# Morbidity and Mortality Pattern in Emergency Paediatric Unit of Mother and Child Hospital Akure, Nigeria

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**Abstract**

**Background:** Morbidity and mortality pattern differs among regions. Also, there may be variations within a nation partly due to availability and cost of health services as well as the health-seeking behavior of the people.

**Aims**: To describe the spectrum and outcome of paediatric medical emergencies in a free integrated maternal and child health facility in south western Nigeria. Also, the likelihood of death from specific diseases in the setting was evaluated.

**Methods**: The data were analyzed using the Software Package for Social Science (SPSS) version 20.0 (Windows Inc; Chicago, IL, USA). Categorized data were presented as percentages. Using inferential analysis, Odds ratio (OR) and 95% confidence interval (CI) were calculated for common disorders as possible predictors of under-five mortality. P-value <0.05 was considered significant.

**Results**: The total number of under-fives admitted in the EPU during the study period was 2361, with a male preponderance (53.5%); 21.3% were neonates (<1month old), 38.8% post-neonatal infants (1-12 months) and the rest (39.9%) aged 13-60 months. The commonest emergencies seen in the unit were severe malaria (31.2%), gastroenteritis (16.9%) and pneumonia (8.6%). The overall mortality rate was low (3.7%) with a majority (96.6%) of deaths occurring in the first 24 hours. The commonest causes of death were infectious. The case fatality rates (CFR's) were as follows: septicemia (38.5%), aspiration pneumonitis (10.5%), meningitis (10.0%), severe malnutrition (7.0%), severe malaria (5.6%), gastroenteritis (4.3%), pneumonia (2.9%) and neonatal disorders (2.2%). The most significant predictors of death were septicemia (OR = 17.06, 95% C.I. = 5.46-53.26) and severe malaria (OR = 1.98, 95% C.I. = 1.29-3.03).

**Conclusion**: Infectious diseases are the leading paediatric emergencies and commonest causes of deaths among under-five children in our hospital. The overall outcome of childhood disorders managed in our cost-free facility compared favorably with findings in fee-paying health systems elsewhere in Nigeria.

*Key words: morbidity, mortality, paediatric emergencies, Mother and Child Hospital*

**Introduction**

The morbidity and mortality pattern of under-five children is improving globally in the last decade.[1] However, the progress is slow in sub-Saharan African due to the high burden of infections and vaccine-preventable diseases.[1,2] In 2013, the under-five mortality rate in low-income countries was 76 deaths per 1,000 live births— more than 12 times the average rate in high-income countries.[1] Worldwide, nearly 1.6 million children under the age of 5 years die of pneumonia annually; 98% of these children who die of pneumonia live in developing countries.[3] According to 2008 estimates, about 177,000 children under the age of five died of pneumonia in Nigeria.[4] This number is highest in Africa and second highest overall in the world.[4] World Health Organization (WHO) estimated that 198 million malaria cases and 584,000 malaria deaths occurred in 2013, with almost 90% of the mortalities being under-five African children.[5] In Nigeria, malaria kills about 250,000 under-fives every year.[6] Despite the gains made with Child Survival Strategies, Roll Back Malaria and other related programs, these disorders remain a major part of childhood emergencies in developing countries including Nigeria, with a significant proportion of deaths occurring at community level before accessing health care.[7-9]

Consequently, the pattern and outcome of childhood disorders seen in emergency departments (ED) varied around the world.[7,10] In developed countries, respiratory

emergencies, childhood poisoning, drowning, accidental and non-accidental injuries are common causes of ED visits.[10-12] The foregoing also account for a significant number of childhood deaths. Conversely, in the tropics, infectious diseases predominate. Obonyo et al in western Kenya reported that 66% of under-five deaths were malaria-related.[13] Similarly, in Gusau Northern Nigeria, Bilkisu et al found that Malaria, sepsis, diarrhea and pneumonia were the major causes of death among under-fives.[14] A two-year review of admissions in the emergency paediatric unit of the University of Benin Teaching Hospital southern Nigeria found that the common indications were malaria (44.4%), respiratory tract infections (17.8%) and gastroenteritis with moderate or severe dehydration (10.1%).[15] Severe malaria accounted for the largest number of deaths (29.4%), followed by meningitis (16.9%) and septicaemia (15.4%) with over 80% of the deaths being from infectious diseases.[15] Also, researchers in other fee-paying centers in Nigeria have confirmed a similar trend.[16,17]

