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Childhood dead-before-arrival, our experience at a tertiary hospital in Southern Nigeria: a clarion call to stakeholders in the health sector

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Abstract

Dead-Before-Arrival (DBA) is a term used to describe patients who have no sign of life at the time of presentation to the hospital. There is a dearth of information about this cohort of children at most healthcare service delivery points. In fact, these children are also never captured in most of our national and local healthcare data. This research is aimed at sharing our experience on DBA at the Children's Emergency Room of a tertiary hospital in the South-South geopolitical region of Nigeria, by determining the prevalence, probable disease cause, and pattern of DBA among children presenting at our facility. This is a cross-sectional study that used a standardized verbal autopsy instrument to ascertain the details of all the children aged 1 month to 17 years who were cases of DBA at the Children's Emergency Room of the University of Benin Teaching Hospital, Benin City, Edo State, Nigeria, over 24 months (January 2018 to December 2019). Socio-demographic characteristics, symptoms before demise, treatment received, and suspected cause(s) of death were documented. The prevalence of DBA was compared to the in-hospital mortality during the period. A total of 96 (3.2%) compared to 144 (4.9%) in-hospital of the 2,914 emergency admissions were cases of DBA, with a 2:1 male-to-female ratio. The age group of 1-6 months had the highest proportion (41.7%). Children under two were 62.5% and 81.3% were under-fives. Infections such as diarrhea, bronchopneumonia, and sepsis were the most common suspected causes of death, followed by non-infectious causes such as perinatal asphyxia, Chronic Kidney Disease (CKD), cyanotic congenital heart disease, drowning, and electrocution. Cases of DBA were significantly lower than in-hospital mortality (144 cases) during the study period (3.2% *vs* 4.9%).

The DBA prevalence as recorded in this hospital-based study may be the tip of the iceberg compared to what happens in the community. Making our primary and secondary health care services more accessible, affordable, and optimally functional may help reduce the burden of DBA.

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Introduction

Sick patients are brought to the hospital with varying degrees of illnesses, in some cases critically- ill and at times with no signs of life on arrival. Dead-Before-Arrival (DBA) is a term used to describe patients who have no sign of life at the time of presentation to the hospital.[1] There is a dearth of information about this cohort of children in most healthcare service delivery points. However, a retrospective study carried out by Patel *et al.* in India over a 12-month period reported 186 cases of DBA across all age ranges.[2] Another study on DBA done in Ghana over a three-year period by Orish *et al.* reported a prevalence of 31.1%.[1] While a five-year, retrospective, descriptive, hospital-based study done in Lagos, Nigeria by Adegoke and Ajuluchukwu among adults reported that cases of DBA made up 11.5% of total mortalities at the Emergency Room (ER).[3] In a more recent study conducted by Adeniyi *et al*. at the Children's Emergency Ward of the Wesley Guild Hospital, Ilesa, Nigeria, over 12 months in 2021 and comprising children aged one month to 14 years, DBA contributed 7.4% of the mortalities.[4]

Resource-depleted settings like ours with sub-optimal primary healthcare service delivery are primed for failure. Such failure will inevitably lead to an increase in mortality and DBAs at the community level and in the ER of hospitals across borders.

The variability of the prevalence of DBA across all levels of health care[1,5] is, therefore, not surprising because it is a reflection of the accessibility, affordability, and quality of the first-line medical services available to the populace. In the study locale and Nigeria in general there are known contributory factors that have led to the abysmal poor health indices including DBA. These include socio-cultural factors that in most cases prevent the mother from seeking medical help early without the express permission of the father, poverty, delayed access to quality health care, and poor health-seeking behaviour.[6-8] The over-concentration of super subspecialists (pediatricians) in urban centres compared to the rural areas,[9] very high children to pediatrician ratio in Nigeria compared to other developed countries like the United States of America,[9,10] and the lack of female empowerment and education have propagated this ugly trend. Children because of their helplessness in expressing themselves are the worst affected because they depend solely on the health-seeking behaviour of their caregivers who may be financially or otherwise handicapped to act swiftly to avert the impending danger of delay in seeking medical intervention. The scenario captured above is further worsened by the increase in the brain drain of healthcare professionals including pediatricians in search of greener pastures.

