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# *Childhood mortality in Ibadan: an autopsy study*

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## Summary

**Akang EEU, Asinobi AO, Fatunde OJ, Pindiga HU, Okpala JU, Abiola AO and Aghadiuno PU. Chilhood mortality in Ibadan: an autopsy study.** *Nigerian Journal of Paediatrics 1992*; **19:30**. The present autopsy study has revealed that infection, contributing to 47 percent of the deaths, was the leading cause of childhood mortality from early neonatal period through school age period, with the highest incidence of 40 percent in the pre-school age period. The six leading infections, in descending order of frequency included pneumonia, meningitis, tuberculosis, measles, malaria and neonatal tetanus. Other common causes of mortality in the series included asphyxia in 11.0 percent, congenital malformations in 10.4 percent and malignancies in 8.7 percent of the total deaths. While preventable conditions generally, including infections, birth asphyxia, malnutrition, birth injuries and accidents accounted for 66.4 percent of the deaths, neonatal problems of asphyxia, birth injury and low birthweight contributed to 18.0 percent of the mortality. On the basis of the present findings, it is suggested that in order to reduce childhood mortality to acceptably low levels, improvement in obstetric and perinatal services in our institution should be undertaken. Furthermore, health education to parents, immunizations and economic improvement of parental status, should be carried out to prevent infections, malnutrition and accidents.

## Introduction

DEATHS among children throughout the developing countries of the world remain very high, according to several workers.[1-6] Indeed, most of these deaths are attributable to preventable disorders, including infections and malnutrition.[1] Recently, Bamgboye and Familusi[4] have noted that childhood mortality rates in developing countries may be underestimated as there are no reliable vital statistics in these countries. However, estimates of infant mortality rates in the developing world, as reported in the literature range between 100 and 295 per 1,000 live births; these rates are over 10 times those in the developed countries.[5] [6] It has also been reported that 90 percent of all recorded deaths in childhood, worldwide, occur in the third world countries.[1]

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In view of the fact that children under 15 years of age constitute about 48 percent of the population in developing countries,[4] the above mortality rates are alarming and unacceptably high. Knowledge of the major causes of death in childhood is therefore necessary, if any significant improvement on these rates is to be achieved. Previous studies on childhood morbidity and mortality from some African countries were based largely on clinical materials.[1-4 7-9] There can be no doubt that mortality data derived from either clinical or autopsy materials alone, cannot be as comprehensive as those from combined clinical and autopsy materials. The purpose of the present retrospective study was therefore, to carry out an analysis of the autopsy materials available in the University College Hospital (UCH), Ibadan, over a period of 30 years.

## Materials and Methods

Records of all autopsies performed on children under the age of 15 years, in the Department of Pathology, UCH, Ibadan, over a 30-year period (January 1961 to December 1990), were reviewed. Relevant clinical data, necropsy findings and anatomical diagnosis were abstracted from the autopsy reports on each patient. The patients were grouped into certain age periods and defined as follows: *Perinatal* period which includes late foetal life (stillbirth) and within few hours after birth; *early neonatal* period is from birth to six days of life; *late neonatal* period is from seven days to 28 days; *post-neonatal* period covers between four weeks and 11 months; *pre-school* period is between one year and four years and *school age* period is between five and 14 years of age.

Patients were also classified into one of the following broad diagnostic categories: congenital malformations, comprising major malformations directly responsible for death, or resulting in fatal medical, or surgical complications; malignant neoplasms, classified according to the method of Marsden;[10] accidents which include iatrogenic, domestic and road traffic accidents; infections; haematological disorders, including neonatal jaundice, coagulation disorders of the newborn and sickle-cell anaemia; malnutrition; birth trauma; birth asphyxia; low birthweight, including perinatal, or neonatal deaths in premature babies, or in small-for-gestational age babies who do not fit into the above categories; miscellaneous conditions, including renal, cardiovascular, gastrointestinal, hepatic, pulmonary, craniospinal, endocrine, or metabolic disorders which could not be included in the above categories. Unexplained deaths due to no known cause were also included under the miscellaneous category. Classification was determined by the major pathological process in patients with more than one condition.

## Results

During the 30-year period covered by the present study, 6872 autopsies were performed on perinatal deaths and on children from birth to 14 years of age. During the same period a total of 14965 adult and paediatric autopsies were performed. Thus, the paediatric autopsy rate was 46 percent of the total. Annual paediatric autopsies fell from 615 cases (60 percent) in 1961 to 77 cases (18 percent) in 1988 (Figure 1). There was also a striking decrease in the total annual autopsies from a peak of 1044 cases in 1962 to 301 cases in 1988 (Figure 1).

