

RESEARCH PAPER**LEADING CAUSES OF CHILDHOOD MORTALITY IN SELECTED COMMUNITIES IN NORTHERN NIGERIA**

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Abstract

Background: As part of the bid to ensure healthy lives and promote well-being for children, the Sustainable Development Goals were adopted by the United Nations in 2015. Reports show that economically and socially deprived neighbourhoods have an increased risk of under-five mortality.

Objectives: To describe the causes of childhood deaths in selected communities in Nigeria.

Methods: Four states namely, Borno, Kwara, Plateau, and Sokoto states representing three geopolitical zones of Nigeria were included in the study. Two local governments were randomly selected in each state. A descriptive cross-sectional study design was employed to carry out this survey. Pre-coded questionnaires were used to collect data from care givers.

Results: The three leading causes of death among under-fives in the Borno State was diarrhoea, measles and sudden death, in the Kwara State was asphyxia, diarrhoea, cough; in Sokoto it was diarrhoea, cough and asphyxia, and in the Plateau State it was diarrhoea, acute respiratory illness and malaria.

Conclusions: Diarrhoea was consistently the leading cause of death, followed by pneumonia and asphyxia, which are largely preventable. Surprisingly, with the exception of the Plateau State, malaria was not listed amongst the three leading causes of death in the communities under study.

Keywords: Children, community, mortality, Nigeria, under-five



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Introduction

There has been much progress globally in reducing child deaths since 1990, with a global decline of under-five (U5) deaths from 12.7 (12.6- 13.0) million in 1990 to 5.9 (5.7- 6.4) million in 2015¹. This comprises 16,000 deaths per day in 2015 compared to 35,000 in 1990, and a drop of global under-five mortality rate from 53% from 91 deaths per 1,000 live births in 1990, to 43 in 2015¹.

Most global child deaths are caused by preventable or treatable diseases such as infectious diseases and neonatal complications. These can account for as much as 70% of the global deaths², and children in sub-Saharan Africa are reported to be 14 times more likely to die before the age of 5, compared to children from developed regions³.

In a bid to ensure healthy lives and promote well-being for all children, the Sustainable Development Goals (SDG) were adopted by the United Nations in 2015. The SDG goal 3 is to end preventable deaths of newborns and under-five children by the year 2030³. Achieving this goal requires having an under-five mortality rate of 25 or fewer deaths per 1000 live births by 2030. Residents of economically and socially deprived neighbourhoods have a higher risk of U5 mortality^{4, 5}. However, studies have also associated children living in economically and socially deprived communities to have increased mortality risk^{6,7,8}.

Nigeria as the most populous African country is characterised by regions that are socially and economically-advantaged and disadvantaged. This coupled with various religious, geographical, ecological and economic diversifications result in a variety of risks for U-5 mortality^{9,10}.

This is further affected by the fact that Nigeria did not make sufficient progress

towards achieving the millennium development goal 4; the U-5 mortality in the country between 1999 – 2003 was 201 per 1000 live births, and there was only a marginal decline to 157 per 1000 live births between 2004-2008^{10, 11}. Hence, Nigeria has so far made slow progress in under - five and infant mortality reduction.

In a recent study on the leading causes of childhood mortality between 2005 –2009, neonatal sepsis and birth asphyxia accounted for 57.3% of the childhood deaths in tertiary hospitals in Nigeria¹², while in a study from South East Nigeria, overall mortality was 5.8% with major causes of death in the under-five being diarrhoeal diseases, complicated malaria, sepsis and respiratory tract infections (RTIs)¹³.

Systematic assessment of mortality may be useful for setting priorities, estimating the potential benefit of specific and non-specific interventions, and providing continuous feedback on the quality of care provided and the outcome of health reforms.

This descriptive study was carried out with the aim of identifying the causes of childhood deaths in selected communities in Northern Nigeria.