There is a dearth of information about this group (DBA) of children in most healthcare service delivery points in Nigeria. In fact, this group of children is also never captured in most epidemiological surveys. This research is aimed at sharing our experience on DBA at the Children's ER of a tertiary Hospital in the South-Southern geopolitical region of Nigeria, by determining the prevalence, probable disease cause, and pattern of DBA among children presenting at our facility.

Materials and Methods

This is a hospital-based cross-sectional study conducted over 24 months (January 2018 to December 2019) at the Children's ER (CHER) of the University of Benin Teaching Hospital (UBTH), Benin City, Edo State, South-Southern Nigeria. The UBTH is a tertiary hospital that caters to the health care needs of the population within the urban town of Benin City, semi-urban and other rural towns within Benin City, Edo State as well as from surrounding towns in the neighbouring states of Kogi, Delta, Anambra, Ondo, Bayelsa and beyond.

The Pediatric Emergency Division comprises three subunits. The CHER receives all the children coming to seek medical care services in the division. It offers both outpatient care and admission into the Children's Emergency Ward (CHEW) and Pediatric Intensive Care Unit (PICU) for in-patient care where necessary after stabilizing the patient. CHER is a ten-bed unit with full complements of manpower and other resources to care for a varied range of childhood illnesses.

Ethical approval for the study was obtained from the Health Ethics and Research Committee of the UBTH as an adjunct to a study titled "Analysis of admissions into pediatric emergency division and missed opportunity in intensive care services in a tertiary hospital in a resource poor setting in Southern Nigeria," which was

Table 1. Age and sex distribution of the cases of Dead-Before-Arrival (DBA).

	Male	Female	Total, n (%)
Age group			
1-6 months	30 (46.9)	10 (31.3)	40 (41.7)
7-12 months	12 (18.8)	8 (25.0)	20 (20.8)
13-59 months	14 (21.9)	4 (12.5)	18 (18.8)
60-144 months	8 (12.5)	10 (31.3)	18 (18.8)
Total	64 (66.7)	32 (33.3)	96 (100.0)

Table 2. Mothers' level of education.

Level of education	Frequency	Percentage
No formal education (NFE)	2	2.1
Primary	10	10.4
Secondary	40	41.7
Tertiary	44	45.8
Total	96	100.0

Table 3. Suspected causes of death among the Dead-Before-Arrival (DBA).

Suspected cause of death	Age group				
	1-6 months	7-12 months	13-59 months	60-144 months	Total, n (%)
Acute diarrhea	8	10	7	5	30 (31.2)
Pneumonia	4	10	5	1	20 (20.8)
Sepsis	1	9	6	2	18 (18.7)
Malaria	2	4	2	0	8 (8.3)
Meningitis	1	3	2	0	6 (6.3)
Perinatal asphyxia	3	1	0	0	4 (4.2)
Chronic Kidney Disease (CKD)	0	0	1	3	4 (4.2)
Cyanotic congenital heart disease	1	0	0	1	2 (2.1)
Drowning	0	0	0	2	2 (2.1)
Electrocution	0	0	0	2	2 (2.1)
Total					96

previously conducted by the authors at the same study location.

Confidentiality was maintained throughout the study. The study population included all children aged from 1 month to 17 years who were brought into the CHER and who on arrival had no sign of life and were confirmed dead. A standardized verbal autopsy form[11] was used to obtain and record information about the age, gender, nature, and duration of the symptoms the patient had before demise.

Patients were assumed to have had anemia if the parents or caregivers had noticed whiteness of the palms and/or soles (pallor) at any time in the course of the illness before the presentation. The possibility of sepsis was considered only if the patient had signs and symptoms suggestive of pathology in two or more systems. Information was also obtained about the treatment that was given, where the treatment was sourced from, and whether treatment was sought in any healthcare facility. The patients were examined for any physical features that may give further clues to the possible cause of death.

To ensure their cooperation, disclosure of the demise of the patient was only done after the required information had been obtained directly from either the parents/caregivers and/or other informants. The number of cases of DBA was compared with the in-patient mortality at CHEW over the same period.