Factors perpetrating poor outcomes of paediatric emergencies are present at community and health facility levels in developing nations.[9,18] The former relates to poverty, ignorance, poor health seeking behavior, malnutrition, as well as unhealthy living conditions, while the latter consists of further delays within health facilities, high cost and absence of quality health care especially to rural dwellers who often constitute over half of the populations.[18] The inefficient primary health

care system and limited emergency medical services further undermine paediatric health indices in Nigeria.[19,20] Hence, there are significant delays both in seeking and receiving health care in childhood emergencies. [8,20]

Therefore, free health care delivery to under-fives can significantly improve childhood survival in resource–limited settings.[21,22] Prior Nigerian reports of morbidity and mortality patterns were from fee-paying health facilities outside our state. However, would the findings differ in free-health programs? In this novel report, we describe the spectrum and outcome of paediatric medical emergencies in a free integrated maternal and child health facility in south western Nigeria. Also, the likelihood of death from specific diseases in the setting is evaluated.

**Methods**

**Study Setting and Participants**

The study was carried out at the Mother and Child Hospital (*M&CH)* Akure. It is a busy 100-bedded (60 obstetrics and 40 paediatric beds), public facility with an ultra-modern Emergency Paediatric Unit (EPU) providing specialized free paediatric services to the state capital and ally communities.

Akure is the state capital of Ondo State, located in the south-west geo-political zone of Nigeria with land area of 15,000 square kilometre and has a long coastal line.

This was a cross-sectional observational survey. Ethical clearance was obtained from the Research and Ethical committee of the *M&CH* Akure. The participants were all consecutive under-five children with medical emergencies from January to December 2013.

**Data Collection**

The demographic and clinical features (such age, sex, diagnosis and outcome) of consecutive patient were documented in a patient log by a trained research assistant over the 12 month period. Patient outcome was documented as discharged (or transferred), died, left against medical advice (LAMA) or absconded. The data

collected were reviewed monthly at the *Hospital General and Health Statistics Meeting*, enhancing its accuracy.

**Data Analysis**

The data were entered into an excel sheet and later analyzed using the Software Package for Social Science (*SPSS*) version 20.0 (*Windows Inc; Chicago, IL, USA*). Categorized data like diagnoses and outcome were presented as percentages. Causes of death and case fatality rates (CFR's) were presented pictorially. Using inferential analysis, Odds ratio (OR) and 95% confidence interval (CI) were calculated for the common disorders as possible predictors of under-five mortality. *P-value <0.05* was considered significant.

## Results

### Demography and Morbidity Pattern of the under-five Children

The total number of under-five children *admitted* at the EPU during the study period was 2361, with a male preponderance (53.5%); 21.3% were neonates (<1month old), 38.8% post-neonatal infants (1-12months) and the rest (39.9%) aged 13-60months. Their maximum duration of admission in EPU was 72 hours before transfer or discharge.

Table 1 shows the spectrum of emergencies seen at the unit during the study. Severe malaria (31.2%) was the commonest, distantly followed by gastroenteritis (16.9%) and bronchopneumonia (8.6%). Least common morbidities were accidental poisoning (0.8%), tetanus (0.6%) and acute exacerbation of bronchial asthma (0.2%).