Materials and Methods

Study area: The states covered in this study included Borno, Kwara, Plateau, and Sokoto States (Figure1). This community study was conducted in 2013 as a follow-up to the hospital based study on the leading causes of childhood mortality amongst under-fives in tertiary hospitals¹². The essence of using the same states was to be able to conclusively compare the leading causes of mortality amongst under-fives from both the tertiary hospital and the community.

Two local governments were randomly selected in each state, while four wards in each local government area (LGA) were used and streets randomly selected within each ward. The LGAs were selected by purposive sampling, and included one urban and one rural from each LGAs in the

Questionnaire

This was designed to give information on retrospective birth history, order of birth, survivorship status, current age/age at death (for each of respondents' live births) and information on the living children from the

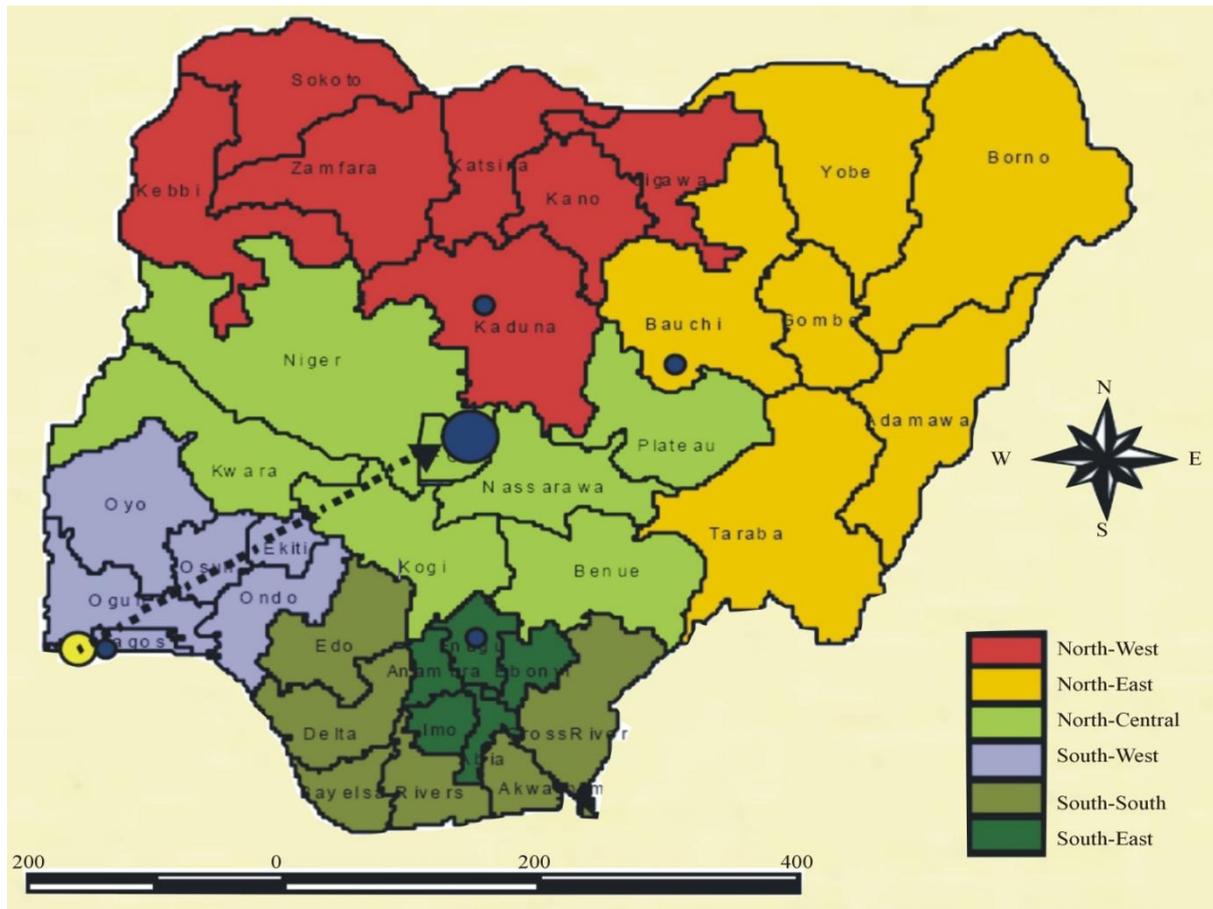


Figure 1: Map of Nigeria and the states (the states under the study are also included) and their geographical zones