Data analysis was done with Statistical Package for the Social Sciences (SPSS), version 20.0 (IBM Corporation, Chicago, USA). Categorical data such as sex, diagnosis, and educational status of mothers were summarized using proportions and percentages, while continuous data such as age was summarized using mean and standard deviation. Statistical differences between the categorical variables were determined using the Pearson Chi-square test of association, and $p<0.05$ at 95% confidence interval was considered as being significant.

Results

Within the same time, a total of 2,914 children were admitted for treatment at the CHEW, making the case incidence of DBA (96 cases) approximately 1:30 compared to in-hospital case incidence of 144 deaths (4.9% prevalence against a DBA prevalence of 3.2%) The age of the cases of DBA ranged from 1 month to 12 years, with death being commoner among children aged 1-6 months. Nearly two-thirds, 62.5%, were under two years and 81.3% (78 of 96) of the children were under five. There were 64 males and 32 females (male-to-female ratio 2:1). A highlight of the age and sex distribution of the case of DBA is shown in Table 1.

Nearly half of the mothers had a tertiary level of education while 41.7% (40 of 96) and 10.4% (10 of 96) had secondary and primary levels of education respectively. Of the 96 mothers, only 2% (2 of 96) had No Formal Education (NFE). While only 87.5% (84 of 96) had secondary levels of education and above (Table 2).

Acute diarrhea was the most common suspected cause of death occurring in 31.2% of the cases of DBA (Table 3). Under-five children accounted for 83.3% of cases of DBA with diarrhea compared to 17.7% in children greater than five years old. Eight (26.7%) of the cases of diarrhea were self-medicated by their mother while 19 (63.3%) had sought care in a healthcare facility in the course of the illness before their demise. Infectious causes of death (Table 4) accounted for 82 (85.4%) of the cases of DBA in this study compared to 14 (14.6%) contributed by noninfectious causes.

The infectious causes of DBA were commoner among under-fives while the noninfectious (downing, CKD, electrocution, perinatal asphyxia, cyanotic congenital heart disease) causes were more prevalent in children greater than five years (Table 3).

Considering the suspected primary causes of death in cases of DBA put together in this study (Table 4), significantly more under-five cases of DBA resulted from possibly infectious causes than children older than five years - 74 (90.2%) of the 82 infectious causes of death compared to 8 (9.2%). Of the 14 non-infectious causes of DBA 6(42.9%) occurred in children less than five years compared to 8(57.1%) in children greater than five years, $\chi^2=19.335$; $p=0.001$ (Table 4).

Discussion

The study shows a high rate of childhood cases of DBA among patients presenting at our facility, which is lower than the in-patient mortality at the CHEW during the same study period. The majority of the cases of DBA were infants and under-five children when compared to those above five years. This is in tandem with the reports by Olatunya *et al.*[12] and Adeniyi[4] in other tertiary healthcare facilities in Southwest Nigeria. This finding further buttresses the vulnerability of children less than five years old to morbidity and mortality.

Precisely two-thirds of the cases of DBA in our study were males, with a male-to-female ratio of 2:1. This is also similar to the reports from other facilities in South-western Nigeria.[4,12] This finding is not unexpected as mortality has been known to be higher in boys than girls in most parts of the world. This has been attributed to sex differences in genetic and biological makeup, with boys being biologically weaker and more susceptible to diseases and premature death.[13] Higher risk-taking behaviours in males in comparison with females may also be a contributing factor as previously reported.[14-16]

Mothers with a tertiary level of education accounted for almost half of the cases of DBA in this study. This is unexpected as it is assumed that mothers with higher levels of education are more likely to be literate enough to seek medical care early and hence reduce the incidence of DBA among their children. This finding may have been due to the fact that the study locale is an urban setting with more educated clients seeking healthcare services. Religious inclination, socio-cultural belief, poverty, poor health-seeking behaviour, and the influence of immediate family members are some of the factors that education cannot completely erode in the sub-region. Delay in seeking medical care, the severity of illness or injury, lack of efficient pre-hospital care, faulty transport system, lack of equipment and skilled manpower in peripheral

Table 4. Infectious and non-infectious cases of Dead-Before-Arrival (DBA) vs age distribution.

