Duru C
Paul NI
Peterside O
Akinbami F

CC –BY

Pattern of mortality among Childhood emergencies at the Niger Delta University Teaching Hospital, Bayelsa State, Nigeria

Paul NI, (✉)
Department of Paediatrics,
and child health, University of
Port Harcourt Teaching Hospital,
Port Harcourt, River State Nigeria

Duru C, Peterside O, Akinbami F
Department of Paediatrics,
and child health,
Niger Delta University Teaching
Hospital, Okolobri Bayelsa State,
Nigeria

Abstract: *Background:*
Regular and periodic assessment of pattern of childhood mortality in the Children emergency room (CHER) is important to define common childhood killer diseases, notify responsible authorities and outline measures to prevent and curb them.
Objectives: The aim of this study was to describe the pattern of childhood mortality seen in the CHER of a tertiary centre in the Niger Delta region- Bayelsa State of Nigeria over a 5 year period (1st January 2014 to 31st December 2018)
Methods: The admission records of all the children admitted into the CHER of the Department of Paediatrics of the Niger Delta University Teaching Hospital (NDUTH), Bayelsa State were retrospectively reviewed and analysed.
Results: One hundred and thirty nine out of 1,949children admitted over the study period died, giving a mortality rate of 7.1%.Out of 139 children who died, 88 (63.3%) of them died within 24 hours of arrival at the

hospital. Majority of the deaths, 115 (82.7%) were children under the age of 5 years out of which 51.3% were infants. The common causes of death were septicaemia (34.8%) and severe malaria (34.8%) among the under-fives and meningitis (25.0%) and HIV/TB (20.8%) among those above the age of 5 years. The highest number of mortalities were recorded in the months of February to April and there was a decline in annual mortality rates over the five year period however, this was not statistically significant.
Conclusions: Childhood mortality is high in Bayelsa State especially among the under-fives. Most of the deaths are preventable. Strengthening of the existing programmes such as malaria control practices, good antenatal care, training and retraining of health workers, extension of immunization services beyond infancy and good access to health care services is advocated to reduce Childhood mortality

Key words: Mortality, Children, Emergency Room, Bayelsa, Niger Delta

Introduction

Childhood mortality is an indication of a country's development and portrays its priorities and values.[1]In recent times, childhood mortality has been reported to be on a steady decline globally from 1990 to 2017.[2]However, in Sub-Saharan Africa, it still remains high as 1 in 13 children will still die before their 5th birthday.[2] These childhood deaths have been largely attributed to common childhood illnesses such as pneumonia, diarrhoeal diseases and malaria with malnutrition as an important underlying factor. Studies have shown that majority of these deaths could have been avoided by easily preventable and treatable interventions which are simple and affordable.[2]

In Nigeria, Childhood mortality remains unacceptably high despite the various childhood disease preventive programmes put in place to control the scourge.[3]Various studies done in Nigeria have shown that the major causes of childhood mortality are largely preventable diseases. [4-9] Factors noted to contribute to the high childhood mortalities in Nigeria have been late presentation, unavailability of health services and poor transportation to mention a few.[5-9]

Children, unlike adults are more unlikely to withstand the effect of certain diseases for prolonged periods. Thus, they deserve more immediate attention to enable them have better chance of survival. The CHER provides care for children who require prompt life-saving measures, thus an effective CHER may reduce

childhood mortality.

This study was carried out to describe the pattern of childhood mortality in the CHER at the Niger Delta University Teaching Hospital, Bayelsa State. The information obtained is hoped to contribute to the available data in Nigeria in a bid to assist in policy making and health care reforms.

Materials and methods
Study centre

The Niger Delta University Teaching hospital is located in Okolobri, a semi-urban area in Bayelsa State. It is a referral centre for the surrounding primary and secondary health centres in the locality and also attends to patients from neighbouring states. It is equipped with a twenty bedded Paediatric Emergency room where Paediatric medical and surgical emergencies of children more than 28days and up to eighteen years are attended to and stabilized before onward admission to the Paediatric wards. The CHER is manned by consultants, resident doctors, house physicians and nursing staff who provide twenty four hours inpatient care. Asides manpower, the CHER has basic equipment necessary for resuscitation, stabilization and diagnosis of the common emergencies and this includes electric and manual suction machines, nebulizers, oxygen cylinders, cardiac monitors and a defibrillator, endotracheal tubes, pulse oxymeters, a functional Automated External Defibrillator (AED), side laboratory and a dedicated pharmacy.

