

# Pattern and outcome of postneonatal pediatric emergencies in Nnamdi Azikiwe University Teaching Hospital, Nnewi, South East Nigeria

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## Abstract

**Background:** Nigeria is still battling with preventable childhood deaths, being one of the six countries in which 50% of all global child deaths occur. Regular community and health facility audits are needed to determine morbidity and mortality patterns in children which will guide preventive and therapeutic interventions.

**Objectives:** The objective was to determine morbidity and mortality patterns, and identify factors influencing poor outcome of the disease in children seen in the emergency room of Nnamdi Azikiwe University Teaching Hospital, Nnewi.

**Materials and Methods:** This was a 2-year retrospective study (March 2012 to February 2014) involving all children admitted into the children emergency room (CHER). Information on the patients' biodata, diagnosis, and outcome were retrieved from the CHER doctors' log. Analysis was done using Microsoft Office Excel 2007 and Statistical Package for Social Sciences version 20.

**Results:** The total of 1964 patients were seen (1088 males, 845 females, 31 unspecified) with a male to female ratio of 1.3:1. Under-fives constituted 78.8% of the study population. Mean duration of illness before presentation was  $18.71 \pm 71.94$  days. Malaria, diarrheal disease, and respiratory tract infections were the most common morbidities. Sepsis had the highest case fatality rate (CFR) and was the most common cause of death among the 247 patients that died – mortality rate of 12.6%. Most deaths were in under-fives (CFR = 13.9,  $\chi^2 = 25.553$ ,  $P = 0.000$ ), with 74.1% of the mortalities occurring within 24 h of presentation. Patients who presented within a day and those that presented in the 2<sup>nd</sup> and 3<sup>rd</sup> weeks of onset of symptoms had CFR of 6.4–15.2%, respectively.

**Conclusion:** Infectious diseases remain a menace in our environment with the eventual outcome worsened by late presentation to an appropriate health facility. There is an urgent need to create public awareness on the need to seek prompt medical attention for sick children.

**Key words:** Emergency, morbidity, mortality, outcome

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## Introduction

It is becoming more obvious as 2015 draws nearer that the health related millennium development goals may not be achieved after all; as many children still die from highly preventable and treatable diseases.<sup>[1-3]</sup> This sad situation is especially rampant in sub-Saharan Africa and South East Asia where most of these diseases are poverty-associated, with the undertones of ignorance, environmental and cultural

factors.<sup>[2]</sup> More than 50% of all these child deaths occur in just six countries worldwide, of which Nigeria is one.<sup>[3,4]</sup>

The world focus seems to be shifting to noncommunicable diseases, like cancer, which have recently been pointed out to be the dominant causes of death and disability

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worldwide.<sup>[1]</sup> However, deaths from infectious diseases and malnutrition have decreased by just about 17% between 1990 and 2010, thus, reducing child deaths by up to 67% by 2015 may not be achievable.<sup>[3,4]</sup>

A regular health facility-based assessment of child health in regard to morbidity and mortality is essential to provide information needed for evidence-based decisions and planning that will positively impact on all children as “growing up healthy should not be a matter of luck, or where you live or how much money you have. It should be a fact.”<sup>[5]</sup> However, studies in Nigeria and other developing countries have documented evidence that economic, social, and political circumstances in which children are born and live, are major determinants of their health, growth, and survival.<sup>[2,6,7]</sup>

A standard emergency room in a resource-poor nation like Nigeria is usually the last resort sought when all other alternatives have failed. It is thus expected that information from this study will be useful as a guide to devise strategies to help reduce childhood morbidity and mortality.

## Objective

The study was aimed at determining the prevalence and patterns of morbidities in children presenting in the children emergency room (CHER) of Nnamdi Azikiwe University Teaching Hospital (NAUTH), Nnewi and identifying factors which may predispose to the unfavorable outcome of mortality in these children.

