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Deaths at home and in hospital in Zimbabwe

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Abstract

A prospective study was done of children less than 13 years of age, who died at home or on their way to hospital and those who died in hospital, over a one year period. Fifty seven (86%) of the 66 children who were dead on arrival and 94 (77%) of the 122 children who died after admission were 2 years old or less. The main causes of death in both groups were identical and infections were the most frequent diagnosis. AIDS was the most common cause with 23 (35%) of the deaths in the children who were dead on arrival and 27 (22%) of the deaths in the children who died after admission. An overall positive HIV-I serology was found in 31 (47%) of the children in the dead on arrival group and in 50 (41%) of the children in the group that died after admission.

Data on childhood mortality outside hospital in developing countries is scanty and most information is obtained from hospital records.[1 2] This paucity of accurate information regarding exact causes of death in children in developing countries prompted us to look into this problem in some detail. It was thought necessary to evaluate prospectively both those children who died at home or *en route* to hospital and those who died after admission.

The Bulawayo Central Hospital serves a mixed population. It is one of the two teaching hospitals in Bulawayo and a referral centre for half of the southern part of the country. It is also a general hospital for the middle class suburbs where a substantial part of the population consists of domestic workers who predominantly use the hospital, while the middle class uses a nearby private hospital. There are two military barracks in the catchment area.

The study was approved by the Medical Research Council of Zimbabwe.

Patients and methods

EXTRAMURAL DEATH

All infants and children, aged from 1 day to 13 years, who were presented dead on arrival at Bulawayo Central Hospital from June 1990 to July 1991 were seen by one of the authors. Information obtained included age, sex, and circumstances of death of the child. A detailed medical history was taken from the parents or caretakers and any treatment given before death was noted. A detailed physical examination was performed and specimens of cerebrospinal fluid, blood, urine, and stool were taken for culture and sensitivity. Blood was also obtained for HIV-I test (enzyme linked immunosorbent assay (ELISA); Abbott Laboratories Enzyme Immunoassay). The time lag between the presumed time of death of the child and the collection of the specimens was within two hours. Previously diagnosed cases of AIDS were not further investigated. A postmortem examination was done with parental consent and in appropriate cases the necropsy was requested by the police. A definitive diagnosis was made on the basis of the history, and the physical and laboratory findings, backed up by the necropsy report. The bereaved relatives were given the opportunity to discuss the child's death and its cause or causes with one of the authors four to six weeks later.

INTRAMURAL DEATH

In order to determine whether the characteristics of the children who were dead on arrival were different from those who died after admission, all children and infants aged from 1 day to 13 years, who died in the hospital's general paediatric wards, were studied prospectively during the same year. Admissions to the paediatric surgical ward and babies admitted to the neonatal ward from the maternity ward of the hospital were excluded from the study. In the period under consideration there were 2038 admissions to the general paediatric wards.

DEFINITIONS

A diagnosis of probable AIDS was made when the child presented with a constellation of at least two of the following features: severe pneumonia, oral candidiasis, generalised lymphadenopathy, hepatosplenomegaly or failure to thrive, backed up by a positive HIV-I serology (ELISA).[3] HIV associated disease was defined as illness without the above mentioned constellation but with a positive HIV-I serology on testing.

Results

Over the one year period, 118 infants and children were certified dead on arrival in the emergency department. There were 15 abandoned newborn babies, 16 children with accidents and 21 children with inadequate data, who were excluded, leaving 66 children for analyses. Forty eight (73%) of these 66 children were infants and 57 (86%) were aged 2 years or less. There were 39 boys and 27 girls. During the same period 122 children died after admission

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on the general paediatric wards. In this group 69 (57%) were infants and 94 (77%) were aged 2 years or less. There were 54 boys and 68 girls in the admitted group. The figure shows the age distribution of both the children who died outside the hospital and those who died after admission.

CAUSES OF EXTRAMURAL DEATH

Table 1 shows the causes of death in the 66 children who were dead on arrival. The most frequent cause of death was AIDS which was diagnosed in 23 children (35%). Of these, 14 were diagnosed on previous hospitalisation. In the nine previously undiagnosed cases, multiple micro-organisms were isolated on culture of various body fluids (table 2). An overall positive HIV-I serology was found in 31 of the 66 children (47%).