Sampling

This was a retrospective study. The admission register, case notes and mortality review registers of the children admitted into the Children's emergency room (CHEW) of the Department of Paediatrics and Child Health of the Niger Delta University Teaching Hospital, Bayelsa State over a five year period(1st January 2014 to 31st December 2018) were reviewed and analysed. All children admitted into the CHER within this period were selected. Data obtained included the socio-demographic characteristics of the subjects, the principal clinical diagnosis, duration of hospital stay before death and the month of admission.

The principal diagnosis was based on the final assessment by the managing unit and as documented after weekly mortality reviews. It was based on the presenting clinical features, with or without the results of laboratory tests. For example, the diagnosis of malaria was confirmed by a positive malaria rapid diagnostic test (RDT) and or by the presence of malaria parasites in the blood film. Patients with respiratory tract infections with or without bronchopneumonia were diagnosed based either clinically or by chest radiographs or both. HIV/AIDS was based on two positive HIV rapid diagnostic tests as recommended by WHO on a patient with features of the WHO clinical case definition of HIV/AIDS in African.[10]Diagnosis of meningitis was based on the

clinical features with or without positive cerebrospinal fluid culture or abnormal biochemical analysis while that of malignancies were based on clinical features, ultrasound report and biopsy results.

Data analysis

The data obtained was entered into an Excel spreadsheet and was analyzed by calculation of means, percentages and ratios. A test of significance between proportions and means was assessed using Chi square and T-test and a p value <0.05was considered significance at 95% confidence interval.

Ethical approval

Ethical approval was obtained from the Research and Ethics committee of the Niger Delta University Teaching Hospital (NDUTH/REC/0049/2017).

Results
General characteristics of the patients that died

A total of one thousand, nine hundred and forty-nine (1,949) children were admitted over the five year period (1st January 2014 to 31st December 2018).There were 1107males and 842females with a male/female ratio of 1.3:1. Over the study period, 139 children died giving an overall mortality rate of 7.1%. Of those who died, 68 (48.9%)were male and 71(51.1%)were female (M: F 0.9:1). There was no statistical significant difference between the sexes (p>0.05)Eighty eight (63.3%) of them died before 24 hours of arrival at the hospital, 24 (17.3%) deaths occurred within 24 - 48 hours of admission and 27(19.4%) deaths occurred after the first 48 hours of admission.

Age and sex distribution of mortality

Out of the 139children who died, 115(82.7%) of the children were less than 5 years old. Out of the under – fives, 59(51.3%) of deaths were infants. Twenty-four (24) children above the age of 5 years died and this constituted 17.3% of the total mortality (See Table 1)

Table 1: Age and sex distribution of mortality

Age at death	Sex		No of deaths
	Male No (%)	Female No (%)	No (%)
1-12 months	28(41.2)	31(43.7)	59(42.4)
>12-60 months	25(36.7)	31(43.7)	56(40.3)
>60 months	15(22.1)	9(12.6)	24(17.3)
	68(48.9)	71(51.1)	139(100.0)

Causes of mortality

Among the children between the ages of 1 month and 5 years, the major causes of death were septicaemia in 40 (34.8%), severe malaria in 40 (34.8%), diarrhoeal dis-

ease in 16(13.9), respiratory tract infections in 15(13.0% and protein energy malnutrition 8(6.9%). Whereas in the children who were above the age of five, Meningitis in 6 (25.0%) and HIV/Tuberculosis in 5(20.8%) were the major causes of death. (See tables 2 and 3)

Table 2: Causes of death in the postneonatal age group less than 5 years old(n-115)

