



## Morbidity and Mortality Pattern of Post Neonatal Admissions into the Children Emergency Room of the Imo State University Teaching Hospital, South East Nigeria

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### Abstract

**Objective:** *The emergency room is a high volume stressful area offering 24 hours service to critically ill patient without prior appointment. It becomes imperative that the emergency room pediatrician should acquaint himself with prevailing disease conditions in that environment to enable him function effectively since most deaths tend to occur within 24 hours of admission. This study was designed to review the pattern of morbidity and mortality in children admitted into EPU of the Imo state university teaching hospital with a view of understanding the factors affecting the mortality rates.*

**Method:** *This is a prospective cohort study of children presenting to the emergency pediatric unit of IMSUTH Orlu. Children were consecutively recruited into the study as they presented to EPU. This study was carried out over a period of 4 years (January 2012- December 2015). Neonates were excluded from this study. Both discrete and continuous variable were measured and presented in frequency tables and bar charts. Test for significance was done using Chi square test. A p- value of <0.05 was considered significance.*

**Results:** *Infectious diseases such as Diarrhea diseases (n=495, 18.7%), malaria (n=460, 17.4%) and sepsis (n=255, 9.5%) continue to be the commonest reason for been admitted into EPU. These were significantly higher in children less than 5 years. Non communicable diseases were significant higher in children more than 5 years. Overall mortality rate in this study is 8.8% with a significant proportion of death occurring in children less than 5 years.*

**Conclusion:** *Infective diseases make up 7 out of 10 commonest reasons why children are admitted into EPU with a mortality rate of 8.8%. Both morbidity and mortality rates are higher in children under 5 years.*

**Keyword:** *Neonatal, Emergency Pediatrics unit, Morbidity, Mortality, infectious disease, child hood disease, IMSUTH.*

## Background

The emergency pediatrics unit in a tertiary health institution such as Imo state Teaching Hospital specializes in emergency medicine, the acute care of children who presents without prior appointment. The emergency room is a high volume, stressful area that offers a 24 hours service. The pattern of childhood diseases varies from region to region around the globe even in same country <sup>[1,2]</sup>. The implication of these variations is that no one regional pattern of childhood diseases can serve as a true representation of the global and national pattern of childhood diseases. Consequently, data on childhood diseases in a country such as Nigeria are aggregates of information obtained from various secondary and tertiary institutions. It is also important that the emergency room pediatrician acquaint himself with the prevailing pattern of childhood diseases in his environment in order to plan and function effectively

The Millennium developmental goal 4 is targeted towards reducing childhood mortality by two thirds by the year 2015<sup>[3]</sup>. Available data has shown clearly that Nigeria has failed to meet this target. Presently, the Under 5 mortality rate in Nigeria is 109 <sup>[4]</sup>. This figure is unacceptably too high hence any meaningful strategy geared towards reduction in childhood mortality in any environment to a large extent should be based on accurate information about the causes of morbidity and mortality and what factors affect the mortality rates in that environment. Several workers in different centers in Nigeria have looked at pattern of mortality in EPU with mortality rates obtained, ranging from 3.5% in Enugu <sup>[5]</sup> to 17.5% <sup>[6]</sup> in Benin. These figures are high when compared with figures obtained from other parts of the world for example, Fallazadeh et al in Iran <sup>[7]</sup> obtained mortality rates of 1.35%. Most of these deaths were noted in most centers to have occurred in the first 24 hours of admission. This study is the first of its kind in this tertiary health facility. It was designed to review the pattern of morbidity and mortality in children admitted into EPU of the Imo state university

teaching hospital and also in generation of baseline data for comparative purposes. Information obtained will help in proper management of children presenting to EPU, serve as an indispensable tool for evaluating the health care services rendered to the populace.

