Pattern Of Childhood Mortality In Sandakan Hospital, East Malaysia

S Shahid

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Abstract

We studied mortality pattern of children admitted in pediatric medical unit of our hospital to have a baseline assessment of quality of care and to recognize our priority problems. Causes of death and their nature based on preventability were determined. Impact of gender, age, nationality and home-to-hospital distance on death was analyzed.
Fatality was higher in non-Malaysians, especially females, and toddlers ($p<0.05$). Children residing on islands, or more than 7 miles (11.2 kilometers) from hospital had higher fatality rates. Children older than 5 years who died were more often likely to stay far, arrive to hospital late and had higher percentage of severe malnutrition. All deaths in non-Malaysians and older children were of preventable type.
Health of younger children should be focused on. Nutritional education should be provided to parents/caretakers of children, and primary health care services should be strengthened especially in the interiors and on islands.

INTRODUCTION

Childhood mortality is a reliable indicator of health of children in a population and also a pointer of adequacy of health care facilities in an area ([1,2,3]) Evaluation of characteristics of children who die in hospital gives an insight into main medical illnesses in children and measures to overcome them ([4]) In Asian countries, limited health resources require that health priorities be selected wisely and child health-related research is clearly warranted, to identity high-risk groups and to suggest appropriate preventive and therapeutic approaches for decreasing mortality rates among children.

Sandakan is a developing city of East Malaysia with mixed population. Duchess of Kent (Sandakan) Hospital is a government-owned hospital with 352 beds and it caters to low and middle class local and foreign community. It is a secondary level hospital and patients come here from as far as 128-160 kilometers for treatment as it is the only hospital with specialist in that area. Even though much activity and effort is directed towards promoting children's health, there is scarcity of information on childhood morbidity and mortality in East Malaysia. We carried out this retrospective analysis to study mortality characteristics of children admitted with medical illnesses at pediatric department of our hospital in order to list out the priority problems in our area and also to be able to plan out health resources in that direction. This study could also be used as a baseline to compare pattern of deaths over the years.

SUBJECTS AND METHODS

STUDY POPULATION

A detailed retrospective audit was conducted of pediatric mortality at pediatric medical ward of Duchess of Kent Hospital, Sandakan, East Malaysia from 1 st January 2005 to 31 st December 2006. Children admitted for surgical reasons were excluded. Children admitted for medical problem, but who took discharge against medical advice were not included for evaluation, as their outcomes were not known.

STUDY DESIGN

Data was retrospectively collected from hospital register, patient's file record and from death certificate. Demographic details of each child were noted down. Duration of illness and period of hospitalization prior to death were noted. Cause of death was determined from case notes and after proper review was classified into following 3 categories: non-preventable (present knowledge and technological development cannot prevent these deaths), preventable (cause with modifiable risk factors) and uncertain. A death was considered as preventable if an individual or community could reasonably have done something to alter the conditions

that led to the child's death or could reasonably do something now to reduce the likelihood of future similar deaths. Preventable deaths were further subdivided into vaccine-preventable deaths, deaths preventable with early diagnosis and timely treatment, deaths preventable with improvement of environmental sanitation, hygienic measures, and health education, and deaths preventable by mixed measures. Influence of age, sex, nationality status, and residence-to- hospital distance on death was studied. Seven miles (11.2 kms.) was taken as the cut-off for distance of residence from hospital because this was the limit of Sandakan city proper with maximum public transport buses plying up to this distance from hospital on both sides. Deaths in first 4 (immediate), 24, 4-48 (early) and >48 (late) hours post-admission were calculated and studied. Correlation between variables, if any, was analyzed.

DATA ANALYSIS

All data are expressed as means SEM. Comparison of demographic data was done by Chi-square test. Continuous data of two subgroups were tested for significant difference by unpaired Student's t-test for normally distributed data. Correlations were performed by Pearson's test for normally distributed data, and by Spearman's test for non-Gaussian data. Significance was considered when $p<0.05$ ([5]).

RESULTS

Out of 3484 patients admitted in the said period, there were 116 deaths (3.3%). Crude death rate was 9.6 per 1000 live births. Table 1 compares demographic details of fatal cases with those who were admitted and discharged well.