states where the hospital based study was carried out. Systematic sampling technique was used to interview the respondents within the houses. Within each selected cluster, about 10 households were selected from an address list and all care-givers were selected for individual interviews irrespective of gender or age. This was done using trained interviewers, using a semi- structured questionnaire developed using the Demographic and Health Surveys¹⁴ (questionnaire) adapted to our local circumstances.

mothers or care givers. The questionnaire was designed to provide estimates of child mortality that were representative of each region. It involved socio-economic and bio-demographic characteristics such as residence, care givers' level of education, and gender of child; symptoms within the last 2 weeks before death, and the mother/guardian's perception on cause of death was obtained via a verbal questionnaire. The birth section of the questionnaire derived information for calculating mortality estimates.

Information on living children was verified by viewing the birth certificate if available on site. Neonatal, post neonatal, infant and under-five mortalities were extrapolated from the data.

The questionnaires used for Plateau and Borno was the same, but a different one was used in Kwara and Sokoto. Therefore, results for LGAs where the same questionnaire was used were tabulated together.

Ethical considerations

Ethical approval was obtained from the Institutional Review Board of the Nigerian Institute of Medical Research (IRB/10/106), together with concurrence of the relevant IRBs of the study sites; and informed consent was obtained from all parents and care-givers interviewed in this study.

Data analysis

A descriptive cross sectional study design was employed to carry out this survey. Pre-coded questionnaires were used to collect data from care-givers. The statistical packages used for data analysis were IBM SPSS Statistics 20 and Microsoft Excel 2010. Univariate analysis was conducted using frequency, percentage and charts to summarize and describe patterns in the data.

Results

A total of 734 completed questionnaires were obtained, and the distribution from the different states were as follows: Plateau (294), Kwara (200), Borno (178) and Sokoto (62). Table 1 shows the difference

in proportion between age distribution of causes of death among children under-five years in the Kwara and Sokoto states, while Table 2 shows the difference in proportion between the age distribution of causes of death among children under-five years in the Plateau and Borno states. The three leading causes of death in Kwara and Sokoto states were asphyxia, diarrhoea and cough (Table 1). The leading cause of death in Kwara and Sokoto states was asphyxia and this was the highest in all age groups, except for 12 – 59 month age group in Sokoto (Table 1); in the 12 – 59 months age group, the leading cause of death was diarrhoea in Sokoto and asphyxia in Kwara. There was a statistical significance in the causes of death among the different age groups among children under-five years in Kwara and Sokoto States ($p=0.028$).

The three leading causes of death of among under -fives in the States of Plateau and Borno were diarrhoea, acute respiratory illness and malaria, which account for over half (58.0%) of the under five deaths (Table 2). Differences in causes of death among children under-five years, by age distribution was statistically significant ($p<0.001$). The leading cause of death in all age groups in the Plateau state was chronic respiratory illness, while malaria was more common among infants and children. Diarrhoea was the leading cause of death in all age groups, followed by measles in the State of Borno.

The ‘age at death’ was not recorded for many of the diseased children captured in the study, and Kwara state had the highest rate in this regard, with 23% not recorded.