## Materials and Methods

This was a 2-year retrospective analysis of the records of all children admitted into the CHER of the NAUTH Nnewi from March 2012 to February 2014. This is a major tertiary center in Anambra State and serves as a referral center for all other cadre of hospitals in the state, and other adjoining towns from boundary states, especially Imo and Delta states. Emergency services in the CHER are rendered to all children from the immediate postneonatal period to 18 years who require immediate life-saving resuscitative interventions. Most traumatic injuries are however managed in a separate accident and emergency room of the hospital.

Patients admitted in the CHER are usually seen within minutes by a Trainee Pediatrician (Junior Registrar) and soon after by a senior registrar in pediatrics and/or a consultant. An initial diagnosis is made on patients based on the medical history and the outcome of a thorough physical examination. Certain basic investigations are available bedside, or in the side laboratory which is equipped to run urgently and produce results. Major investigations which may be considered important to save the patients' life, like a

blood grouping and cross-matching and serum electrolytes/urea/creatinine may be gotten from the main laboratory of the hospital within an hour or less of request.

There is an emergency care service for children in the hospital packaged to ensure that indigent patients are given all necessary life-saving medical attention with or without payment within the first 24 h of presentation. After the initial resuscitation and stabilization, patients are either transferred within 24–72 h of admission to the main pediatric wards to continue treatment or discharged to continue out-patient treatment.

Ethical approval was obtained from the Research and Ethical Committee of NAUTH, Nnewi. All patients admitted into the CHER from March 2012 to February 2014 were eligible for this study, thus forming the study population. Children seen as outpatients and those that were brought in dead were excluded. The records that were used included the details of all patients admitted within the stated period as documented in the CHER doctors' log. Information obtained included the patients' socio-demographic variables-age, sex; presenting symptoms in order of development, the duration of illness prior to presentation in CHER, diagnosis, duration of treatment in CHER and outcome. Certain information especially on the biodata was crosschecked in the nurses' record book.

The analysis was done using computer software: Microsoft Excel and Statistical Package for Social Sciences version 20 software packages. Frequency distributions of all relevant variables were represented in tables and charts. Tests of statistical significance were carried out using appropriate statistical tests like the Chi-square to test differences between proportions. The statistical tests were carried out at a significance value of  $P < 0.05$ .

## Results

### Biodata

The total of 2107 patients were admitted from March 2012 to February 2014 in the CHER of NAUTH, Nnewi, with information retrieved on 1964 patients. There were 1088 males and 845 females with a male to female ratio of 1.3:1. The gender of 31 patients was not specified. Under-fives constituted the majority (78.8%) of the study population. Infants alone constituted 47.2% of the study population as shown in Table 1. The mean age of the patients was  $49.9 \pm 112.9$  months.

### Pattern of morbidities

Malaria, respiratory tract infections (RTIs), diarrheal diseases, and sepsis accounted for 58.9% of all admissions within the study period as shown in Table 2. Seventy-six percent of all those with RTI had pneumonia. Other

diagnoses with frequencies are as in Table 2. Disease conditions listed as miscellaneous infections included rabies, bullous impetigo, orbital cellulitis, tetanus, and hepatitis. "Others" included bleeding diathesis, drug reaction, dysmenorrhea, urticaria, and diabetic ketoacidosis. Common associated morbidities included septic shock in 26% of those with sepsis, severe anemia in 14.7% of all the patients, severe dehydration and shock (hypovolemic and septic) in 5.8%, moderate dehydration in 10.5%, and underweight in 4.8% of the patients.

**Presenting symptoms and signs**

Fever was the most common presenting symptom and sign elicited in 1335 (68%) of the patients. Other common ones were fast breathing in 649 (33.1%) and vomiting in 745 (37.9%) [Table 3 and Figure 1]; however, loss of

consciousness in 242 patients (12.3%) and fast breathing were the most common symptoms preceding presentation in the children that died [Figure 2]. Relatively, the presenting symptom with the worst outcome was a loss of consciousness. Out of all those that presented unconscious, 40.9% ended up as mortalities as shown in Table 4. Majority of the patients presented with more than one symptom.

