occurring within the 29 days to 4 years age group. Details of these causes are provided in Table 3.

Table 3: Causes of Deaths in the Children Emergency (CHER) from Jan. – Dec., 2024)

Causes of Deaths	29 days - 11months	1 - 4 years	5 – 9 years	10 – 19 years	Total
Cardiac-related Diseases					
Cardiovascular Diseases	0	0	0	1	**1**
Seizure Disorder	1	0	0	1	**2**
Diabetes-related Diseases					
Hyperglycemic Shock	0	1	0	0	**1**
Infectious Diseases					
Septicemia	21	11	2	3	**37**
Retroviral Diseases (RVD) – HIV	2	0	1	1	**4**
Non-communicable Diseases					
Bronchopneumonia	4	5	0	0	**9**
Severe Anemia	3	2	1	0	**6**
Severe Acute Malnutrition	1	4	1	0	**6**
Acute Watery Diarrhea	1	2	0	0	**3**
Severe Malaria	0	3	0	0	**3**
Gastroenteritis	1	1	0	0	**2**
Acute Moderate Dehydration	0	1	1	0	**2**
Intestinal Obstruction	0	0	1	0	**1**
Road Transport Accident	0	1	1	0	**2**
Viral Hemorrhagic Fever	0	1	0	0	**1**
Sickle Cell Diseases	0	0	1	1	**2**
Upper gastrointestinal bleeding	1	0	0	0	**1**
Severe Respiratory Distress	1	0	0	0	**1**
Obstructed Inguinal Hernia	1	0	0	0	**1**
Parotitis Mumps	0	0	0	1	**1**
Cerebral Malaria	0	0	0	1	**1**
Meningitis	0	1	0	0	**1**
Total	**37**	**33**	**9**	**11**	**90**

The causes of mortality in CHER were categorized into four main groups: non-communicable diseases accounted for 43 (48%) deaths, infectious diseases had 41 (46%) deaths, cardiac-related diseases constituted 3% (3 deaths), and diabetes-related diseases such as hyperglycemia had 1% (1 death). This distribution is illustrated in Figure 4.
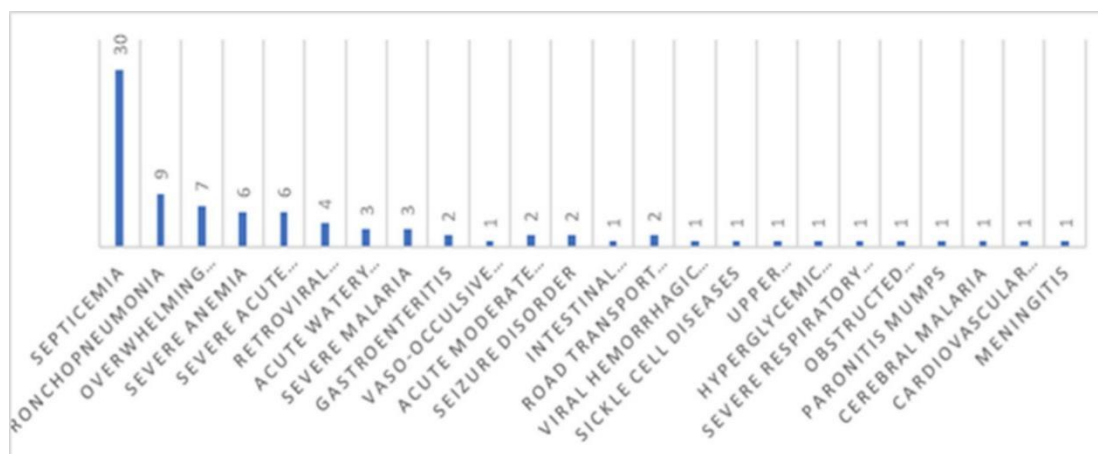
Figure 4: Mortality Indicators in the Children's Emergency Room (CHER) for 2024