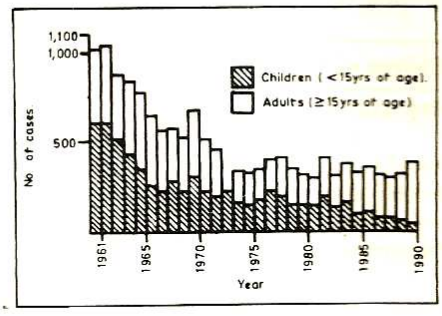


*Figure 1: Annual autopsies in UCH, Ibadan, between 1961 and 1990.*

Detailed information was available for 6634 (96.5 percent) of the 6872 paediatric autopsies. There were 3742 males, 2851 females and 279 children whose sex was not stated, giving a male to female ratio of 1.3 to 1. This male predominance was observed in all categories of disease, except in haematological disorders in which there was an equal sex incidence. The age distribution showed a peak incidence in the age group, one year to four years (Figure 2). Of the 6634 cases, 2057 (31 percent) were less than one year of age.

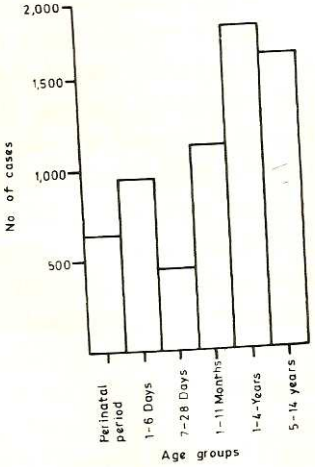


*Figure 2: Age distribution of patients*

The commonest cause of death in the present study was infection, which accounted for 3086 (46.5 percent) of the 6634 cases (Table). The six commonest infections in descending order of frequency included pneumonia, meningitis, tuberculosis, measles, malaria and tetanus. Perinatal asphyxia was the cause of death in 734 (11 percent) of the 6634 cases (Table). Associated conditions in deaths due to asphyxia included premature deliveries, multiple pregnancies, antepartum haemorrhage and obstructed, or prolonged labour. Death was due to congenital malformations in 693 (10.4 percent) of the total number of cases (Table). The systems most frequently involved included the gastrointestinal tract, cardiovascular, urogenital and central nervous systems in descending order of frequency. Malignancies accounted for 580 (8.7 percent) of the 6634 deaths (Table). Of these 580 cases, 319 (55 percent) were Burkitt's lymphoma, while Hodgkin's disease accounted for only 29 (5 percent) of the cases. Thus, the ratio of Burkitt's lymphoma to Hodgkin's disease was 11 to one. Other malignancies in the series included leukaemia in 69 cases (12 percent), nephroblastoma in 55 cases (9.5 percent) and intracranial neoplasm in 50 cases (9.5 percent) of the malignancies.

Other major causes of death included haematological disorders in 261 (4.0 percent), malnutrition in 274 (4.1 percent), birth injuries in 241 (3.6 percent), and low birthweight in 214 (3.2 percent) of the total number of deaths (Table).

Table

Major Causes of death in 6634 children

| Age period | Disease categories | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Infection | Asphyxia | Congenital disease | Malignancy | Haematologic disorder | Malnutrition | Birth injury | Low birthweight | Accidents | Miscellanous | Total No. of cases |
| Perinatal | 5 | 335 | 58 | - | 3 | - | 79 | 164 | - | 1 | 645 |
| Early neonatal | 150 | 379 | 181 | 3 | 55 | - | 150 | 47 | 3 | 9 | 977 |
| Late neonatal | 238 | 15 | 132 | 3 | 35 | - | 10 | 3 | 2 | 16 | 454 |
| Post neonatal | 753 | 1 | 226 | 13 | 24 | 39 | 2 | - | 14 | 61 | 1133 |
| Pre-school | 1221 | - | 62 | 109 | 56 | 211 | - | - | 53 | 69 | 1781 |
| School | 711 | - | 29 | 451 | 88 | 24 | - | - | 24 | 299 | 1626 |
| Unspecified age | 8 | 4 | 5 | 1 | - | - | - | - | - | - | 18 |
| Total | 3086 | 734 | 693 | 580 | 261 | 274 | 241 | 214 | 96 | 455 | 6634 |

The relative frequencies of infections, haematological disorders and malnutrition remained constant during the three-decade period covered by the study. However, there was a dramatic reduction in the incidence of major causes of perinatal death such as birth trauma, asphyxia and low birthweight during the third decade. During the same period, there was also a corresponding and relative increase in the proportion of congenital malformations, neoplasms and accidental deaths.