**Duration of illness**

The mean duration of illness before presentation in the emergency room was 18.71 ± 71.94 days ranging from 1 day to 6 years. About 15.1% of the patients presented within a day of onset of symptoms with a total of 50.6% presenting between the 2<sup>nd</sup> and 7<sup>th</sup> days [Table 5]. In the 2<sup>nd</sup> and 3<sup>rd</sup> weeks after onset of symptoms, 18.1% of the patients presented, while 12.3% presented after 3 weeks of onset with 42.3% of these ones actually presenting 3 months after onset of symptoms. Admission into the emergency room on the 1<sup>st</sup> day of onset of symptoms was common in those with accidental ingestion of poisonous substances such as alcohol, organophosphates, and kerosene, out of which 78.3% presented within 24 h of onset/complaint. Other common reasons for 1<sup>st</sup> day presentations were surgical emergencies such as foreign body aspiration, acute severe asthma, and other forms of accidental injuries such as near drowning, car entrapment, and trauma. Within 1 day of onset of symptoms, 14.1%, 12.3%, 7.4%, and 10.8% respectively of those with

**Table 1: Age and gender distribution of patients**

Age	Gender n (%)			Total n (%)
	Female	Male	Unspecified	
Infants	414 (21.1)	500 (25.5)	13 (0.7)	927 (47.2)
Preschool age	266 (13.5)	346 (17.6)	9 (0.5)	621 (31.6)
School-age	106 (5.4)	163 (8.3)	2 (0.1)	271 (13.8)
Adolescents	54 (2.7)	70 (3.6)	1 (0.1)	125 (6.4)
Unspecified	5 (0.3)	9 (0.5)	6 (0.3)	20 (1)
Total	845 (43)	1088 (55.4)	31 (1.6)	1964 (100)

**Table 2: Diagnoses and outcome in the patients**

Diagnosis	n (%)			Percentage of CFR
	Number admitted	Discharged/transferred	Mortality	
Malaria	383 (19.5)	342 (19.9)	41 (16.6)	10.7
Diarrheal disease	347 (17.7)	304 (17.7)	43 (17.4)	12.4
Respiratory tract infections	278 (14.2)	258 (15)	19 (8.1)	6.8
Sepsis	148 (7.5)	91 (5.3)	57 (23.1)	38.5
Sickle cell disease	87 (4.4)	85 (5)	2 (0.8)	2.3
RVD related	74 (3.8)	65 (3.8)	9 (3.6)	12.2
Meningoencephalitis	59 (3)	48 (2.8)	11 (4.5)	18.6
Protein energy malnutrition	57 (2.9)	43 (2.5)	14 (5.7)	24.6
Congenital anomalies	50 (2.5)	44 (2.6)	6 (2.4)	12
Nephropathies	42 (2.1)	35 (2)	7 (2.8)	16.7
Malignancies	38 (1.9)	35 (2)	3 (1.2)	7.9
Neurological diseases*	36 (1.8)	33 (1.9)	3 (1.2)	8.3
Miscellaneous infections**	36 (1.8)	33 (1.9)	3 (1.2)	8.3
Gastritis/PUD	27 (1.4)	27 (1.6)	0 (0)	0
Poisoning	23 (1.2)	21 (1.2)	2 (0.8)	8.7
Accidental and nonaccidental injuries	23 (1.2)	20 (1.2)	3 (1.2)	13
Measles	12 (0.6)	9 (0.5)	3 (1.2)	25
Asthma	13 (0.7)	13 (0.8)	0 (0)	0
Acquired heart diseases	9 (0.5)	7 (0.4)	2 (0.8)	22.2
Surgical emergencies	162 (8.2)	159 (9.3)	3 (1.2)	1.9
Others	51 (2.6)	43 (2.5)	8 (3.2)	15.7
Missing	9 (0.5)	3 (0.2)	6 (2.4)	-
Total	1964 (100)	1717 (100)	247 (100)	12.6

\*Noninfectious neurological diseases like seizure disorders; \*\*Rabies was responsible for all the 3 mortalities; CFR=Case fatality rate; RVD=Retroviral disease; PUD=Peptic ulcer disease