Age range (years)	Infectious causes of death (n=82), n (%)	Non-infectious causes of death (n=14), n (%)	χ^2 and *p*
<5	74 (90.2)	6 (42.9)	19.335, 0.001
≥5	8 (9.2)	8 (57.1)	

health facilities, and delay in referral are possible contributory factors to DBA cases, irrespective of educational status.[17-19]

Benin City which was the study location has many public and private health care facilities but for most of the DBA cases, caregivers did not utilize these services prior to presentation at our facility. The majority of the DBA was treated at home with native herbs, self-prescribed medications, and over-the-counter drugs. This finding is in consonant with the reports from other Nigerian studies which identified financial constraints, and cultural and religious beliefs to be the most common causes of delay in seeking proper medical care.[20,21]

This study also noted that the majority of the causes of death in cases of DBA that presented at the facility were due to infectious diseases and this was more common among the under-fives. The Non-infectious cases of DBA were more common in children older than five years. This finding is similar to tertiary hospital reports at Ado-Ekiti[12] and Ilesa[4] in the South-western region of Nigeria. The most frequent infectious diseases suspected to be responsible for cases of DBA in our study were diarrhea, pneumonia, sepsis, malaria, and meningitis, especially among those less than two years old. This pattern of infectious diseases is similar to the reports from South-western Nigeria.[4,12] These findings might be a pointer to the poor nutritional and immune status of these children that predisposes them to infectious and preventable diseases. This is also in keeping with a report from the World Health Organization (WHO) that attributed the cause of more than half of deaths in under-fives to diseases that are preventable or treatable with simple and affordable interventions.[22] Severe dehydration from diarrhea was the most common suspected cause of death in the 1-59 months age group in this study. Person-to-person transfer of pathogens through direct contact and through contaminated objects has also been incriminated in the oral transmission of causative organisms to the gastrointestinal tract.[23] This has been associated with a lack of safe water, poor sanitation, and poor personal hygiene.

The non-infectious diseases were observed in this study to be the most common suspected causes of DBA cases in children above five years which is a sharp contrast to that of under-five children. The common non-infectious causes contributed to half of the cases of DBA in children older than five years (CKD, cyanotic congenital heart disease, drowning, and electrocution). This finding is in contrast with the reports by Cunningham *et al*.[14] in the United States of America 2019 report by WHO on mortality among children aged 5-14 years,[24] and Adeniyi *et al.* in Ilesa, South-western Nigeria,[4] which found road traffic accidents and falls as leading causes of death among older children and adolescents. The non-infectious causes of DBA in our study may have been different from the reports by Cunningham *et al.* and WHO[14,24] because the CHEW only attends to medical cases while all cases of trauma inclusive of road traffic accidents and falls are treated at the trauma unit of the accident and emergency complex of the hospital. As such these patients would have been completely excluded from the cohort studied.

The number of DBA cases was lower than the in-patient deaths recorded within the study period. However, DBA constituted a significant proportion of the overall deaths recorded during the study period which on its own is very worrisome. This might amount to a very significant number when DBA cases from other tertiary health facilities are included. The prevalence of DBA from this study may be a pointer to an equally significant number of deaths occurring outside healthcare facilities that are not recorded, as reported in previous studies.[25]

Conclusions

This study has provided some insights into the knowledge gap in the estimation of the actual burden of DBA in our communities. The urgent need for intervention by relevant authorities and stakeholders in the health sector of Nigeria cannot be over-emphasized since effective planning to improve health and safety is based on the knowledge of who is dying and what they are dying of.

Recommendations

Policymakers and stakeholders in the Nigerian healthcare space should look into the functionality of its primary and secondary levels of healthcare delivery with a view to making them more accessible, affordable, and functional to its populace.

The scope and coverage of the National Health Insurance Scheme be reviewed to cover the primary and secondary levels of health care that are closer and provide more impactful first-line medical care to its populace.

There is a need for an improved sensitization of the populace to create community awareness about DBA and improve the health-seeking behaviour.

Line for future Research

Similar studies on the burden, risk factors, and scope of DBA in our communities at different levels of healthcare delivery, including private hospitals should be carried out.

Limitations

The authors' inability to do *post mortem* examinations in cases of DBA, which is a more objective way of ascertaining the possible cause(s) of death is a major limitation in this study. This was because of the circumstances surrounding their deaths and the caregiver's refusal to give consent for the procedure.

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