*Perinatal period*

The leading cause of perinatal deaths in the present series was birth asphyxia which accounted for 335 (51.9 percent) of the 645 perinatal deaths, or 5.0 percent of total deaths (Table). The second commonest cause was low birthweight. Antepartum haemorrhage, maternal anaemia and multiple pregnancy were identified as risk factors in these patients. Seventy-nine perinatal deaths were associated with injury, due mostly to cranio-cephalic injury and less frequently to abdominal or chest trauma. Infection was also an important cause of mortality in this period.

*Early neonatal period*

Birth asphyxia was also the leading cause of death in the early neonatal period; it accounted for 379 (38.8 percent) of the 977 deaths in this period. Of the total of 977 deaths, 139 (14.2 percent) were histologically confirmed to have hyaline membrane disease. Congenital malformation was second leading cause of death in early neonatal period. The commonest malformations were those of the gastrointestinal system, followed by those of the cardiovascular system. Birth trauma occurred in 150 cases (15.4 percent) out of 977 deaths in this period. The two haematological disorders in this period were neonatal jaundice which accounted for 45 (82 percent) of the 55 cases of the haematological disorders and coagulation disorders of the newborn in 10 cases (18 percent). Nineteen (42 percent) of the 45 patients with neonatal jaundice had kernicterus. Predisposing factors to neonatal jaundice included blood group incompatibility and septicaemia.

*Late neonatal period*

Infection was the leading cause of death in this age period. It accounted for 238 (52.4 percent) of the 454 late neonatal deaths. Although respiratory infection predominated, it only constituted 67 (28 percent) of the total number of infections. Neonatal tetanus accounted for 61 (26 percent) of the fatal infections and about half of these cases were associated with umbilical sepsis. Congenital malformations of the gastrointestinal and cardiovascular systems were also prominent in late neonatal deaths.

*Post-neonatal period*

There were 753 (66.5 percent) deaths due to infection out of the 1133 post-neonatal deaths and respiratory infection was the commonest. Meningitis and septicaemia were the next two frequent infections. The peak age incidence of gastrointestinal, cardiovascular, urogenital and craniospinal malformations was in post-neonatal children. Congenital malformations were second commonest cause of death in this age period, accounting for 226 (20.0 percent) of the 1133 cases. Marasmus was the cause of death in 23 (59 percent) of the 39 post-neonatal deaths due to malnutrition.

*Pre-school period*

Infection remained an important leading cause of mortality among children in this period. There were 1221 deaths (40 percent) out

of the 3086 cases resulting from infection. The two commonest infections were broncho-pneumonia and meningitis. Kwashiorkor was the next most common fatal condition; it accounted for 167 (79 percent) of the 211 cases of malnourished states. Malignancy was the third leading cause of death in this age period, the commonest tumour being nephroblastoma. Malignant lymphoma, intracranial tumours, leukaemia, retinoblastoma and sarcomas were less frequently encountered in descending order of frequency. Death due to accidents occurred in 53 (3.0 percent) of the 1781 cases. The main cause of accidental death was poisoning and the poisoning agents included cow's urine concoction, corrosives and diethylene glycol in descending order of frequency. There were 62 (3.5 percent) deaths due to congenital malformations, mostly cardiovascular anomalies.

*School-age period*

Infection contributed to 711 (43.7 percent) of 1626 deaths in this period, with non-specific gastroenteritis and typhoid fever being the commonest conditions. Craniospinal infections occurred in 135 cases (19 percent), predominantly due to meningitis. There were 451 (27.7 percent) deaths due to malignancies out of the 1626 deaths. Two thirds of the 451 children had lymphomas, mostly Burkitt's lymphoma, while only 16 (9 percent) of the patients with lymphoma had Hodgkin's disease. The peak age incidence for Burkitt's lymphoma was six years, while that of Hodgin's disease was 16 years. Leukaemias accounted for 57 (18 percent) and intracranial tumours for 38 (8 percent) of 451 cases of malignancy. Renal diseases accounted for 181 (11 percent) of the 1626 deaths. One hundred and thirteen (62 percent) of these children with renal disorders had chronic glomerulonephritis, followed by 42 cases of nephrotic syndrome (23 percent) and 21 cases of acute glomerulonephritis (12 percent). Haematological disorders contributed to 88 deaths (5.4 percent), being the fourth commonest cause of 1626 deaths in this age period. There were 67 (76.0 percent) cases of sickle-cell anaemia. Bronchopneumonia, cardiac failure and spontaneous intracranial haemorrhage were important causes of death in these children with sickle-cell anaemia. Death due to rheumatic heart disease occurred in 29 children, while endomyocardial fibrosis accounted for 28 deaths. Congenital heart malformation accounted for 21 (72 percent) of the 29 cases of congenital malformations. There were 24 accidental deaths accounting for 1.5 percent of the total number of 1626 deaths in this age period; these deaths were mostly associated with trauma which accounted for 15 cases (62.5 percent).