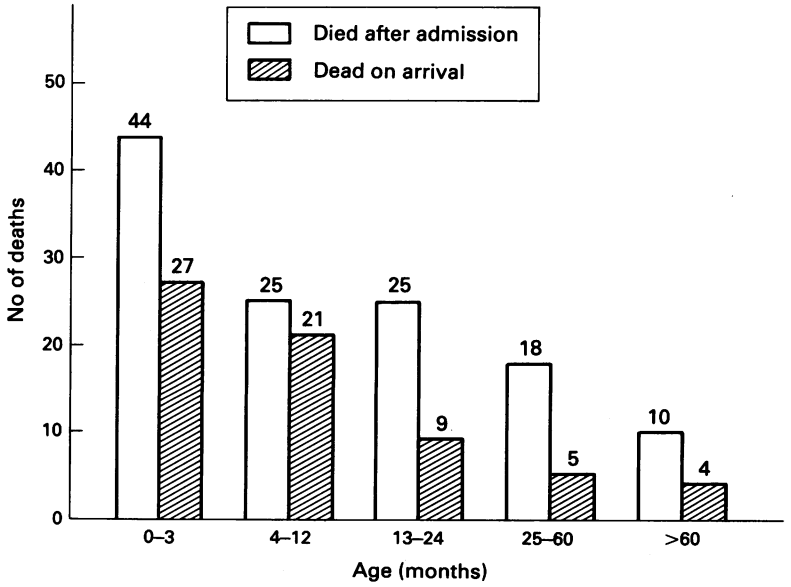
CAUSES OF INTRAMURAL DEATH

In the same period, 2038 children were admitted of whom 122 died, a mortality of 6%. Table 3 shows the causes of death in these children. Twenty seven (22%) children were thought to have died of AIDS. An overall HIV-I seropositivity was found in 50 children (41%).

Comparison between the causes of death in the two groups revealed an essentially similar pattern with the exception of meningitis, which was relatively under-represented in the group of children who were dead on arrival.

Table 1 Causes of death in 66 fully analysed children who were dead on arrival

Cause	*No (%) of children*
AIDS	23 (35)
Pneumonia (HIV associated, n=7)	12 (18)
Sepsis	6 (9)
Heart disease	4 (6)
Gastroenteritis (HIV associated, n=1)	3 (5)
Malnutrition	2 (3)
Anaemia	2 (3)
Cerebrovascular accident	2 (3)
Prematurity	2 (3)
Aspiration	2 (3)
Miscellaneous:	
Meningitis	1
Congenital syphilis	1
Pulmonary tuberculosis	1
Obstructive uropathy	1
Paraffin ingestion (pneumonitis)	1
Asphyxia	1
Haemorrhagic disease of newborn	1
Anaphylactic shock	1



Age distribution of 66 children who were dead on arrival and 122 children who died after admission.

Table 2 Micro-organisms cultured in nine children with previously undiagnosed AIDS who were dead on arrival

Micro-organisms	*Specimen*	*No of children**
Mycobacterium tuberculosis	Pericardium	5
Escherichia coli	Blood	3
	Pericardium	1
Klebsiella	Blood	2
	CSF	1
	Urine	1
Streptococcus pneumoniae	Percardium	1
Streptococcus D	Pericardium	1
Micrococcus	Blood	1
Staphylococcus epidermidis	Blood	1
Pseudomonas	Blood	1

*Several children had more than one kind of micro-organism. CSF=cerebrospinal fluid.

Table 3 Causes of death in 122 children who died after admission in hospital

Cause	*No (%) of children*
AIDS	27 (22)
Pneumonia (HIV associated, n=16)	26 (21)
Heart disease (HIV associated, n=1)	13 (11)
Sepsis (HIV associated, n=1)	9 (7)
Meningitis (HIV associated, n=2)	9 (7)
Gastroenteritis (HIV associated, n=3)	7 (6)
Malnutrition	5 (4)
Congenital syphilis	4 (3)
Seizures (intractable)	4 (3)
Neoplasma	3 (2)
Neuromuscular disorder	3 (2)
Miscellaneous:	
Biliary atresia	1
Renal failure	1
Prematurity	1
Haemorrhagic disease of the newborn	1
Pharyngeal abscess	1
Diphtheria	1
Kernicterus	1
Uropathy	1
Intoxication	1
Neonatal tetanus	1
Suicide	1
Rabies	1

Discussion

The study shows that the pattern of deaths of infants and children at home and in hospital are similar. Lack of reporting of the deaths at home causes falsely low hospital mortality rates as many of these children would have probably died anyway even if they managed to be admitted.