Figure 1

Table 1: Demographic characteristics of hospitalized children

PARAMETER	DEATHS	NON-DEATHS
Number (n)	116 (100)	3368 (100)
Female	42 (36.2)	1316 (39.1)
Non-Malaysian	46 (39.7)	442 (13.1)*
Age groups 1m-5 y >5-12 y	 102 (87.9) 14 (12.1)	 2510 (74.5)* 858 (25.5)*
Residence on island	10 (8.6)	102 (3.0)*
Residence >7 miles from hospital	36 (31)	726 (21.6)*
Mean distance from hospital (miles)	15.5 ±3.2	13.5 ±0.6

Figures in parenthesis are percentages
* p<0.05

As seen in Table 1, fatalities were significantly more in non-Malaysian children (39.7 vs 13.1%, 95% confidence interval of 17.6 to 35.6% for difference between proportions, RR=4.03). Also children 5 years had significantly more casualties than their older counterparts (95% confidence interval of 7.3 to 19.5% for difference between proportions, RR=2.4). Death was also more in hospitalized children who resided more than 11.2 kilometers from the hospital or on islands (95% confidence interval of 1 to 17.8% for difference between proportions, RR=1.96).

Mean duration of symptoms prior to hospitalization in children who died was 3.6 0.5 days. Only 19% of children presented within 1 day of illness to hospital. Gender or nationality of child did not influence the time interval from onset of symptoms to seeking of medical help (Table 2).

Figure 2

Table 2: Relationship between nationality of child's parents and death characteristics:

PARAMETER	LOCAL	NON-LOCAL
Total	2996	488
Deaths (%)	70 (2.3)	46 (9.4)*
Age group: 1m-5 y >5-12 y	 62 (88.6) 8 (11.4)	 40 (87) 6 (13)
Mean age (y)	1.9±0.4	1.6 ± 0.6
Female	30 (42.9)	12 (26.1)**
Mean distance from hospital (miles)	19.8±4.3	7.7±4.1*
No. residing on island	2 (2.9)	8 (17.4)*
Residence > 7 miles from hospital	30 (42.9)	6 (13)*
Mean duration of symptoms (days)	3.9 ±0.8	3.3 ±0.4
Malnutrition (%)	44 (62.9)	24 (52.2)
Mean hospital stay duration (hours) (days)	 209.1±74.9 8.7 ± 3.1	 121.7±31.8 5.1 ±1.3
Death in first 4 hours after admission (%)	12 (17.1)	2 (4.4)*
Death in first 24 hours after admission (%)	30 (42.9)	16 (34.8)
Death in 4-48 hours after admission (%)	30 (42.9)	20 (43.4)
Death in first 48 hours after admission (%)	42 (60)	22 (47.8)
Death after 48 hours of admission (%)	28 (40)	24 (52.2)
Deaths occurring during 'out of office' hours (%)	56 (80)	30 (65.2)
Non-Preventable deaths (%)	8 (11.4)	0 (0)**

Figures in parenthesis represent percentages
*=p<0.05, **=p<0.1

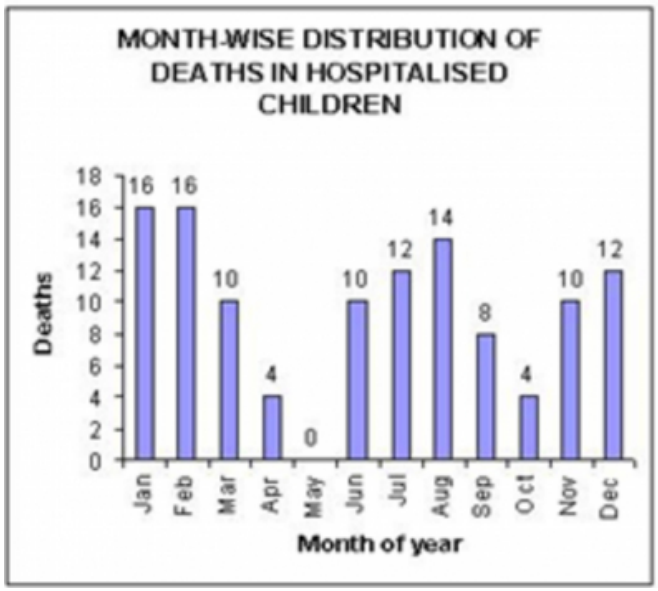
60.3% of children who died were malnourished (<80% of expected weight for age) ([6]). Expired children survived for a mean of 7.4 1.9 days after admission. 12.1, 39.6 and 55.2% of fatalities occurred within 4, 24, and 48 hours after

admission respectively. 34.5% of these deaths occurred at nighttime (between 10.00 pm to 6.00 am). 86 (74.1%) of these lethal cases were admitted when there were no seniors around. There was no increase in early deaths in these cases who were admitted during ‘out of office' hours.

93.1% of total deaths were preventable; vaccine preventable being 3.7%, preventable by proper sanitation was 3.7% and those in whom early diagnosis and treatment could have helped formed 92.6% of fatal cases. None of deaths were of uncertain etiology. Non-preventable deaths constituted 6.9% of total deaths; all of these were in children 2 years of age (mean=0.7 0.4 years). Deaths were unevenly distributed over the months of the year with maximum deaths seen in the months of January and February. May month had no documented deaths (Figure 1).