*Cause of death	Age (months)		Total	% Mortality
	>1- 12	>12-60		
Septicaemia	26	14	40	34.8
Severe malaria	15	25	40	34.8
Diarrhoeal disease	12	4	16	13.9
Bronchopneumonia	8	3	11	9.6
Protein Energy Malnutrition	4	4	8	6.9
Paediatric HIV/AIDS	6	1	7	6.1
Measles& Pertussis	3	1	4	3.5
Cardiac conditions	3	0	3	2.6
Meningitis	0	2	2	1.7
Burns	0	2	2	1.7
Malignancies	0	1	1	0.9
Surgical conditions	1	0	1	0.9

*Some had more than one cause of death

Table 3: Causes of mortality in children over the age of 5 years (n=24)

Cause of death	No of deaths	% of mortality
Meningitis	6	25.0
HIV/AIDS±Tuberculosis	5	20.8
Malignancies	4	16.7
Surgical conditions	3	12.5
Tetanus	2	8.3
Sickle cell disease	2	8.3
Burns	1	4.2
Asthma	1	4.2

Note: HIV/AIDS- Human Immunodeficiency Virus/ Acquired Immunodeficiency Syndrome

*Annual and monthly pattern in mortality rate*

There was no significant decrease in the annual mortality rate over the years (Table 4, 4a and 4b).Majority of the admissions occurred in the months of April to May though there was no significant increase in mortalities over the months (Fig 1)

Table 4: Annual admissions and mortalities (2014-2018)

Year	Admissions		Total	Deaths		Total	Mortality rate (%)
	Male	Female		Male	Female		
2014	280	198	478	22	16	38	7.9
2015	264	216	480	18	16	34	7.1
2016	140	111	251	8	14	22	8.8
2017	210	168	378	11	17	28	7.4
2018	213	149	362	9	8	17	4.7
Total	1107 (56.8)	842 (43.2)	1949 (100.0)	68(48.9)	71(51.1)	139 (100.0)	7.1

P-value = 0.96, 2 =0.002 (admissions); p-value = 0.24, 2 =1.366 (mortality)

Fig 1: Monthly admissions and mortality rate (2014-2018)
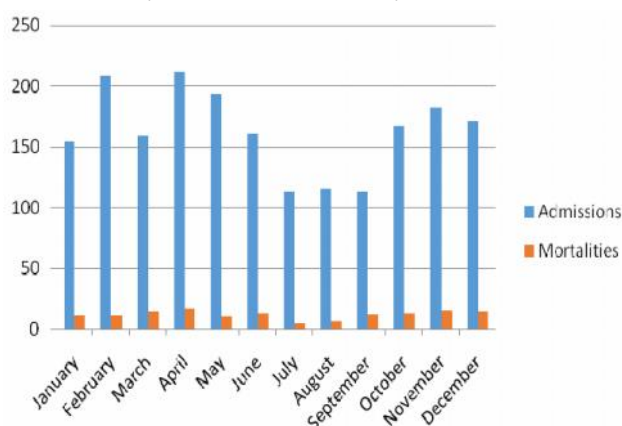
Discussion

This study showed an over all childhood mortality rate of 7.1%. This finding is within the unacceptably high range of (4.4-15.8%) reported from other Nigerian studies.[4-9, 11-17]The prevalence in this study was higher than that reported by Abhulimen-Iyoba *et al* in Benin (4.4%),[14]George *et al* in Port Harcourt (4.5%),[16]and Ibeziako *et al* in Enugu (5.1%)[15] but lower than that reported from Ayoola*et al* in Ibadan (9.5%),[11]Fajolu*et al* in Lagos (11.1%),[7] Bilikisi *et al* in Gasau (11.2%)[17] and Okechukwu *et al* in Abuja (15.8%)[18] The finding of lower mortality rates in the South- South and South-East studies when compared to studies from the South-West and Northern Nigeria may be due to some differences in health seeking behaviour in people from these regions or to a yet unidentified geographical factors. However, more of the studies with higher mortality rates recruited neonates in the study sample and considering the impact of neonatal deaths on childhood mortality rate this methodology will give a higher rate. The lower mortality rate of 7.1% from this present study may be due to improved health seeking behaviour from the local communities that mainly patronise our sub urban located hospital due to the up scaling in infrastructure and health care personnel over the years. Lending support to this is the finding of a higher mortality rate of 7.6% in a previous study in the same centre on outcome of emergency admissions in the CHER by Duru *et al*.[19]

The finding of a higher male preponderance in children visiting the CHER has been documented in other studies and may be related to the biological vulnerability of males to infection.[20] It may also emphasize the premium placed on the male child in terms of priority in bringing to the hospital for medical attention. However, the proportion of males dying in this study is in contradistinction to other studies where more males died. Could it be that many more females are left unattended to in the communities and so are dying at the community level rather than in hospitals? This may require a community based childhood mortality study.