As expected, the mortality was highest in the lower age groups with the first two years accounting for 86% and 77% of the deaths in the groups of children who were dead on arrival and died after admission, respectively. Out of the total number of deaths, infants accounted for 73% in the group of children who were dead on arrival and 57% in the group who died after admission. A similar observation was made by Choudhary and Jayaswal in a prospective study on childhood mortality in India.[4] The main causes of death in both of the groups were identical and infections were the most frequent

diagnosis (tables 1 and 3). This is in contrast to industrialised countries where congenital anomalies and accidents are the main causes of death in children.[5 6] In a recent retrospective hospital based study from a teaching hospital in Nigeria,[1] measles and protein energy malnutrition proved to be main causes of death in children less than 2 years of age, whereas diarrhoea was the main cause of death in children between 1 and 6 years in a prospective community based survey in India.[4] In neither study, however, were necropsies done and diagnoses were based on clinical criteria or information from the parents which may raise doubts as to the exact causes of death.

In a newsletter, Nkrumah and Nathoo listed seven main causes of childhood death in Zimbabwe which included measles, tetanus and malnutrition, but gave no figures to reflect the order of relevance of these causes.[7] In our series of 188 children there was only one case of neonatal tetanus and one case of diphtheria (table 3). Death from measles was conspicuous by its absence. The obvious lack of a substantial contribution to mortality from childhood diseases preventable by immunisation is remarkable. Although the period of observation is short, deaths from such diseases must now be regarded as rare in our area. Deaths from protein energy malnutrition appears to be showing a similar trend. This observation, however, may have been biased by the fact that our hospital is a referral hospital and therefore cases of malnutrition might have been dealt with in the rural district hospitals. Another remarkable observation is the total absence of cases of cot death (sudden infant death syndrome) among the infants who died at home.

The high prevalence of HIV associated mortality of 47% in the group who were dead on arrival and 41% in the group who died after admission is alarming. The diagnosis of HIV infection in infants by ELISA is problematic because of passive transfer of maternal antibodies, but methods for HIV antigen detection or virus isolation are not available in Zimbabwe. The problem is made worse by the fact that the test can be carried out only once in a deceased person. The clinical presentation with infections associated with HIV-I and a positive ELISA strongly suggests that these children were immunocompromised. In particular, young infants with severe pneumonia and positive serology (HIV associated pneumonia) showed a high mortality in both the groups. It is estimated that recent reductions in child mortality are likely to be reversed in regions where HIV-I infection is prevalent.[8]

In children with AIDS a substantial number have been shown to be infected with *Pneumocystis carinii*, pathogenic bacteria, and *Mycobacterium tuberculosis*.[9] In our series, although small, all nine previously undiagnosed cases of AIDS, who were brought in dead and were fully investigated, were found to be infected with either pathogenic bacteria or mycobacterium. Infection with *P carinii* was not looked for because of lack of appropriate laboratory facilities.

Although our access to medical literature is limited, we recall no previous studies involving children in a developing country, which have dealt with death at home by identifying the causes in a systematic, clinical manner. In many developing countries the causes of death in children are based on interviews with parents and health workers or on postmortem examinations which are often inadequate. These approaches have inherent difficulties and are prone to gross error which can only be overcome by the method of investigation which we have adopted, particularly for those children dying at home. Many hospitals and health centres have no laboratory facilities to verify the clinical impression. In some developing countries deaths at home do not necessarily have to be delivered to hospital, as is compulsory in Zimbabwe, or even reported to the authorities; this is particularly true in rural areas. It is therefore important in discussions of childhood mortality from developing countries to define clearly the population under study and how the cause of death was identified and by whom.

In conclusion, there is a substantial number of children who die at home or on their way to hospital. The causes of death in this group of children are of a similar pattern to the causes of death in the children who were admitted to hospital, where infections, especially AIDS, were the most common diagnosis. There is need for a large scale study of the type undertaken here.

It is hoped that improved primary health care and better education of the parents and health workers can reduce the number of children who die at home.

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