Figure 3

Figure 1: Month-wise distribution of deaths



Deaths were classified as per PAHO-6/67 list for tabulation of mortality data (ICD-10, International Classification of diseases) ($_{7}$). 90 (77.6%) deaths were due to communicable diseases, 2 (1.7%) due to neoplasm, 16 (13.8%) deaths were attributed to diseases of circulatory system, and 8 (6.9%) were in the ‘all other diseases' group.

Table 2 above analyses the relationship between nationality of child's parents and characteristic of death in the child. Significantly more of non-local children stayed within city limits, but death was still more in them.

Children above 5 years of age were noticed to seek medical assistance late compared to the younger children. None of these children were brought to hospital within a day of illness whereas in younger children, 21.6% of cases sought medical assistance within a day of illness ($p<0.05$, 95% confidence interval of 13.6 to 29.6%, RR=2.3). These children also stayed far and were more severely malnourished (Table 3).

Figure 4

Table 3: Correlation between age and other demographic variables of lethal cases:

PARAMETER	1 m-5 y	>5-12 y
Total	2612	872
Deaths	102 (3.9)	14 (1.6)*
Female	40 (39.2)	2 (14.3)**
Malaysian	62 (60.8)	8 (57.1)
Mean distance from hospital (miles)	14.0 ±3.2	26.7 ± 12.9
No. residing on island	8 (7.8)	2 (14.3)
Residence > 7 miles from hospital	28 (27.5)	8 (57.1)*
% who sought medical assistance within a day of illness	22 (21.6)	0 (0)*
Severe malnutritionΨ	24 (23.5)	10 (71.4)*
Mean hospital stay duration (days)	8.0 ±2.2	2.2 ±1.2 p=0.31
Death in first 4 hours after admission (%)	12 (11.8)	2 (14.3)
Death in first 24 hours after admission (%)	40 (39.2)	6 (42.9)
Death in 4-48 hours after admission (%)	42 (41.2)	8 (57.1)
Death in first 48 hours after admission (%)	54 (52.9)	10 (71.4)
Death after 48 hours of admission (%)	48 (47.1)	4 (28.6)
Deaths occurring during ‘out of office’ hours (%)	74 (72.5)	12 (85.7)
Preventable deaths (%)	94 (92.2)	14 (100)

Figures in parenthesis are percentages

*=p<0.05, **=p<0.1, Ψ=Grade III and IV as per Indian academy of Pediatrics classification (‘).

In older age group, no deaths occurred at nighttime, whereas in the younger age group, 39.2% of deaths occurred between 10.00 pm to 6.00 am ($p<0.05$). All deaths in children above 5 years of age were preventable.

Gender had no influence on other demographic parameters or class of death. No correlation was demonstrated between age of child and duration of hospital stay prior to death. No correlation could be demonstrated between distance from hospital and nutrition status in fatal cases.

Children who died within 4 hours of admission had longer duration of illness compared to those who did not have immediate deaths (6.6 3.9 vs. 3.3 0.3 days, $p<0.05$). Hence statistically, there seemed to be some delay in seeking medical assistance by them, but this was not clinically significant. Home-to-hospital driving distance was found to

have no bearing on time of death after admission. Deaths within 48 hours were found to have significantly more cases of communicable disease compared to deaths after 48 hours (95.2 vs. 53.8%, p highly significant, 95% confidence interval of 28.7 to 57.3%, RR=6.8). Deaths in children with congenital heart diseases were also delayed to after 48 hours of admission. Non-preventable deaths had significantly longer hospital stay and hence consumed more hospital and health resources (38.2 20.0 vs. 4.9 1.1 days, p<0.001, 95% confidence interval of 5.6 to 61.1 days).

DISCUSSION

This retrospective analysis of mortality in children 1 month to 12 years of age reveals that though the overall mortality rate is less in hospitalized children, significant number of younger or non-local or far-staying children has a fatal outcome. Majority of deaths were preventable and communicable diseases form the major chunk of these fatal illnesses. Nighttime deaths were seen in 39.2% of fatalities in children less than 5 years of age.

This is the only study of its kind in East Malaysia and could serve as a baseline data for evaluation of health care services over time and amongst the different hospitals in the state. The effect of distance of residence from health care unit has been highlighted in this study. The study shows that distance of residence of patient from our hospital was directly proportional to the risk of casualty and this could emphasize the need for establishment of more primary care centers and emergency centers in the interiors of the region for early provision of emergency care to these children. Besides, this analysis has shown that children above 5 years of age who died were more significantly malnourished compared to those who died due to illness at less than 5 years of age. Nutritional education should be the imparted to doctors working in the peripheral hospitals, and made available to parents of these children in order to avert such eventualities in the future. Being a retrospective study, this study is bound to have some unknown and inevitable extraneous factors which may affect the results.