More than eighty percent of the deaths were under five deaths with infant mortality being more than 50%. This

is similar to findings from other studies.[7-18] It reflects the vulnerability of young children dying from probably low immunity and also the need for quick and prompt diagnosis and treatment in this age group when they fall ill.

Sepsis, severe malaria, diarrhoeal disease, pneumonia and protein energy malnutrition were the commonest causes of death seen in our study and this is similar to report from other studies.[8-18, 21-23]These preventable causes of death has persistently remained the same showing little or no change in the mortality pattern in Nigeria. These are disease that are associated with poverty, poor sanitary and living conditions and since no significant progress has been made in the living standards of the people with persisting poor socioeconomic status, it becomes a herculean task to curb these diseases.

In this study, severe malaria (especially severe anaemia and cerebral malaria) and septicaemia were found to be the leading cause of death. However, recent studies have shown that malaria is no longer the leading cause of under-five mortality in sub Saharan Africa, being topped by respiratory tract infections and diarrhoeal diseases[2].This emphasises the need to expedite on malaria control programs- use of Insecticide Treated Nets (ITNs) and Indoor Residual Spraying (IRS) in this sub region.

In children older than five years, infections such as meningitis, HIV/AIDS and tetanus were still prominent as leading causes of death, though more deaths from non-infectious diseases like malignancies, surgical conditions and sickle cell disease occurred in this age group compared with the younger age group. It was interesting to note that meningitis was the commonest cause of death in those over the age of 5 years and this has been documented be Ayoola et al[11] in Ibadan where it contributed 7.2% of deaths in children over 5years. This may be due to lack of booster doses of vaccines. Post neonatal tetanus was also a cause of mortality in those above the age of five years unlike in many other studies.[13-15, 24]

All of these children except one presented very late and they all had severe tetanus and so succumbed to the disease. Contributory factors for this could be the lack of booster doses of tetanus immunization given after the primary series in infancy. It would also be worthy to look further into the immunization practices such as cold chain breaks and availability of potent vaccines to these group of children. Protection from tetanus infection by tetanus toxoid (given as pentavalent vaccine) received in infancy begins to wane shortly after and studies have shown that the current National Programme on Immunisation (NPI) recommended by the WHO for developing countries of which three doses of pentavalent vaccine are given during infancy with no provision for booster doses, is inadequate for tetanus prevention during childhood.[25]The CDC's Advisory Committee on Immunization Practices (ACIP) currently recommends administration of three doses of a tetanus containing vaccine in infancy, with booster doses between 15 and 18 months old; and between four and six years old. Another booster dose is recommended at 11-12 years of age. After these booster doses of tetanus vaccines, booster doses with

tetanus - diphtheria toxoid vaccine (Td) are recommended every ten years throughout a person's life[26]. It is hereby suggested that a clause be added to the present NPI schedule, advising three extra doses of TT between ages four to six years and 11 to 12 years (entry into primary school and secondary school, respectively) for all children as recommended by the CDC advisory committee. In order to ensure compliance, these booster doses of TT could be made prerequisites for entry into these schools.