Table 1: **Paediatric medical emergencies seen at the EPU, M&CH Akure, Jan.–Dec. 2013**

| Emergencies[*] | Frequency | Percentage (%) |
|---|---|---|
| **Pulmonary** | | |
| bronchopneumonia | 204 | 8.6 |
| bronchiolitis | 54 | 2.3 |
| Aspiration pneumonitis | 38 | 1.6 |
| Acute asthma | 5 | 0.2 |
| **Neurologic** | | |
| meningitis | 40 | 1.7 |
| Tetanus | 13 | 0.6 |
| **Digestive** | | |
| Gastroenteritis[‡] | 399 | 16.9 |
| Enteric fever | 7 | 0.3 |
| Severe malnutrition | 43 | 1.8 |
| **Infection** | | |
| malaria[‡] | 121 | 5.1 |
| Severe malaria | 737 | 31.2 |
| Septicemia | 13 | 0.6 |
| **Neonatal** | | |
| prematurity | 197 | 8.3 |
| Neonatal jaundice | 127 | 5.4 |
| Severe birth asphyxia | 19 | 0.8 |
| Neonatal sepsis | 151 | 6.4 |
| **Miscellaneous** | | |
| Accidental poisoning | 19 | 0.8 |
| others | 174 | 7.4 |
| **Total** | **2361** | **100** |

\**Classification was based on their primary diagnoses only in order to avoid multiple entries of the same patient.*

[‡]Gastroenteritis with severe dehydration or shock; *uncomplicated malaria with persistent vomiting or anaemia;*

## General outcome and Causes of Deaths

Altogether, 2234 (94.6%) of the participants were discharged, 17 (0.7%) left against medical advice (LAMA), 9 (0.4%) referred to tertiary health facilities while 13 (0.6%) absconded. The total no of under-five deaths was 88(**3.7%**) with a majority (96.6%) of deaths occurring in the first 24 hours in EPU. All brought-in-dead (BID) cases were excluded.

The leading causes of death in the unit were severe malaria (47%), gastroenteritis with shock/electrolyte derangement (19%) and complicated pneumonia (7%). Septicemia and meningitis contributed 6% and 5% of the mortalities respectively (Figure 1).