Mortality by Length of Stay of the Patients

The majority of deaths occurred within the first 24 hours of admission, accounting for 275 cases (46.8%). This was followed by deaths occurring one day after admission, with 196 cases (33.4%). Additional deaths were recorded as follows: 57 cases (9.8%) on the second day post-admission, 27 cases (4.6%) on the third day, and 35 cases (6%) after more than three days. These distributions are illustrated in Figure 5.
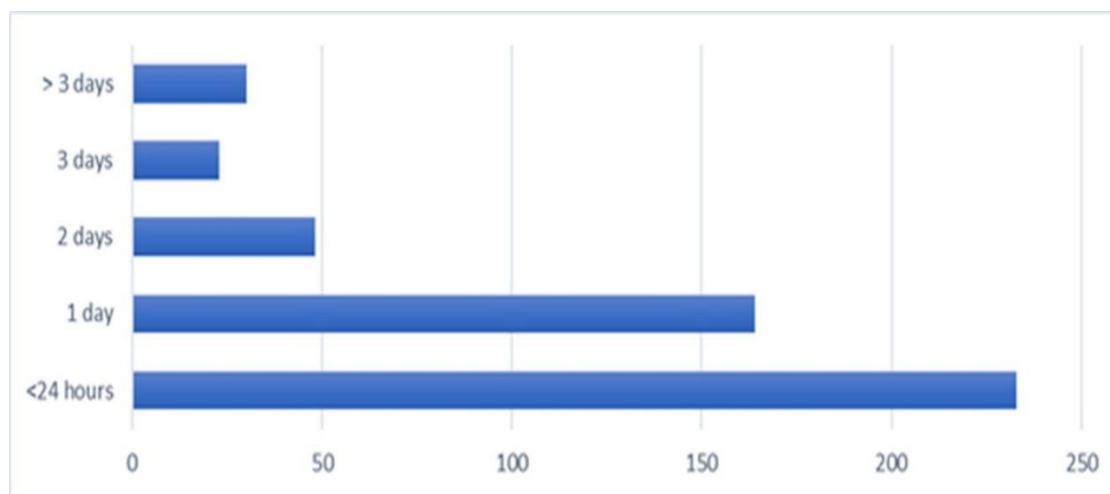

Figure 5: Mortality by Length of Stay of the Patients

Case Fatality Rates of Death Indicators in Emergency Department

The case fatality rates (CFRs) of the specific adult and children's medical emergencies that contributed to mortalities during the period of study are shown in Figure 6. Cardiac-related diseases were the most virulent disease in the department with a CFR of 76.9%, closely followed by diabetes-related diseases with CFRs of 71.3%, and then infectious diseases with CFRs of 45%, and non-communicable diseases with CFRs of 42.3%. The study focuses only on the course of the disorder in the AED.
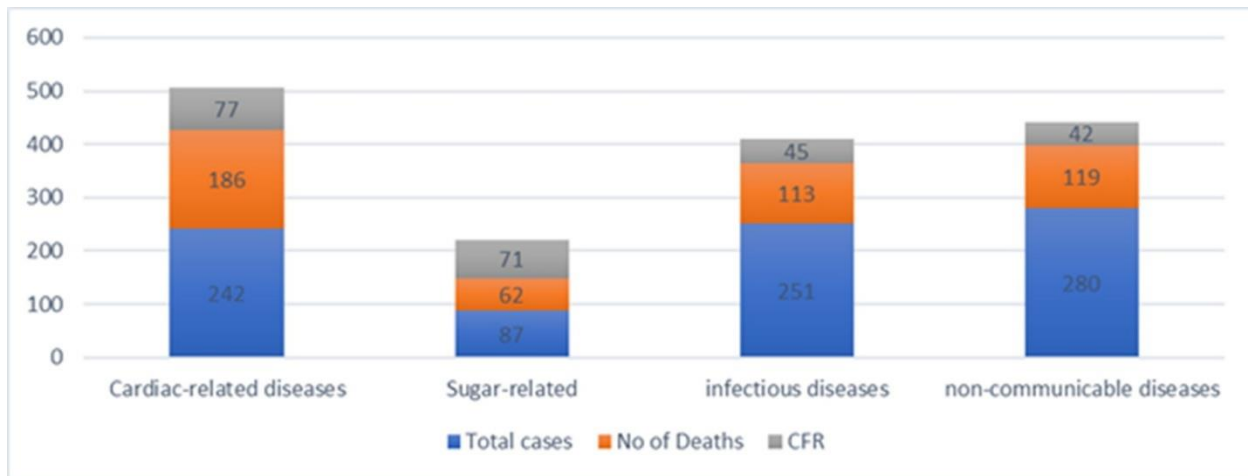
Figure 6: Case fatality rates of emergencies at RSUTH, Jan.-Dec. 2024.

Likelihood of Death in Children and Adult Emergencies
Table 4 revealed the relative risk of death from the emergency department. Patients diagnosed of non-communicable diseases (excluding cardiac issues) and infectious diseases had a double death risk, while those with cardiac-related diseases were 16 times more likely to die. Diabetes-related diseases did not predict mortality in this study ($p > 0.05$, C.I = 0.49-1.93).

