

RISK FACTORS FOR FATAL PNEUMONIA: A CASE CONTROL STUDY

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ABSTRACT

We conducted a case control study to identify the risk factors for death among hospitalized children with acute pneumonia at the Institute of Child Health, Madras. All the 70 patients who died of pneumonia constituted the case-patients and 140 children recovered from pneumonia, selected by systematic sampling, during the same period served as controls. By univariate analysis, the risk factors for death in pneumonia observed were associated illnesses—Odds Ratio (OR) 22.2 (95% confidence interval [CI] 9.8-51.4; $p < 0.001$); congenital anomalies—OR 10.4 (2.9-37.8; $p < 0.001$); severe pneumonia—OR 4.2 (1.2-14.4; $p = 0.09$); marasmic status—OR 2.9 (1.5-5.7; $p = 0.001$); age under 6 months—OR 2.8 (1.3-5.7; $p = 0.004$); and severity of the pneumonia (lobar versus segmental)—OR 2.0 (0.9-4.5; $p = 0.09$). By logistic regression analysis the following risk factors were significant—associated illnesses (51.6; 18-146.9; $p < 0.001$); age under 6 months (6.5; 2-20.6; $p < 0.001$), marasmic status (5.8; 2.2-15.6; $p < 0.001$); and congenital anomalies (3.8; 2.0-7.1; $p < 0.001$). These risk factors should be kept in mind by the clinicians for appropriate intervention at an earlier stage to minimize death.

Key words: Pneumonia, Death, Risk factors.

Acute respiratory infections are an important cause of under five mortality in our country(1). Guidelines, for community health workers and medical personnel, to assess the severity of the illness at community as well as hospitals are well accepted(2). There is, however, paucity of information on the predictors for fatal outcome among children with pneumonia, particularly in our country(3,4). We designed this study with the objective of identifying risk factors for fatal outcome in children with pneumonia. This would enable to plan for effective management of the cases with risk factors.

Material and Methods

A case control study design was adopted to identify the risk factors for death in hospitalized cases of pneumonia during the period January to December, 1989 at the Institute of Child Health, Madras. All cases of pneumonia who died in the hospital were included. Cases of pneumonia who recovered during the same period were used as controls. Two controls were selected for each case by systematic sampling method in the ratio of 10:1. The diagnosis of pneumonia was established on basis of clinical findings and radiological features of consolidation were included. Cases of bronchopneumonia were not included. The risk factors studied were—age less than 6 months, extent and severity pneumonia, grade of malnutrition, associ-

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ated septicemia or other illnesses and congenital malformations. Radiological diagnosis of pneumonia was made by a Pediatric Radiologist. Severity of pneumonia was assessed as per standard guidelines(5). In brief, pneumonia is considered severe, if child has respiratory rate $>50/\text{min}$ with any one of the following signs like cyanosis, drowsiness, refusal of feed and convulsion. Nutritional status was defined as per the recommendations of the Nutritional Subcommittee of the Indian Academy of Pediatrics(6). Crude odd's ratio (OR) was calculated for each risk factor by univariate analysis using Chi square or Fisher's exact test. The risk factors which had $\text{OR} > 2$ were included for logistic regression analysis by forward stepwise method (SPSS PC+ software) to assess the risk of individual factor towards death.

Results

The total number of case-patients dying of pneumonia and controls were 70 and 140, respectively. The age of the children ranged from 1 month to 11 years. The mean (SD) age of cases and controls was 16.3 (21.5) and 29.7 (30.6) months, respectively. Twenty three (32.8%) case-patients who died were between 1 and 5 months old and 41 (56.5%) were below the age of one year. Of the 70 case-patients with pneumonia who died, 42 (60%) were males. Children with PEM Grade-III and IV malnutrition had a higher proportion of death (48.6%), compared to 12.9 and 38.6% in normal and Grades I and II, respectively.