Moreover, 9% of the deaths were due to neonatal causes comprising prematurity (5%), sepsis and severe perinatal asphyxia, 2% each (Figure 1).
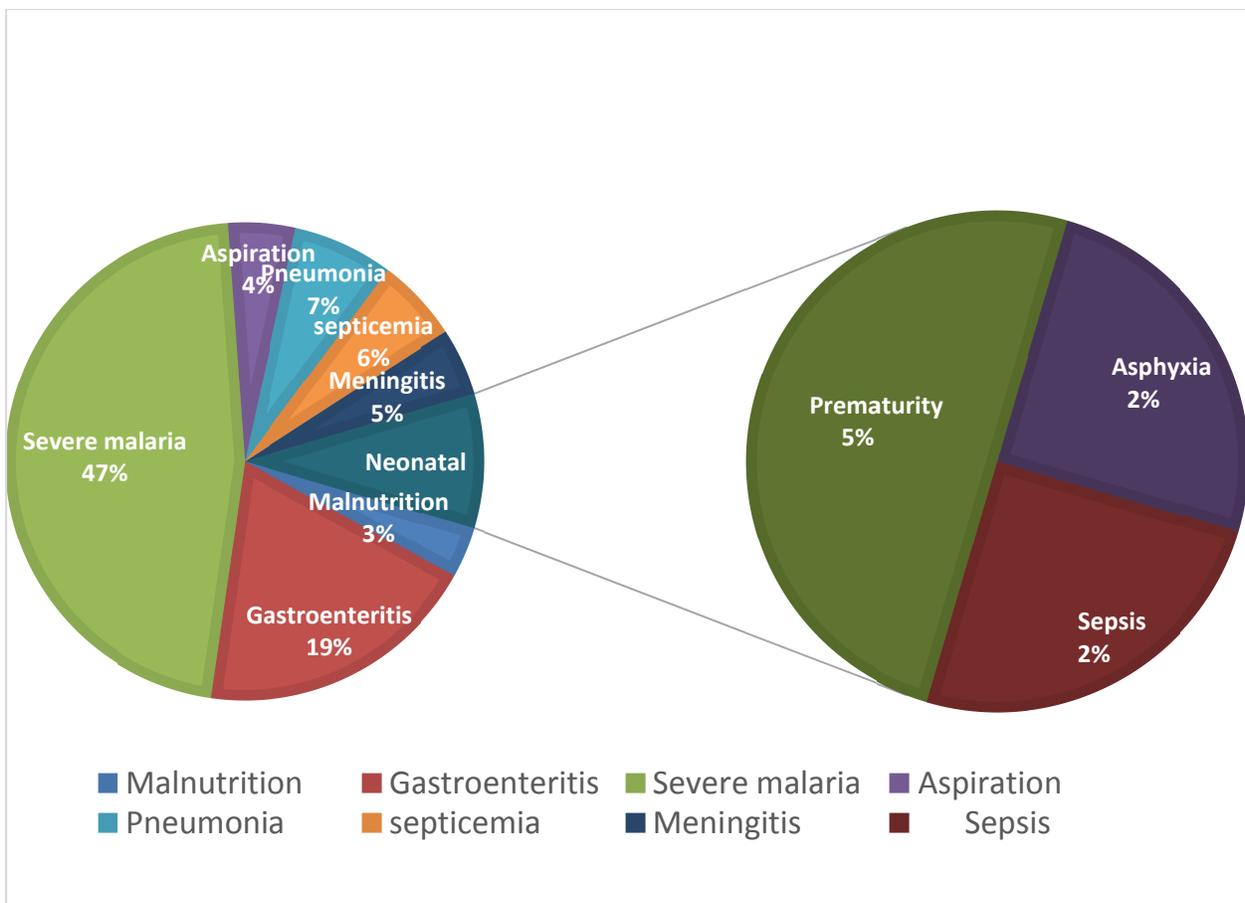


Figure 1: **Causes of death among under-5 children at the EPU, M&CH Akure, Jan.–Dec. 2013**