## Methodology

### Study area and population

The study was carried out in the emergency paediatric unit of Imo State University Teaching Hospital (IMSUTH) Orlu. The hospital is located in the South eastern part of Nigeria. It receives referral from the whole of the south eastern part of Nigeria. Geographically, Orlu is situated in the tropical rain forest with 2 main seasons, the rainy and dry seasons. The rainy seasons includes the months of April through October, while the dry season includes the months of November through March. The EPU receives both medical and surgical emergencies in children referred to it from health facilities in the zone and the paediatric general outpatient unit of the hospital. It is open 24 hours of the day and every day of the week. These children are stabilized usually within 48 to 72 hours and then transferred to appropriate children medical unit or for those who have recovered, they are sent home. Acutely sick neonates are immediately transferred to the newborn special care units where they are cared for and hence excluded from this study. The cadre of doctors in the EPU ranges from Consultants to House officers. Other members of staffs include the Nurses and the Ward orderlies.

### Study type

This is a prospective cohort study of children presenting to the emergency paediatric unit of IMSUTH Orlu. Children were consecutively recruited into the study as they presented to EPU. This study was carried out over a period of 4 years (January 2012- December 2015). Neonates were excluded from this study. The only criterion for eligibility was children older than 2 months presenting to the EPU. Each patient was first seen by the house officer and the junior registrar,

followed by a review by the senior registrar and the consultant paediatrician. Diagnosis was made by the attending doctors based on clinical features and available laboratory results. A Questionnaire was filled for each patient recruited into the study. Information requested for in the questionnaire included age, gender, address(rural/urban), mode of referral(who referred the patient), duration of illness before presentation, healthcare provider before presentation(who was managing the patient before presentation), time at presentation, day of the week, month presented, diagnosis, outcome (those who died, those who recovered fully are discharged home, once stabilized those who have not fully recovered are transferred to the ward after 48 hours and those who are discharged against medical advice.) and socioeconomic status (father and mothers education and occupation).

### Data analysis

Statistical analysis was mainly descriptive using the statistical package for social sciences SPSS version for windows. Both discrete and continuous variable were measured and presented in frequency tables and bar charts. Test for significance was done using Chi square test. A p-value of <0.05 was considered significance.

### Results

Over the period of 4 years (January 2012-December 2015), 2,649 children were admitted into the emergency paediatric unit as shown in table 1. These children were aged 2 months to 18 years. About 1991(75.2%) were children aged less than 5 years while the remainder 658 (24.8%) were aged more than 5 years. There were 1,630 males and 1,019 females constituting 61.5% and 38.5% of total admission respectively with a male: female ratio of 1.6:1.0.

**Table i:** Causes of Admission into the Children Emergency Unit

Diagnosis	Frequency	<5yrs	>5yrs	$\chi^2$	p
Diarrheal disease	495(18.7)	450(17.0)	45(1.7)	78.02	<0.0001
Malaria	460(17.4)	380(14.3)	80(3.1)	15.18	<0.0001
Surgical emergencies	359(13.5)	209(7.7)	150(5.7)	64.91	<0.0001
Sepsis	255(9.5)	233(8.8)	22(0.8)	37.91	<0.0001
Pneumonia	169(6.4)	109(4.1)	60(2.3)	10.92	0.001
Broncholitis	118(4.4)	118(4.4)	---	38.95	<0.0001
URTI	98(3.7)	66(2.5)	32(1.2)	3.11	0.0778*
Meningitis	95(3.6)	79(3.0)	16(0.6)	2.79	0.0950**
Seizure disorder	84(3.2)	73(2.8)	11(0.4)	5.58	0.0182
Acute Asthma	64(2.4)	21(0.8)	43(1.6)	61.74	0.0001
FB Aspiration	62(2.3)	57(2.1)	5(0.2)	5.36	0.0206
Sickle cell anaemia	55(2.1)	7(0.3)	48(1.8)	115.42	<0.0001
Measles	40(1.5)	33(1.2)	7(0.3)	0.75	0.3857*
Malignancies	37(1.4)	24(0.9)	13(0.5)	1.70	0.1922*
Tetanus	33(1.3)	8(0.3)	25(1.0)	4.36	<0.0001
Cardiac disease	33(1.3)	18(0.7)	15(0.6)	6.01	0.0147
Severe malnutrition	26(1.0)	22(0.8)	4(0.2)	0.76	0.3848*
Renal diseases	23(0.9)	5(0.2)	18(0.7)	33.13	<0.0001
Childhood poison	21(0.8)	17(0.6)	4(0.2)	0.12	0.7338*
Others	122(4.6)	68(2.6)	54(2.0)	25.71	<0.0001
<b>Total</b>	<b>2649(100.0)</b>	<b>1997</b>	<b>652</b>		