TABLE 1: Difference in proportion between the age distribution of causes of death among children under -five years in Kwara and Sokoto State*

Causes of death	Kwara State				Sokoto State			
	Age groups				Age groups			
	Neonatal (0-28 days)	Infants 29 days	Children 12-59 months	Age at death missing	Neonatal (0-28 days)	Infants 29 days	Children 12-59 months	Age at death missing
Diarrhea	11.1	20.4	19.9	8.7	0.0	29.4	39.4	0.0
Pneumonia	5.6	12.2	19.4	17.4	33.3	11.8	21.2	0.0
Asphyxia	44.4	24.5	21.8	34.8	33.3	23.5	13.6	0.0
Seizure	16.7	22.4	11.7	13.0	33.3	11.8	15.2	100
Collapse/Faint	16.7	16.3	15.5	8.7	0.0	5.9	9.1	0.0
Yellow eyes	5.6	4.1	11.7	17.4	0.0	17.6	1.5	0.0
Total (%)	18(100)	49(100)	206(100)	23(100)	3(100)	17(100)	66(100)	1(100)

*For the table above, $P = 0.028$, which is less than 0.05, showing that there is a statistically significant difference in the proportion of age distribution of causes of death among children under - five years in Kwara and Sokoto State.

Discussion

The main leading cause of death in this study was diarrhoea. This compromised about a quarter of the causes of death in the four states. The reasons for this has been reported to be due to several conditions, such as poor personal hygiene, unavailability of potable water and efficient disposal systems, overcrowded living conditions and low birth weight¹⁵. The leading cause of under-five mortality in our tertiary hospital study was neonatal sepsis accounting for 30.1%¹².

Globally, it has been reported that the main killers of under-fives in 2015 were pneumonia (16%), preterm birth complications (16%), intra-partum related complications (11%), diarrhoea (9%), neonatal sepsis (7%) and malaria (5%)¹⁶. Most of these findings were from hospital - based studies.

In Africa, pneumonia, diarrhoea and malaria accounted for 49% of under-five mortality¹⁷. In Nigeria, underlying risk factors for under-five mortality were reported to be due to family poverty and illiteracy, in addition to over-crowding, unsafe drinking water and poor sanitary and drinking habits¹⁷.

The second leading cause of under-five mortality in this study was in two states (Kwara and Sokoto) was asphyxia, while lower respiratory tract infection accounted for the third common cause of death.

This is similar to the report of Ezeonwu et al.,¹³ which reported that the major causes of death were complicated malaria, sepsis, diarrhoeal diseases and respiratory tract infections. Although Abu et al.¹⁸ reported the three leading causes of under-five mortality in Benue State (North central) to be due to malaria, complications at birth and measles, the three leading causes of death in our 2013 study in the same

TABLE 2: Difference in proportion between the age distribution of causes of death among children under -five years between Plateau State and Borno State*

Causes of death	Plateau State				Borno State			
	Age groups				Age groups			
	Neonatal (0-28 days)	Infants 29 days	Children 12-59 months	Age at death missing	Neonatal (0-28 days)	Infants 29 days	Children 12-59 months	Age at death missing
Diarrhoea	0.0	27.3	30.8	35.3	20.0	42.9	17.9	22.2
Measles	0.0	0.0	0.0	0.0	20.0	7.1	21.4	11.1
Sudden death	15.8	1.5	3.8	0.0	12.5	7.1	10.7	11.1
Chronic respiratory illnesses	28.9	22.7	20.5	17.6	7.5	14.3	10.7	5.6
Malaria	0.0	24.2	24.4	23.5	5.0	7.1	3.6	27.8
Asphyxia	21.1	0.0	0.0	0.0	2.5	14.3	3.6	11.1
Poisoning	0.0	0.0	0.6	0.0	7.5	0.0	3.6	0.0
Accident/injuries	0.0	0.0	1.3	0.0	2.5	0.0	3.6	0.0
Congenital abnormalities	10.5	7.6	0.6	11.8	0.0	0.0	10.7	0.0
Pneumonia	2.6	6.1	12.2	5.9	12.5	7.1	14.3	5.6
Meningitis	0.0	9.1	1.9	0.0	5.0	0.0	0.0	0.0
Pertussis	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0
Sickle cell anaemia	0.0	1.5	0.6	0.0	0.0	0.0	0.0	0.0
Preterm complications	15.8	0.0	0.0	5.9	0.0	0.0	0.0	0.0
Non- communicable diseases	5.3	0.0	3.2	0.0	0.0	0.0	0.0	0.0
Total(%)	38(100)	66(100)	156(100)	17(100)	40(100)	14(100)	28(100)	18(100)