## Case fatality rates of specific emergencies

The case fatality rates (CFR's) of the specific paediatric medical emergencies contributing to mortalities during the study period are shown on Figure 2. Septicemia was the most virulent disease in the unit with a CFR of 38.5%, distantly followed by aspiration pneumonitis and meningitis with CFR's of 10.5% and 10.0% respectively. The CFR's of the remaining causes of death were as follows: severe malnutrition (7.0%), severe malaria (5.6%), gastroenteritis (4.3%), complicated pneumonia (2.9%) and neonatal disorders (2.2%). The foregoing focuses only on the course of the disorder in the EPU.
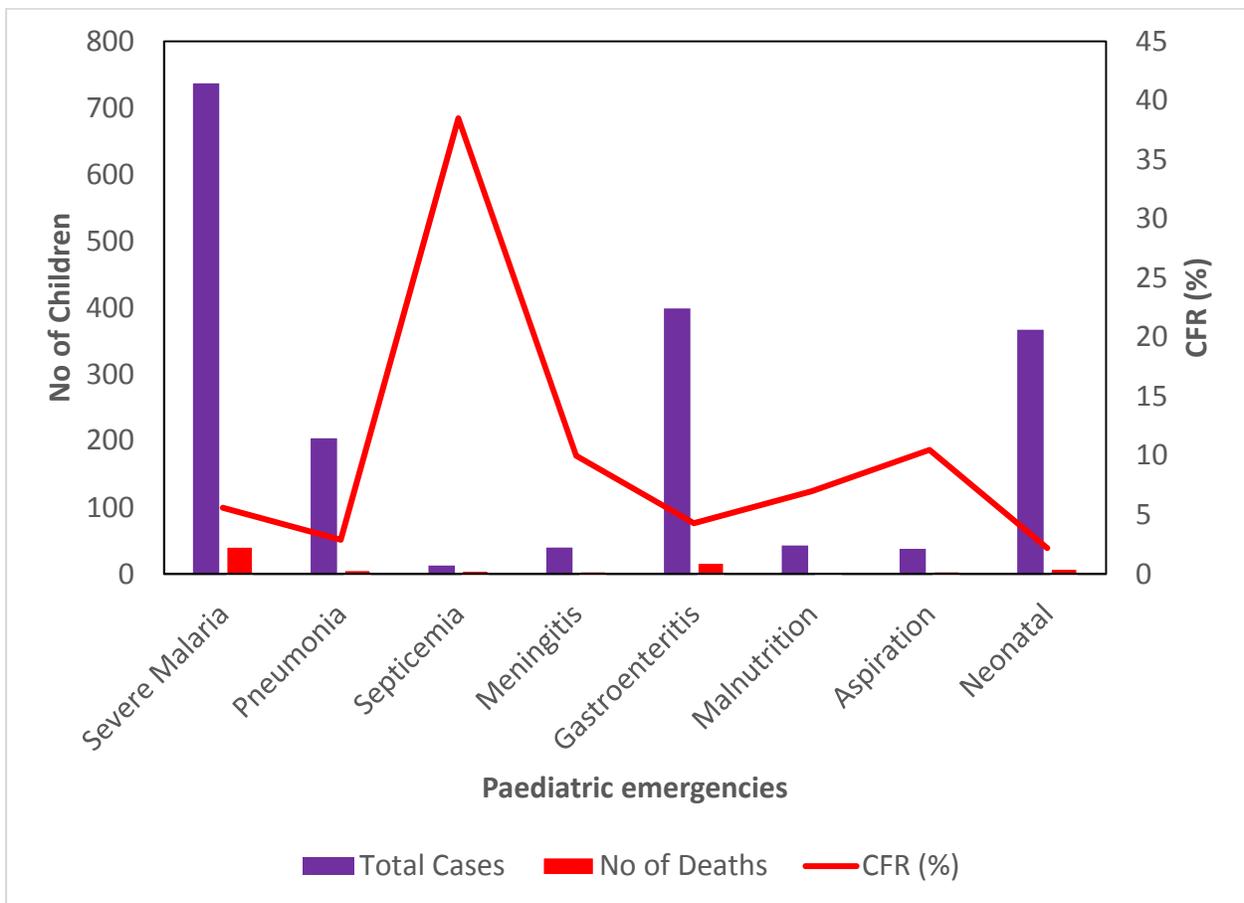


Figure 2: **Case fatality rates of specific emergencies at the EPU, M&CH Akure, Jan.-Dec. 2013.**

**Likelihood of death in EPU**

Table 2 shows the relative risk of death from specific paediatric emergencies in the unit. Compared to others, participants diagnosed of severe malaria or severe malnutrition had a double death risk during the study period while those with septicemia were 17 times more likely to die. Also, the presence of meningitis in a child threatened a poor prognosis in the emergency unit (odds ratio [OR], 2.96; 95% confidence interval [CI], 1.03-8.51). Bronchopneumonia, gastroenteritis and other emergencies did not predict mortality in this cohort ($p > 0.05$).

Table 2: **Likelihood of death from specific paediatric medical emergencies**

| Emergencies | Test, $X^2$ | p-value | O.R. | 95% C.I. |
|---|---|---|---|---|
| Severe malaria | 10.06 | 0.002 | 1.98 | 1.29-3.03 |
| Meningitis | 4.462 | 0.059[‡] | 2.96 | 1.03-8.51 |
| bronchopneumonia | 0.3845 | 0.535 | 0.77 | 0.33-1.78 |
| Gastroenteritis[*] | 0.3807 | 0.537 | 1.19 | 0.69-2.04 |
| Septicemia | 43.95 | 0.000 | 17.06 | 5.46-53.26 |
| Malnutrition[**] | 1.289 | 0.256 | 1.97 | 0.60-6.50 |