**Table 3: Prevalence of mortality by age of patients**

Age	Mortality n (%)		Total n (%)	CFR	$\chi^2$	P
	Yes	No				
Infants*	147 (59.5)	780 (45.4)	927 (47.2)	15.9	25.553	0.000
Preschool age*	68 (27.5)	553 (32.2)	621 (31.6)	11		
>School age	17 (6.9)	254 (14.8)	271 (13.8)	6.3		
>Adolescents	10 (4)	115 (6.7)	125 (6.4)	8		
Unspecified	5 (2)	15 (0.9)	20 (1)	**		
Total	247 (100)	1717 (100)	1964 (100)			

\*Case fatality for all under-fives was 13.9%; CFR=Case fatality rate  
\*\*p=0.000

**Table 4: Symptoms/signs and the outcome in patients**

Presenting symptoms/signs	Mortality n (%)		Total** n (%)
	Yes	No	
Fever	135 (10.1)	1200 (89.9)	1335 (100)
Vomiting	74 (9.9)	671 (90.1)	745 (100)
Fast breathing	107 (16.5)	542 (83.5)	649 (100)
Diarrhea	69 (13.9)	427 (86.1)	496 (100)
Cough	52 (13.3)	338 (86.7)	390 (100)
Weakness	13 (4)	314 (96)	327 (100)
Convulsion	65 (21.1)	243 (78.9)	308 (100)
Loss of consciousness	99 (40.9)	143 (59.1)	242 (100)

\*\*NB=Multiple symptoms in most of the patients. Total, therefore, exceeds the actual number

**Table 5: Duration of illness before presentation and outcome**

Duration of symptoms	Mortality n (%)		Total n (%)	CFR	$\chi^2$	P
	Yes	No				
1 day	19 (1)	277 (14.1)	296 (15.1)	6.4	157.138	0.000
2-7 days	109 (5.6)	884 (45)	993 (50.6)	11		
8-21 days	54 (2.7)	302 (15.4)	356 (18.1)	15.2		
>21 days	21 (1.1)	221 (11.2)	242 (12.3)	8.7		
Unspecified	44 (2.2)	33 (1.7)	77 (100)	**		
Total	247 (12.6)	1717 (87.4)	1964 (100)	12.6		

\*\*Unspecified duration of illness. CFR=Case fatality rate

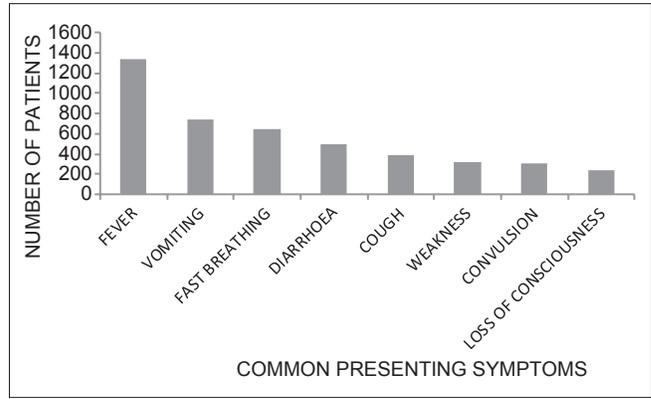
diarrheal disease, malaria, sepsis, and RTIs, presented, while 19.9%, 19.1%, 41.9%, and 36.4% of them, respectively, presented more than a week after onset of symptoms.