The common indications for admission as shown in table 1 were acute diarrheal diseases (n=495, 18.7%), malaria (n=460, 17.4%), surgical emergencies (n=359, 13.5%) and sepsis (n=255, 9.5%), making up 59.1% of the total admissions. Acute abdomen comprises about 86.0% of the surgical emergencies resulting from road traffic accidents and falls from height.

In terms of age distribution, acute diarrheal diseases, malaria, surgical emergencies and sepsis were significantly commoner in children less than 5 years (p value 0.0001) while acute asthmatic attacks, sickle cell anemia diseases, cardiac diseases, renal diseases and surprisingly post neonatal tetanus were significantly commoner in children older than 5 years (p value <0.0001). One hundred and twenty two children comprising of

4.6% of the total number of admissions did not have a diagnosis.

The childhood malignancy admitted into EPU included Leukemias, Burkitts lymphoma, Nephroblastoma, Neuroblastoma and Osteosarcoma. Collectively, there was no significant age difference between its occurrence in children less than 5 years and those above 5 years.

Renal diseases admitted included severe urinary/tract infection, acute renal failure, acute glomerulonephritis, nephrotic syndrome and chronic renal failure.

The commonest childhood poison seen in EPU was kerosene poison.

**Table ii:** Causes of Mortality in the Children Emergency Unit

Diagnosis	Frequency of Admission	Mortality	CFR	% of total Mortality
Sepsis	255	54	21.2	23.1
Malaria	460	45	9.8	19.2
Bronchiolitis	118	30	25.4	12.8
Pneumonia	169	21	12.4	8.9
Surgical emergencies	359	21	5.8	8.9
Acute diarrhea	495	17	3.4	7.3
Meningitis	95	8	8.4	3.4
Sickle cell Anaemia	55	6	10.9	2.6
Measles	40	6	15.0	2.6
Acute severe Asthma	64	5	7.8	2.1
Tetanus	33	4	12.0	1.7
Renal Disease	23	2	8.7	0.9
Malignancies	37	1	4.8	0.4
Childhood poison	21	1	3.8	0.4
Severe malnutrition	26	1	3.8	0.4
Others	122	12	9.8	5.1
<b>TOTAL</b>	<b>2649</b>	<b>234</b>	<b>8.8</b>	<b>100</b>

**TABLE iii:** Aetiological Factors of Death By Age

Aetiological Diagnosis	Age		Total $\chi^2$	p value	
	<5yrs	>5yrs			
Sepsis	51	3	54	-	0.0017*
Malaria	38	7	45	0.236	0.6272
Broncholitis	30	-	30	-	0.0020*
Pneumonia	16	5	21	0.072	0.7888
Surgical Emergencies	18	3	21	-	0.7728
Acute diarrhea	13	4	17	-	0.7484
Meningitis	5	3	8	-	0.1833
Sickle cell anaemia	1	5	6	-	0.0011*
Measles	4	2	6	-	0.3255
Acute Severe Asthma	1	4	5	-	0.0052*
Tetanus	2	2	4	-	0.1677
Renal disorders	0	2	2	-	0.0363*
Malignances	0	1	1	-	0.0258*
Childhood poison	1	0	1	-	1.0000
Severe malnutrition	1	0	1	-	1.0000
Others	8	4	12	-	0.2523
<b>TOTAL</b>	<b>189</b>	<b>45</b>	<b>234</b>		