As can be seen from the Table, infection, asphyxia, malnutrition, birth injury, low birthweight and accidents contributed to 4404 (66.4 percent) of the 6634 deaths. Perinatal and neonatal problems (asphyxia, birth injury and low birthweight) accounted for 1189 (18 percent) of total deaths.

## Discussion

The present study has shown that 46 percent of all autopsies performed in the UCH, Ibadan, during a 30-year period, were on children under 15 years of age. This autopsy rate is close to the observation by Ayeni[2] that 50 percent of all deaths in Lagos city occurred in children under 15 years of age. Over the same period, there was a considerable decline in the total number of autopsies, particularly in the number performed on paediatric patients. This is an unfortunate trend because of the vital role that autopsy plays in monitoring the quality of medical practice.[11,12] The predominance of males over females in the present series is similar to that reported by others.[1,3] The age distri-

bution showed a peak incidence in children, aged between one year and four years. This distribution probably reflects a low infant autopsy rate, since other studies [2] from the same UCH, indicate that 50 to 60 percent of deaths in children under 15 years of age occur in the first year of life, as compared to 31 percent in the present series.

In the present study, infections contributed to 47 percent of the total deaths. This high contribution was constant throughout the study period. Asphyxia was the second important cause of childhood mortality and it accounted for 44 percent of all perinatal deaths. In the present series, prematurity, multiple pregnancy, antepartum haemorrhage and prolonged, or obstructed labour were the predisposing factors to asphyxia. Previous studies [1 5 12] have emphasized the importance of prematurity, low birthweight and birth asphyxia in perinatal and neonatal mortality. Congenital malformation was the third leading cause of the overall childhood mortality, accounting for 10.4 percent of the total deaths; it was the second commonest cause of death in neonatal and post-neonatal periods. In contrast to the high contribution by congenital malformation to neonatal and post-neonatal mortality in the present series, others [1 3 8 13 14] have reported mortality rates of only one to 10 percent in these age periods. Among Caucasian infants, congenital malformations, immaturity and asphyxia constitute the most common causes of childhood deaths.[15]

It is also noteworthy that malignancies were the fourth leading overall cause of paediatric mortality in the series. Between one year and five years of age, malignant embryonal neoplasms, lymphomas and intracranial tumours predominated, while above the age of five years, Burkitt's lymphoma was the commonest malignancy. The incidence of malignancy in the present series is higher than those that are reported elsewhere.[1 8] However, in industrialized countries, malignancies are reported to be important causes of death in preschool and school children with the absence of Burkitt's lymphoma.[15] Malnutrition contributed to 4.1 percent the overall mortality. While marasmus was the commonest cause (59 percent) of death in the post-neonatal period, kwashiorkor accounted for 12 percent of mortality in pre-school period. This finding is similar to those of other workers in Africa and Asia.[1 3 5]

In our series, accidental deaths were relatively infrequent and this is in contrast to what Ayeni [2] found in a population-based study in Lagos city, where accidents were leading causes of death in children of school age. Similarly, among Caucasian children, accidents are the leading causes of childhood mortality.[15] In agreement with the findings of others,[1] sickle-cell anaemia was an important cause of death in children of school age. Similarly, renal and cardiovascular diseases in our series made high contributions to mortality in children of school age, as have been reported by other workers.[8] Rheumatic heart disease and endomyocardial fibrosis were both causes of death in this same age group. It is noteworthy that in the present series, 66.4 percent of the causes of death (infections, birth asphyxia, malnutrition, birth injuries, low birthweight and accidents) are preventable. Thus, in order to bring about reduction in childhood mortality to acceptable low levels, improved obstetric and perinatal services in our institutions are recommended. Similarly, recognized preventive measures against infections, malnutrition and accidents, which include health education to parents, immunizations and economic improvement of the population, should be vigorously pursued so as to reduce our childhood mortality.

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