Different studies carried out in developing countries have revealed a fatality rate ranging from 5 to 14% ([8,9,10]). These figures are higher compared to our study. 93.1% of deaths in our study were due to preventable causes, and communicable diseases were predominant amongst the causes of deaths in these children. This is higher compared to other studies of mortality of hospitalized patients ([1,11,12,13]). One plausible reason for this could be poverty, widespread health ignorance and large illegal and immigrant population from Indonesia and Philippines into Sandakan. These remain extensive in spite of all measures to curb them.

Those who stayed far away from hospital had higher chances of death. This is expected and other studies have also shown that accessibility to health care services is inversely proportional to mortality ([14,15]). Home-to-hospital distance is vital as in cases where access to health care facilities is difficult, mortality tends to be higher. In our study, children were brought to hospital from as far as 128 kilometers as ours was the only hospital with specialist in the area. Some children also stayed on islands and were unable to reach the hospital on time due to non-availability of boats or due to bad weather. Measures to improve accessibility to health care facilities could assist in reducing mortality in children. 60.3% of children who died were malnourished (<80% of expected weight for age). Role of malnutrition in mortality was more marked in children who were above 5 years of age. Malnutrition increases susceptibility of children to infections and risk of death ([16,17,18,19,20,21]) and this proneness remains high irrespective of grade of malnutrition ([22]). Pelletier D has in his article voiced his doubt as to whether malnutrition is truly responsible for rise in mortality or is just associated with it. Our study could not deal with this aspect and more large-scale well-controlled studies are required to affirm this. Several South Asian studies have revealed that in spite of ‘female advantage', girls have higher mortality due to sex differences in dietary intake, nutritional status and health care ([23,24,25,26,27]). Fortunately, we did not find any influence of sex on death outcome in our study. Children whose parents were of non-Malaysian origin had significantly higher percentage of deaths. This was expected keeping in view the high degree of illegal migration from adjoining countries by these foreigners, and the adverse social circumstances in which they live ([1,28]). This difference remained uncorrected in spite of the fact that significantly more of this migrant population stayed close to the hospital. Local children had significantly higher percentage of immediate deaths. One reason could be because they stayed far from hospital. Children less than 5 years of age had higher risk of death and around 2/5 th of these cases died at night. Silbergleit R et al have shown that there is no marked deficit in patient care/doctor's performance at night ([29]). We could not determine this in our study. Studies on mortality of cases admitted during weekends have yielded inconsistent results due to differences in structure of care, process of care and severity of admissions ([30,31,32,33]). We did not find any difference in

number of immediate deaths in the fatal group whether they were admitted during 'office' or 'off' hours. This is heartening, but we could not make adjustments for the rates based on severity of weekend admissions. Delay in getting medical opinion has been cited as one of the reasons for preventable demise in health care settings ([34,35]). In our study, children above 5 years of age who died sought medical assistance for their illness late compared to younger children. This could possibly be due to the tendency of parents to seek early medical assistance for smaller children, while illness of older children may not receive the same kind of attention due to its more localized nature. Early arrival to hospital could have at least averted some of these deaths.

Our study has revealed that sandakan has a higher fraction of preventable deaths in children and effective measures to minimize deaths due to it should be taken. Improving accessibility to medical care for children in interiors and remote areas would greatly assist in reducing mortality rates. It should be a practice to provide dietetic advice and nutritional education as a routine to parents/caretakers of children, and early diagnosis of nutritional deficiency in these children and its treatment should be done. Besides, effective steps to curtail illegal immigration and formulation of proper policies to take care of children of these illegal parents should be formulated. Focus on early detection of diseases and proper management should be enhanced.

This analysis of deaths in children in sandakan could act as a baseline study for comparison over time and with other areas in the state. This could serve to assess success of implementation of nutritional rehabilitation and other community-based programmes for children. This study could supplement other field studies to recognize the changes that need to be affected in the established policies and plans for children.

CORRESPONDENCE TO

Dr. Sukhbir Kaur Shahid, 8-Jayanti, 353/21, R.B.Mehta Road, Ghatkopar (East), Mumbai-400 077. India Phone: 0091-9869036606 E-mail: s_kaur_shahid@yahoo.com

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Author Information

Sukhbir K. Shahid, M.D.
Consultant Pediatrician and Neonatologist, Duchess of Kent Hospital