$\chi^2 = 93.714$ , df = 1.0 p = <0.0001

In the period reviewed, 234 out of 2649 children admitted into the EPU died giving an overall mortality of 8.8% with an annual mortality ranging from 4.5 to 14.0. A significant proportion (80.8%) of these deaths constituting 189 children were less than 5 years ( $\chi^2 = 93.714$ , p = <0.0001).

As shown in Table 3, major causes of mortality amongst these children were Sepsis (n=54, 23.1%) complicated Malaria (n=45, 19.2%), Bronchiolitis (n=30, 12.8%) and Pneumonia (n=21, 8.9%). Of these 4, only Sepsis and Bronchiolitis showed significant age differences. Bronchiolitis had the highest case fatality rate (25.4), followed by Sepsis (21.2).

In children greater than 5 years, the leading cause of death is Sickle cell anaemia and acute severe asthma (p value = 0.0011).

In terms of monthly distribution of mortalities, the month of February (12.8%) and June (12.4%) recorded the highest number of death. Though more deaths were recorded during the Harmathan period i.e. November to March n= 122 than the rainy season April to October n= 112, this

difference was not statistically significant  $\chi^2 = 0.080$ , p = 0.7767.

‘With regards to outcome, most of the children were transferred to the ward (1265, 47.8%), while 1,054 constituting 39.8% were discharged home.

**Table iv:** Distribution of Admission by Month of Presentation

Month	Average Frequency	% of Total
January	349	13.2
February	362	13.7
March	265	10.0
April	275	10.4
May	217	8.2
June	206	7.8
July	173	6.5
August	96	3.6
September	156	5.9
October	174	6.6
November	218	8.2
December	158	6.0
<b>TOTAL</b>	<b>2649</b>	<b>100.0</b>

**Table V:** Distribution of Mortality by Month of Presentation

Month	Average Frequency	% of Total
January	26	11.10
February	30	12.80
March	20	8.60
April	24	10.20
May	14	6.00
June	29	12.40
July	12	5.10
August	11	4.70
September	14	6.00
October	8	3.40
November	26	11.10
December	20	8.60
<b>TOTAL</b>	<b>234</b>	<b>100.0</b>

$\chi^2 = 0.080$ , df = 1, p = 0.7767.

**Table vi:** Out Come of Children Admitted Into EPU

Outcome	Total	% of Total
Discharge Home	1054	39.8
Transferred to ward	1265	47.8
DAMA	49	1.8
Referred out	47	1.8
Died	234	8.8
<b>TOTAL</b>	<b>2649</b>	<b>100.0</b>



## Discussion

This current study reveals that infectious diseases make up 7 of the 10 commonest diseases. Specifically, diarrhea diseases (n=495, 18.7%) and malaria (n=460, 17.4%) continue to be the commonest reason for been admitted into EPU of Imo state university teaching hospital Orlu, a town situated in the south eastern Nigeria. A review of similar studies done in other centers in the southern part of the country and other parts of the country has shown that the pattern of morbidity and mortality has not changed in the last 14 years. Infectious diseases remain the major problem in this part of Nigeria and most importantly these diseases are preventable. Edelu BO in Enugu <sup>[5]</sup>, Ezeonu BU <sup>[9]</sup> in Asaba and Ndukwu CI in Nnewi <sup>[10]</sup> reported similar pattern of morbidity in children presenting to the emergency paediatric unit in their respective centers located in the south eastern part of Nigeria. Acute diarrheal diseases, malaria, sepsis and respiratory tract infections remained the commonest causes of admission into the EPU in these centers <sup>[5,9,10]</sup>. Several childhood survival strategies designed by the world health organization and handed down to healthcare workers in this part of the world have been put in place to lower both mortality and morbidity in children unfortunately; under 5 mortality rates are still unacceptably high resulting in our inability to achieve the MDGs by 2015. To improve health related goals in this part of the world, healthcare providers need to critically examine these health strategies with a view of assessing their effectiveness and applicability in this part of the world. If after 14 years of implementing these strategies and the pattern of morbidity and mortality has changed little, can healthcare providers in this part of the world truly say that they fully understand the sociodemographic dynamics of these diseases prevalent in our environment, or have we got it all wrong both at conception and at implementation. Do healthcare providers in this part of the globe really take into considerations these cultural differences between countries in the developed and the developing nations of the world and the importance of other