Table 4: Likelihood of Deaths from Specific Children and Adult Emergencies

Emergencies (CHER/Adult)	Frequencies		χ^2	P-value	O. R	95% C. I
	Cases	Deaths				
Cardiac-related	242	189	21.02	0.000	16.07	5.76-54.26
Sugar-related	87	63	17.05	0.502	0.87	0.49-1.93
Infectious diseases	251	154	0.531	0.002	1.86	0.53-1.98
Non-communicable diseases	280	141	0.634	0.003	1.87	1.49-3.94

Discussion
This study provides a comprehensive assessment of mortality patterns in the Accident and Emergency Department of RSUTH and highlights critical gaps in emergency care delivery, disease burden, and patient presentation patterns.
The overall mortality rate of 11.7% observed in this study is higher than reports from similar tertiary hospitals in Nigeria, were mortality rate between 2.2% and 7.6% have been documented (Ekere et al., 2005; Rukewe et al., 2015; Onwuchekwa et al., 2008; Olusegun-Joseph et al., 2021). The higher mortality rate in this setting may reflect late presentation, greater disease severity (particularly cardiovascular and retroviral diseases), inadequate pre-hospital care, and the increasing dual burden of communicable and non-communicable diseases.
This study showed a slightly higher male mortality (53%), consistent with findings across Nigeria (Olusegun-Joseph et al., 2021; Ekere et al., 2005). This pattern is often attributed to gender-related differences in risk exposure, such as road traffic injuries, cardiovascular risks, and occupational hazards.
Age distribution revealed that the majority of deaths occurred among the middle-aged (31% of deaths occurred in the 40–59 years group) and the elderly adults (33% in those aged 60–79 years). This aligns with global transitions, where non-communicable diseases increasingly contribute to mortality in developing countries. The substantial deaths among economically productive age groups (40-59 years) highlight the socioeconomic impact of early mortality.
Cardiac-related diseases were the leading cause of death (37%), followed by non-communicable diseases (24%), infectious diseases (23%), and diabetes-related conditions (12%), consistent with findings of Onwuchekwa et al. (2008). This emphasizes the rising burden of hypertension, heart failure, and stroke-conditions often diagnosed late or poorly managed due to inadequate routine screening and limited awareness.

Infectious diseases such as retroviral illnesses, tuberculosis, and sepsis continue to contribute significantly to mortality, especially among younger adults. In this study, rretroviral disease notably affected the 20–59 years age group, while cardiovascular diseases dominated among older adults. These findings underscore persistent challenges in disease prevention, early diagnosis, and treatment adherence.

In the children's emergency unit, sepsis, bronchopneumonia, severe anaemia, and acute malnutrition were leading causes of mortality, reflecting ongoing public health concerns related to poor sanitation, malnutrition, inadequate immunization coverage, and delayed presentation.

Nearly half of all deaths occurred within the first 24 hours of admission, a finding consistent with previous reports (Ekere et al., 2005). This may reflect poor pre-hospital stabilization, delayed referral, or overwhelming disease conditions at presentation.

Case fatality analyses showed cardiac-related diseases had the highest fatality risk (76.9%), with patients 16 times more likely to die, demonstrating the urgency of improving cardiovascular emergency care. Infectious diseases (45%) and non-communicable diseases (42.3%) also showed significantly elevated mortality risk.

Overall, these findings emphasize the need for strengthened emergency systems, improved diagnostic and treatment capacity, enhanced public awareness, and targeted disease prevention strategies to reduce avoidable mortality.

Conclusion

This study revealed a high mortality burden (11.7%) in the AED of RSUTH, driven by both communicable and non-communicable diseases. Cardiovascular diseases accounted for highest proportion of deaths, with patients facing significantly elevated mortality risk. Most deaths occurred within 24 hours of admission, highlighting delays in presentation and gaps in pre-hospital care.

Deaths were most frequent among individuals in their middle and older ages, underscoring the continuing rise of chronic diseases in the region. The burden of sepsis, malnutrition, and respiratory infections among children also reflects persistent public health challenges.

Strengthening emergency services, improving disease prevention efforts, and enhancing early detection and management of critical illnesses are essential steps toward reducing mortality.

Recommendations

The study recommends the following:
1. Public Health Interventions which will promote healthy lifestyles through community education, improve access to HIV testing and counselling and ensure widespread availability of antiretroviral therapy (ART).
2. Health System Strengthening: which will strengthen emergency response systems, enhance the capacity of healthcare personnel through targeted training (particularly in cardiovascular and HIV care) and ensure effective allocation of resources to addressing the leading causes of mortality.
3. Research and Monitoring: establishment of routine monitoring of mortality patterns and causes of death in AED and steady research into healthcare delivery, efficiency and patients' satisfactions within the emergency care will be very crucial in addressing some of the challengers.

Contributions to Knowledge

The following contributed to the knowledge-base
1. Local Evidence Base: it provides current hospital-based data on mortality patterns in Accident and Emergency (A & E) department of Rivers State University Teaching Hospital (RSUTH), filling a critical gap in regional mortality statistics and enabling comparisons with other tertiary institutions in Nigeria and sub-Saharan Africa.
2. Identification of Major causes of Death: the study identifies the leading causes of mortality and the most vulnerable demographic groups, offering insights into the prevailing disease and injury burden in an urban Nigeria setting.
3. Time-to-Death and outcome patterns: by examining the timing and circumstances of deaths within the A&E the research highlights critical windows for intervention and underscores the importance of early presentation and prompt emergency care.

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