*$X^2$ = chi-square test; [‡]Fishers exact test; [*]Gastroenteritis with severe dehydration or shock; **severe malnutrition;*

**Discussion**

This research found that severe malaria accounted for nearly one-third of the emergency department admissions of under 5 children in our facility, consistent with previous reports in malaria-endemic regions.[13-15] Also, this high burden of malaria reflects the low uptake of preventive measures in the setting.[23,24] Other frequent indications for EPU admission were pneumonia and gastroenteritis which are preventable, readily-manageable illnesses, especially in children presenting early to health facilities.[25,26] Expectantly, the introduction of Pentavalent vaccine (containing Diphtheria, Tetanus, Pertussis, Hepatitis B and Haemophilus influenza type b antigens) into the Nigerian routine immunization schedule and the gradual use of Pneumococcal Conjugate Vaccine (PCV) will reduce the burden of pneumonia, meningitis and other childhood disorders in the near future.[27,28] In contrast, infectious diseases are less prominent in developed countries. Unintentional injuries were the leading cause of morbidity and mortality among children in the United States, including drowning, falls, burns, transportation-related injuries, poisoning, and suffocation between 2000 and 2006.[12]

Considering the high turn-over rate in our emergency unit, the overall mortality rate of 3.7% found in this study is remarkable. It is significantly lower than the mortality rate of 10% reported by Anyanwu et al[29] in the children emergency room

(CHER) of Federal Teaching Hospital Abakaliki (FETHA) and 5.8% by Ezeonwu et al[16] in Federal Medical Centre Asaba both in southern Nigeria as well as 11.2% by Bilkisu et al[14] in northern Nigeria. This enhanced survival of paediatric emergencies in our centre is partly due to the consistent adherence to written standard practice guidelines in the unit as well as regular off-the-job training of the frontline staff. The leading causes of death were severe malaria, pneumonia and prematurity-related morbidities, similar to prior reports from fee-paying Nigerian hospital.[14,15] Also, in the Niger-Delta case series, Ezeonwu et al reported that major causes of death were complicated malaria (24.4%), sepsis (19.9%), diarrheal diseases (18.1%) and respiratory tract infections (7.7%).[16] Moreover, the burden of malaria-related deaths due to anaemia is worse in remote settlements possibly due to delays in blood transfusions.  Iloh et al[30] in a rural hospital in eastern Nigeria found that severe malaria anemia-related deaths constituted 81.8% of their mortalities, while Obonyo et al[13] reported it as 53.0% in Western Kenya. Nonetheless, basic interventions like insecticide-treated nets and improved immunization coverage can significantly reduce under-five mortality in the Tropics.[6,7]

The case fatality rate of septicemia was extremely high in this study, partly due to late presentation with septic shock and multi-organ dysfunction syndrome

(MODS). Similarly, fluid refractory decompensated and irreversible stages of shock were present in some children with severe gastroenteritis before admission. Although our facility offers free services, significant delays in accessing health care can occur in some cases presenting from distant communities partly due to the inefficiency or non-existence of patient-transfer systems.[8,20] This highlights the need to restructure our Emergency Medical Services to include prompt ambulance transfer of all acutely ill children from peripheral facilities, comparable to the free transfer of obstetric emergencies in the state.[20,31] Moreover, pre-referral antibiotics and antimalarial use can reduce mortality in young children.[32,33] Nevertheless, provision of paediatric intensive care services at subsidized rates in all secondary and tertiary referral centres in Nigeria may salvage some terminally ill children.

In conclusion, infectious diseases are the leading paediatric emergencies and commonest causes of deaths among under-five children in our hospital. The overall outcome of childhood disorders managed in our cost-free facility compared favorably with findings in fee-paying health systems elsewhere in Nigeria. Hence, our free-health program should emulated to enhance paediatric health indices nation-wide.

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