sectors of human activities such as food production, housing, and supply of portable water, good road network and political stability on health? The influence of culture on health is vast <sup>[11]</sup>. It affects perceptions of health, illness and death, beliefs about causes of disease, approaches to health promotion, how illness and pain are experienced and expressed, where patients seek help, and the types of treatment patients prefer. Cultural bias may result in very different health-related preferences and perceptions. Being aware of and negotiating such differences are skills known as 'cultural competence. This perspective allows care providers to ask about various beliefs or sources of care specifically, and to incorporate new awareness into diagnosis and treatment planning. For example it is interesting to note that most cases of seizure disorders admitted into EPU of IMSUTH Orlu, was due to complications of local inter ventory measures instituted at home for the relief of the seizures such as, burning the soles of the feet with fire, instilling crude oil into the Childs eyes, ears, nostrils, anal opening and mouth. Occasionally the child is made to drink the mother's urine. Management strategies for various childhood diseases including various childhood survival strategies needs to be validated for different cultures before implementation if really, we indeed want to reduce U5 mortality rates.

Non communicable diseases continue to play significant role especially in children older than 5 years. Such diseases will include childhood asthma, sickle cell anaemia, seizure disorder, cardiac diseases and renal diseases. They constitute (n=259, 9.8%) of all diseases presenting to EPU. These diseases tend to run a chronic course in children with its attendant clinical and social implication. Presently, because of the significantly greater proportion of infectious diseases burden very little attention has been paid to these groups of childhood diseases. Emordi IJ, Ikefuna AN, Ujunwa FA, Chinawa JM <sup>[12]</sup>, in their study at Enugu has clearly shown the importance of putting strategies in place to control and prevent non communicable diseases in children in

order to avert the tragedy of double burden of diseases.

It is interesting to note that surgical emergencies are the third commonest cause of morbidity in EPU constituting (13.5%, n= 359) of all admission into EPU and significantly contributing to the mortality (n=234, 8.9%) of these children. This is in contrast to their findings in Enugu <sup>[5]</sup> where surgical emergencies contributed to 2.4% of all admission into Children emergency room (CHER) over the same period of 4 years. Acute abdomen is the commonest surgical emergency seen in EPU, usually following motorcycles accidents and occasional falls from height. Motorcycles are the commonest mode of transportation in this environment and it is not surprising to see children numbering up to 4 excluding the cyclist been carried on the same motorcycle. Strict adherence to traffic regulation and enforcement of traffic rules will reduce road traffic accidents and hence reduce mortality rates of children presenting to the EPU.

Infective diseases continue to be the leading causes of death amongst children admitted into the EPU of IMSUTH Orlu. Sepsis, complications of Malaria, Bronchiolitis and Pneumonia are the commonest causes of death amongst these children. Sepsis, defined as life threatening organ dysfunction due to a dysregulated host response <sup>[13]</sup>. Sepsis had the second highest case fatality rate of 21.1; this is a reflection of very poor facilities available for the management of critically ill patients especially antimicrobials which are substandard, with very narrow spectrum of antibiotics to choose from. Support laboratory services are far from been adequate. Early diagnosis of sepsis cannot be overemphasized; hence quick clinical assessment is usually done on all children presenting with infection to the EPU using the Quick SOFA (Sepsis related organ failure assessment) criteria and related laboratory abnormalities in keeping with sepsis <sup>[13]</sup>.