**Outcome**

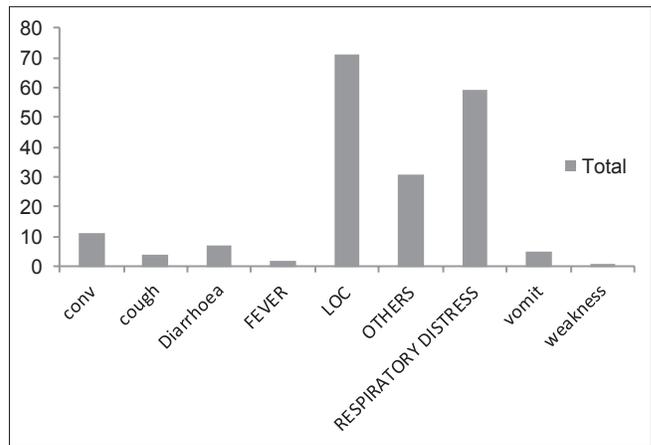
The outcome for all admissions within the period studied is illustrated in Figure 3 with a mortality rate of 12.6%. Most (49%) of the patients were transferred to the ward after initial resuscitation and stabilization for further management by the other pediatric units in the hospital. Apart from 2% that discharged against medical advice, 36% of the patients recovered completely in the emergency room and were discharged home.

**Mortality rate and pattern**

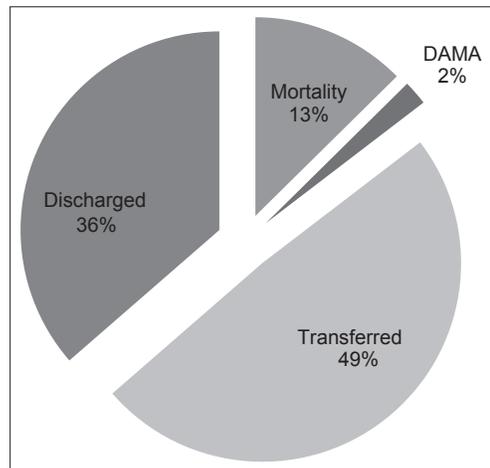
Two hundred and forty-seven patients; 129 females, 118 males, died in the emergency room as shown in Table 3



**Figure 1: Common presenting symptoms (NB: Multiple symptoms in many of the patients)**



**Figure 2: Symptoms preceding presentation in patients that died (NB: conv - Convulsion, LOC - Loss of consciousness)**



**Figure 3: Outcome of admissions**

with a mortality rate of 12.6%. The greater percentage of mortalities (74.1%) occurred within 24 h of presentation. Under-five deaths formed 87% of all the mortalities with a case fatality rate (CFR) among under-fives of 13.9% ( $\chi^2 = 25.553, P = 0.000$ ) [Table 3]. The CFR for adolescents was 8.3% while that for school-age children was

6%. The highest CFR within the age groups was 15.9%, in infancy. The CFRs among the children that presented within 1 day and after the 1<sup>st</sup> week of onset of symptoms were 6.4% and 15.2%, respectively.

Infectious diseases were the most common cause of death in the children with severe sepsis being responsible for 23% of all the mortalities (CFR = 38.5%). Table 2 shows that the malaria, diarrheal disease, and RTIs were the other common causes of death.

## Discussion

The predominant causes of morbidity amongst children presenting in NAUTH pediatrics emergency are infectious and largely preventable diseases. This pattern has been enduring and fairly uniform in Nigeria and other resource-poor nations.<sup>[8-12]</sup> Thus, infectious diseases termed as “most often, diseases of poverty” remain highly prevalent in resource-poor countries in sub Saharan Africa and beyond.<sup>[8-12]</sup> In developed and resource-rich countries, however, the pediatric emergency departments have a higher prevalence of noncommunicable illnesses, injuries and poisoning, than infectious and parasitic diseases.<sup>[13,14]</sup>

The overall mortality rate of 12.6% and the CFR of 13.9% in under-fives in this study are higher than what has been found in developed countries and even, in some local studies.<sup>[10,15]</sup> Put more graphically, at least one out of every 10 patients that presented within the period ended in mortality. In the United States, the 2010 national mortality rate as documented by the Centre for Disease Control and Prevention for patients seen in the pediatric emergency departments was <1%.<sup>[15]</sup> A study in a postneonatal tertiary children emergency center in Benin documented a mortality rate of 4.4% and under-five CFR of 5%.<sup>[10]</sup> Comparable mortality rates of 11.1% and 12.8% were however documented in a tertiary hospital in Lagos, and the recent 2013 Nigerian Demographic and Health Survey, respectively.<sup>[9,16]</sup> These fairly comparable figures underscore the uniformity of the problems in the Nigerian healthcare system.