The children who died from HIV/AIDS infection also had co-existing tuberculosis and severe acute malnutrition which is tandem with other studies.[27]Early detection of childhood and maternal HIV disease and these opportunistic infections in children can mitigate against these deaths as these conditions are treatable. In children, more than 90% of Paediatric HIV/AIDS infection are from mother to child transmission and can be prevented with an effective Prevention of Mother To Child Transmission (PMTCT) program which is began from the ante natal care (ANC).[28] The importance of ANC, an effective HIV/AIDS prevention, treatment and care program with early infant diagnosis of HIV/AIDS need not be overemphasized. These further highlights the need to intensify improvement in hygiene and sanitation, easy access to clean water, strengthening of immunization and attendance to ante natal care (ANC) in all ages in this sub-region. Also in children with HIV/AIDS, early assessment and initiation of Highly Active Anti-Retroviral Therapy (HAART) with proper counselling on adherence, use of cotrimoxazole prophylaxis against opportunistic infections and regular follow up have been found to improve outcome of children with these diseases.[28]

Attention must also be paid to deaths from non-infectious causes in this age group. Similar to findings from Ayoola et al[11] in Ibadan, deaths due to sickle cell anaemia were only found in children above 5 years who had various types of crisis and infections including malaria. . One child died from severe dehydration and acute kidney injury (AKI) due to burns. Burns is an uncommon cause of death in many CHER as most cases are managed in the burns unit by surgeons. However, the prevalent sale of fake kerosene products, a common practice in our environment is a leading cause of home accidents and common cause of burns in children

The finding of highest mortalities in the months of February to April corresponds with findings from Bamgboye et al[5] in Ibadan. This period corresponds with the peak of the rainy season which is associated with the prominence of water borne and other communicable diseases.

In our study, there was no statistically significant change in the annual mortality rate though the rate reduced from 8.8% in 2016 to 4.7% in 2018. This slight improvement in the mortality rate compared to previous years could be attributed to the fact that the hospital had been better equipped and funded since its conversion to a tertiary centre from a general hospital with a subsequent im-

provement in patient care.

This study highlights the fact that childhood mortality in Bayelsa is high especially among under-fives. It also shows that the causes of deaths are similar to what obtains in other part of the country and that majority of these deaths are preventable. Emphasis on preventive practices such as malaria control practices, good antenatal care, training and retraining of health workers, extension of immunization services beyond infancy and good access to health care services would be a positive step to controlling this scourge.

References

1. Park K. Indicators of health. In: Park K, editor. Park's Textbook of Preventive and Social Medicine. 17th ed. Jabalpur, India: M/S BanarsidasBhanot Publishers; 2002. pp. 21–24.
2. World Health Organisation. Children: Reducing mortality. Fact Sheet no 178 http://www.who.int/mediacentre/factsheet/fs178/en/index.html (accessed 10/1/19)
3. Mortality rates, under -5 (per 1,000 live births). Estimates Developed by the UN Interagency Group for Child Mortality Estimation (UNICEF, WHO, World Bank, UN DESA Population Division at child-mortality.org. https://data.worldbank.org/indicator/SH.DYN.MORT
4. Sa'ad YM, Hayatu A, Al-Mustapha. II et al, Morbidity and mortality of childhood illnesses at the emeregency paediatric unit of a tertiary hospital, north-eastern Nigeria. *Sahel Med J 2015;18:*
5. Bamgboye EA, Familusi JB. Mortality pattern at a Children's Emergency ward, University College Hospital, Ibadan, Nigeria. *Afr J Med Med Sci 1990; 9:127-32.*
6. Okechukwu AA, Nwalozie C. Morbidity and mortality pattern of admissions into the Emergency Paediatric Unit of the University of Abuja Teaching Hospital, Gwagwalada *Niger J Med 2011;20: 109-13.*
7. Fajolu IB, Egri-Okwaji MTC. Childhood mortality in children emergency centre of the Lagos University Teaching hospital. *Nig J Paediatr 2011; 38: 131-5.*