*For the table above, $P < 0.0001$, which is less than 0.05, showing that there is also a statistically significant difference in the proportion of age distribution of causes of death among children under -five years between Plateau State and Borno State.

geographical zone, i.e., the North central zone, was asphyxia, diarrhoea and respiratory tract infections for Kwara and diarrhoea, acute respiratory illness and malaria for Plateau. All these illnesses are preventable and could be due to poor sanitary conditions, unclean and unsafe drinking water, and inefficient disposal systems.

Measles was the second leading cause of death in Borno State and was surprisingly absent in the Plateau State, while it was not looked for in the Kwara and Sokoto States. The Borno State has a significantly high temperature, in addition to superstitious and religious beliefs – such as the belief that the immunisation is a strategy to wipe out the citizens.

In keeping with our study of finding that diarrhoea is the leading cause of death amongst under-fives, El-Arifeen et al.,¹⁹, reported the leading causes of neonatal deaths in Bangladesh included possible ARI and diarrhoea.

In Sokoto, Plateau and Borno, diarrhoea was the leading cause of mortality while in the Kwara state it was still birth asphyxia. Many reasons have been attributed to this, namely low birth weight, malnutrition, non-breast fed children, overcrowded conditions, unsafe drinking water and food, poor hygiene practices which were found to be commoner in these states by earlier documentation²⁰.

A report from tertiary hospital by Bilkisu et al.,²¹, showed that under-five mortality was due to malaria, sepsis, diarrhoea and pneumonia while our previous work, also from tertiary hospital, showed the leading cause of under-five mortality to be neonatal sepsis, asphyxia, preterm complications and acute respiratory illness.

All these conditions are treatable and/or preventable by vaccinations. In a review of child mortality determinants from 1990 – 2008 in Nigeria, Akinyemi et al.,²² concluded that the risk of child mortality was fuelled by poor access to potable drinking water, sewage disposal and short birth intervals.

According to Perry et al.,²³, the leading cause of U5 mortality in Haiti was acute lower respiratory infection (ALRI), which accounted for 27% of deaths, with this singular disease topping all age groups studied.

When the leading causes of death according to period of death was analysed, a majority of under-five deaths occurred in the post-natal period (83.4%), while distribution according to state showed that a majority of the post-natal deaths were from Sokoto

(94.9%), and the least were from Borno (65%).

Limitations

The usage of two separate questionnaires for the four states (Plateau and Borno, with Kwara and Sokoto) is a limitation in this study as it has prevented a head to head comparison for certain diseases across the states.

Conclusions

The leading causes of under-five mortality in our community study of four states representing three geopolitical zones in Nigeria were diarrhoea, asphyxia and respiratory tract infection. All these are treatable, preventable by practice or vaccine preventable. Surprisingly, with the exception of Plateau State, malaria was not listed amongst the three leading causes of death in the communities under study.

The information provided in this community study should provide knowledge of the causes of childhood mortality that is essential for appropriate scale up interventions by the health authorities in the country. This will also help to reduce burden of disease, and help improve child health and survival; a step towards achieving the SDG goal on health.

Further community studies will be conducted in the southern part of the country to follow-up the tertiary studies conducted in the region.

Author Contributions

SIS conceived the study design and wrote and edited the draft of the work, JIY entered the data and read the final draft, NAD, SO, AA, MB, NJ, OTA, were all involved in the field work, MAN was

involved in both field work and draft of the write-up, AMA was involved in the data analysis, ZAM was involved in the field work, AOO was involved in the field work as well as editing of the draft. All authors read and approved the final draft.

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Declaration of Conflicting Interests

The Authors declare there is no conflict of interest as regards this study.

Availability of supporting documents

Questionnaires used in this study and data will be made available by the corresponding author upon request.

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