The *Table* shows the crude odds ratio for the risk factors. The chief factors which were associated with a high risk of mortality in pneumonia included associated illness (OR 22.2) and associated congenital anomalies (OR 10.4). Other factors including severe pneumonia, Grade-III and IV

malnutrition status, age under 6 months and severity of the pneumonia (lobar versus segmental consolidation) had ORs ranging from 2 to 4. The major associated illnesses which were associated with a high risk for fatal outcome included gastroenteritis and meningitis. The important congenital malformations included congenital heart disease, Down's syndrome and floppy infant.

All the above risk factors were included in the logistic regression analysis. The odds ratio for the factors both with and without adjustment for other variables as crude OR and adjusted OR with 95% CI are shown in the *Table*. Those risk factors which were significant as shown by adjusted OR, included associated illnesses (gastroenteritis, meningitis) age under 6 months, Grade II or IV malnutrition, and congenital malformations. The extent and severity of pneumonia and associated septicemia were not significant by logistic regression analysis.

Thirty four (48.6%) deaths occurred within 48 hours of admission, 21 (35%) between 2-6 days and 15 (21.4%) after 6 days of hospital stay.

Discussion

Our observations confirm the previous reports that, young infants with pneumonia are at higher risk of death(3,7). One of the probable reasons may be that in this age group significant proportion of the infections are due to Gram negative organisms. Lobar consolidation is a risk factor in our observation concurring with observations of others(3,7). Our data has shown that patients with severe pneumonia as assessed by clinical criteria, are 4 times likely to die compared to those with pneumonia. This confirms the findings reported from other developing countries(3,7).

TABLE—Risk Factors for Mortality in Pneumonia

Risk factors	Cases (n)	Controls (n)	Probability	Crude OR* (95% CI)**	Adjusted OR* (95% CI)**
<i>Age</i>					
<6mo	47	119			
>6 mo	23	21	0.004	2.8 (1.3-5.7)	6.5 (2.1-20.6)
<i>Extent of lesion</i>					
Pneumonitis	54	122			
Consolidation	16	18	0.09	2.0 (0.9-4.5)	
<i>Clinical severity</i>					
Severe	66	138			
Very severe	4	2	0.09	4.2 (1.2-14.4)	
<i>Associated illness</i>					
Absent	12	115			
Present	58	25	<0.001	22.2 (9.8-51.3)	51.6 (18.0-146.9)
<i>Nutritional status</i>					
Normal Gr I, II malnutrition	36	106			
Normal, Gr III, IV malnutrition	34	34	<0.001	2.9 (1.5-5.7)	5.8 (2.2-15.6)
<i>Septicemia</i>					
Absent	57	138			
Present	13	2	<0.001	15.7 (3.4-72.0)	
<i>Associated congenital anomalies</i>					
Absent	57	137			
Present	13	3	<0.001	10.4 (2.9-37.8)	3.8 (2.0-7.1)

* Odds ratio;

** Confidence interval.

Our findings confirm the reports that malnutrition is a risk factor for fatal outcome in pneumonia(8,9). Associated illnesses like diarrhea, meningitis, empyema, tuberculous meningitis, cardiac failure and septicemia were also high risk factors. This has been reported in other studies also(3,7). These associated illnesses increase the severity of the morbidity and the

management becomes complicated and prolonged. Our data corroborates with the earlier reports that if a child has underlying congenital malformation, it is at a higher risk for death(7).

Our findings suggest that young infants, malnutrition, severity of pneumonia and presence of congenital malformations are important risk factors for fatal outcome in

pneumonia. Clinicians need to be aware of these risk factors to allow appropriate intervention. Mortality due to pneumonia may be prevented by recognition of these risk factors and early referral to hospitals for provision of appropriate care.

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NOTES AND NEWS

XVIII CONFERENCE OF GUJARAT STATE BRANCH OF IAP

The 18th Annual conference of IAP Gujarat State branch will be held on 14th February, 1993 at IFFCO, Auditorium, Gandhidham (Kutch).

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