8. Adeboye MAN, Ojuawo A, Ernest SK, Fadeyi A, Salisu OT. Mortality pattern within the first 24 hours of Emergency Paediatric admissions in a Resource poor Health facility. *West Afr J Med 2010; 29:250-252.*
9. Roy RN, Nandy S, Shrivastava P, Chakraborty A, Dasgupta M, Kundu TK. Mortality pattern of hospitalized children in a tertiary care hospital of Kolkata. *Ind J Comm Med 2008; 33:187-9.*
10. World Health Organization. Global HIV/AIDS response. Progress report 2011.
11. Ayoola OO, Orimadegeun AE, Akinsola AK, Osinusi K. A five year review of Childhood mortality at the University College Hospital Ibadan. *West Afr J Med 2005; 24:175-179.*
12. Eke FU, Frank-Briggs AI, Ottor J. Childhood mortality in Port Harcourt Nigeria. Internet Journal of Forensic Medicine and Toxicology 2001***
13. George IO, Alex- Hart A, Frank -Briggs AI. Mortality Pattern in Children: A Hospital Based Study in Nigeria. *Int J Biomed Sc 2009;5: 369- 372.*
14. Abhulimhen-Iyoha BI, Okolo AA. Morbidity and mortality of childhood illnesses at the emergency paediatric unit of the University of Benin Teaching Hospital, Benin City. *Niger J Paed 2012; 39 (2):71-4.*
15. Ibeziako SN, Ibekwe RC. Pattern and outcome of admissions in the children's Emergency Room of the University of Nigeria Teaching Hospital, Enugu. *Niger J Paed 2002; 29 (4): 103-7.*

16. George IO, Tabansi PN. An audit of cases in the children emergency ward in a Nigerian Tertiary Tospital. *Pak J Med Sci 2010;26:740-3.*
17. Bilkisu GI, Aminu MS, Sunday OO, Bassey E, Smart A, Muyideen AB. Pattern of medical childhood morbidity and mortality in a new specialist hospital in Gusau, Nigeria. *Ann Nigerian Med 2014;8:15-9.*
18. Okechukwu AA, Nwalozie C. Morbidity and mortality pattern of admissions into the Emergency Paediatric Unit of University of Abuja Teaching Hospital, Gwagwalada. *Niger J Med 2011;20:109-13.*
19. Duru CO, Peterside O, Akinbami F. Pattern and outcome of admissions as seen at the Childrens Emergency Ward of the Niger Delta University Teaching Hospital Bayelsa State, Nigeria. *Niger J Paed 2013; 40(3):232-237*
20. Drevenstedt GL, Crimmins EM, Sarinnapha Vasunilashorn S, Finch CE. The rise and fall of excess male infant mortality. *Proc Natl Acad Sci U S A. 2008 Apr 1; 105(13): 5016–21. doi: 10.1073/pnas.0800221105*
21. Nwolisa CE, Erinaugha AU, Ofoleta SI. Pattern of morbidity among preschool children attending the children's outpatient clinic of Federal Medical Centre Owerri, Nigeria. *Niger J Med 2005;14:378-80.*

22. Ugwu GI. Pattern and outcome of paediatric admission in a tertiary hospital in the Niger delta region of Nigeria: A two year prospective study. *Int J Med Appl Sci 2012;1:15-29.*

23. Iloh GU, Ofoedu JN, Njoku PU, Amadi AN, Godswill-Uko EU. The Magnitude of Under-five Emergencies in a Resource-poor Environment of a Rural Hospital in Eastern Nigeria: Implication for Strengthening the House-hold and Community-integrated Management of Childhood Illnesses. *N Am J Med Sci 2012;4:344-9.*

24. Patil SW, Godele LB. Mortality pattern of hospitalised children in a tertiary care hospital in Latur: A record based retrospective analysis. *Natl J Community Med 2013;4:96-9.*

25. R. Fatunde OJ, Familusi JB. Post-neonatal Tetanus in Nigeria: The need for Booster doses of Tetanus Toxoid. *Niger J Paediatr 2001: 28(2). DOI: 10.4314/njp.v28i2.12053*

26. R2. CDC Prevention of Pertussis, Tetanus, and Diphtheria with Vaccines in the United States: Recommendations of the Advisory Committee on Immunization Practices (ACIP) *MMWR* Apr. 27, 2018 / 67(2);1–44

27. AIDS Control and Prevention (AIDSCAP) Project of Family Health Internal, The Francois-Xavier BagnoudCenter for Public Health and Human Rights Of the Harvard School of Public Health, UNAIDS. The Status and Trends of the Global HIV/AIDS Pandemic. Final Report July 5-6, 1996.

28. HIV/AIDS statistics in Nigeria 2014-State by State analysis. Ng Newspapers. Jan 28, 2014. Available from: http// www.ngnewspapers.