Preponderance of the deaths occurring within the first 24 h of presentation might be related to the late presentation that was observed from the study with a mean duration of illness prior to presentation of more than 18 days. The CFRs were significantly the least and greatest among patients that presented within the 1<sup>st</sup> day and after the 1<sup>st</sup> week of onset of symptoms, respectively. Being a tertiary center, many were referred when their conditions had become very dire. Other studies from tertiary centers in Nigeria have also documented more than 50% of their mortalities occurring within 24 h of presentation.<sup>[9,17]</sup> It is well-known that critically ill children are usually referred to these teaching hospitals from both private and public health facilities and even prayer houses and tradomedical centers

late in the disease process, after delays and unsuccessful treatments, when the patients have become terribly and inexorably critical, as mortalities would be “bad for their business.”<sup>[12,18,19]</sup> Poor healthcare-seeking behavior, often stirred by poverty and ignorance, is thus a likely contributing factor to late presentation as documented in other Nigerian studies.<sup>[18,19]</sup> The fact that loss of consciousness was the major symptom preceding presentation in the patients that died also points either to delayed seeking of medical attention by the caregivers or lack of prompt referral. Such finding is not limited to this study as in Ilorin, loss of consciousness was also found to be a strong risk factor for death within 24 h of admission with the death of 43.1% of all the patients that were brought in unconscious.<sup>[17]</sup>

The contributors to mortality in this center are a mirror of the morbidity pattern with the highest individual contributor being sepsis. Unsurprisingly too, sepsis also posted the highest disease-specific CFR of 38.5%. Almost half of the patients with sepsis presented more than a week after onset of symptoms. Sepsis which is usually preceded by a primary disease process, was a major contributor to child deaths in a similar study in Enugu 12 years ago but ranked as fourth after severe malaria, RTIs, and diarrheal disease.<sup>[20,21]</sup> In Benin, in 2010, it was the 3<sup>rd</sup> most common cause of mortality behind malaria and meningitis. Even in developed countries, mortality figures in sepsis are often high, and effort is being made globally to contain this disease process.<sup>[21]</sup> Although this study did not encompass the etiopathogenic agents of sepsis, the common organisms often implicated such as *Streptococcus pneumoniae* and *Haemophilus influenzae* are preventable by currently available but sparingly accessed and utilized vaccines.<sup>[22]</sup> Diarrheal disease remains a major cause of pediatric morbidity and mortality and with complicated malaria were, respectively, the second and third greatest killers in the study population. It is both distressing and frustrating that despite the huge campaign and investment in diarrheal and malaria control, they still take this staggering toll on the lives of our children. It may thus be time to research into new frontiers of intervention while consolidating past gains.

The burden of mortality was higher among under-fives within which infants ranked disproportionately highest in this study. This pattern has been reported in a number of other studies.<sup>[9,12,17,20]</sup> This is likely to be related to the relative immaturity and incompetence of their immune systems. This is a premier study in the center and though undocumented, there has been some significant improvement with reduction in overall mortalities in the area of study, following some modification over the past few years in the level of care available to patients in the emergency room and the introduction of emergency care services including drugs and blood transfusion despite nonpayment for services, within the first 24 h of presentation for indigent patients. A daily audit of care rendered to patients in this section of

the hospital has also resulted in the overall commitment to more efficient patient care.

It is regrettable that the majority of our children are still lost to readily preventable and even curable diseases. Proper healthcare-seeking behavior should be addressed through an integrated approach of alleviating poverty and increasing public awareness by promoting health education and encouraging caregivers to present the child to a health facility at the first sign of ill health. The use of alternative treatment like herbal concoctions, gruesome scarification marks amounting to child abuse and battering with no consequence, need to be discouraged. Timely referral culture among doctors working in private hospitals will be of immense advantage to the patient. The current vaccination scheme should be broadened to include vaccines against organisms such as *Rotavirus* and *S. pneumoniae*. Efforts toward development of the malaria vaccine should also be boosted.

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