It is worrisome to realize that malaria is the second commonest cause of morbidity in EPU, hence it is important to properly review the multiple malaria control measures with a view of evaluating their

uptake by the general population. Current studies shows that less than 42% of households have only one ITNs and less than 29% of U5 sleep under ITNs <sup>[14]</sup>. Infrastructural development is still very poor with poor drainage facilities, stagnant waters and poor sanitary conditions. However, complicated malaria had significantly lower fatality rates due to improved clinical skills and more efficient protocol for management of severe malaria. Commonest complication of malaria was severe anemia, rapid response to blood transfusion due to presence of functional blood banks and efficient supportive laboratory played a significant role in lowering case fatality rates.

Lower respiratory tract infections such as bronchiolitis and severe pneumonia accounts for a significant proportion of mortality (12.8%), both LRTI requires supportive critical care management. Bronchiolitis had the highest case fatality rate of 25.4. The high case fatality rate re-emphasizes the need for better facilities needed to manage children requiring critical care. Factors such as overcrowding, poorly ventilated homes, inadequate breast feeding and low immunization coverage predispose children to LRTI. Recent introduction of pentavalent vaccine and pneumococcal conjugate vaccine into the routine national programme on immunization active against haemophilus influenza and strep pneumonia will go a long way in reducing LRTIs. Despite the fact that diarrheal disease remains the commonest cause of admission of children into EPU (n=495, 18.7%), its mortality (n=17, 7.3%) and case fatality rate (3.4) was low. The implication of this is rather interesting. While uptake of preventive measures such as provision of clean water, hand washing, personal hygiene and immunization may be low, current clinical approach to management of diarrhea which involves the use of ORS, Zinc tabs, vitamin A and meticulous attention paid to the hydration status of the child may be seen to be highly effective.

In terms of seasonal variation in admission and mortality, more children are admitted and more die during the dry season than the wet season corresponding to more than 52% of the total death



in EPU. This is in keeping with studies done in Enugu and Asaba in the south eastern part of Nigeria as against studies done in Zaria<sup>[15]</sup> and George in Portharcourt<sup>[16]</sup> where more death occurred in the wet seasons. These deaths may be related to the high incidence of acute diarrheal diseases occurring during the dry season resulting in sepsis as a complication.

Most of the children admitted into EPU had favorable outcomes, they were either transferred to the ward (n=1265, 47.8%) or discharged home (n=39.8.39.8%) from the EPU. This justifies the importance of a paediatric unit, specifically set aside to handle critically ill patients presenting to the hospital without prior appointments. Most of the parents singled against medical advice (n=49, 1.8%) as a protest against been transferred to the ward especially when the reason for the transfer is to further observe the child or complete treatment in a child whom the parents feel has recovered significantly. Administratively, these children are made to pay deposits before been admitted into the ward adding to their financial burden. A review of admission policies may to a large extent reduce the incidence of DAMA as is seen in our EPU.

### Conclusion

Majority of children presenting to the EPU are less than 5 years. Infectious diseases continue to make up 7 of the 10 commonest diseases causing children to present EPU. However, non communicable diseases continue to significantly affect these children presenting to EPU especially those older than 5 years. Mortality rate is 8.8% with more than 80% occurring in children less than 5 years. The influence of culture is vast. Health strategies proposed by the WHO geared towards reduction of mortality rates in children should be validated for different cultures. Differences in perceptions towards health issues should be taken into considerations at all aspects of planning and implementation of these strategies.

### Acknowledgement

I acknowledge the support of the Imo state University Pediatrics emergency and the Microbiology laboratory unit of the University Help and assistance towards the accomplishment of this study.

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