

## ORIGINAL ARTICLE

**Factors Influencing Empyema in Children \***

by

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*(From the Department of Child Health Medical School Padjadjaran University/Hasan Sadikin General Hospital Bandung, Indonesia)***Abstract**

*Incidence of empyema in children at Hasan Sadikin General Hospital is still high, commensurate with the high number of cases of pneumonia. Thirty-seven children with empyema were studied from July 1984 to December 1985; 20 of them were females and 17 males with the age ranging between 5 months and 12 years.*

*Three patients (8.1%) had loculated fluid as observed on chest roentgenographs; the remainder had empyema sinistra and dextra at 43.2% and 48.6% respectively. More than 50% of the patients were undernourished (56.7%), 5 of whom were marasmic. On admission, 89.2% complained of dyspnea, 24.3% of cough, 16.2% of high fever and 10.8% of chest pain. All patients suffered from acute respiratory tract infection (ARI) 7 to 30 days before admission, 70.3% of whom did not receive adequate medication and 5 individuals received no treatment at all. Chest tube drainage was performed on 34 patients. In the study, 3 patients died (8.1%) due to sepsis. All recovered patients had pleural thickening on chest roentgenographs on discharge.*

*The role of under nutrition, delay of medication and inadequate treatment of ARI seemed to have an influence on empyema in the patients observed.*

\* Paper presented at the XVIII International Congress of Pediatrics, Honolulu, Hawaii, USA, July 7-12, 1986. Received 25 June, 1987

**Introduction**

Although medical technology has advanced rapidly and new antibiotics are discovered, empyema is still a problem in children. Several researchers have reported that the incidence of empyema in children in industrial nations has decreased. McLaughlin et al., in 1984 reported that there were only 1 to 2 cases hospitalized per year between January 1969 and August 1980 in the Children's Hospital Medical Centre and Department of Pediatrics, Harvard Medical School, Boston. Lionakis et al., (1958) found only 133 patients in their 25 years research. Lindskog in 1956 reported that the number of empyema in the Thoracic Section of the New Haven Hospital reduced from 16.7% to 2.4% in twelve years; the report attributed this fact to successful antibiotic treatment of pneumonia. A four and a half years study by Hertzler et al., in 1954 reported 41 cases of empyema thoracis, (January 1949 - July 1953) thus averaging 9 cases per year. Earlier literature such as Penberthy (1936) reported 407 empyema cases from 1926 to

1936 (40.7 patients annually); Steinke in 1935 wrote of 289 cases studied between 1920 and 1932.

At the Child Health Department of Hasan Sadikin General Hospital in Bandung, the number of empyema patients is still high and tends to increase. Seventeen empyema and 420 pneumonic patients were treated in 1980; for 1981, 1982 and 1983 there were 14, 23, and 29 empyema cases respectively, and 249, 653, and 894 pneumonia cases respectively.

Questions arose from these facts because the Government of Indonesia has since 1974 established Community Health Centres, each staffed by a physician, and antibiotic medication could be obtained easily now.

To find the factors influencing the high number of cases, a study was made on all empyema patients in the Child Health Department, Hasan Sadikin General Hospital Bandung, from July 1984 to December 1985.

**Materials and Methods****Patients**

All patients with empyema admitted to the Child Health Department, Hasan Sadikin General Hospital Bandung from July 1984 until December 1985 were included in this study. The patients came from urban, suburban and rural areas of Bandung.

Information was recorded on age, sex, chief complaints, signs and symptoms on admission, nutritional status, history, and medical treatment prior to admission; laboratory results, roentgenographs, medi-

cation, duration of hospitalization and outcome were also noted scrutinized.

**Roentgenography**

Chest roentgenographs were made of every patient suspected of empyema clinically before thoracentesis and at least once after chest tube placement and after removal, and before discharge. All roentgenographs were reviewed by radiologists from the Department of Radiology Hasan Sadikin General Hospital Bandung.

### Bacteriology

Gram stain of pleural fluid were examined after thoracentesis in the laboratory. Blood examination for hemoglobin concentration, white blood cell (WBC) count, and differential count was done on admission and every week until discharge; blood culture was done on admission. Culture of pleural fluid was also done on admission and specimen analyzed by the Central Laboratory of Hasan Sadikin General Hospital.

### Pulmonary function tests

Pulmonary function tests were not done due to inadequate equipment.

### Treatment

Ampicillin and cloxacillin at 100 grams per kilogram body weight per 24 hours each were given parenterally to every patient. Chest tube drainage was placed after thoracentesis was positive for empyema and removed when there was no more fluid coming out from the tube.

### Results

In 18 months of observation, 40 children with empyema were admitted, but 3 patients were still hospitalized at the end of observation. During the same period, pneumonia was diagnosed in 941 out of 5423 (17.4%) children hospitalized. Thirty-seven children (20 girls and 17 boys) between 5 and 146 months old ( $65.8 \pm 44.4$  months) were closely observed. Chief com-

plaints of dyspnea, cough, high fever and chest pain were present in 89.2%, 24.3%, 16.2%, and 10.8% of patients respectively. Examination on admission indicated cough and fever in all patients, dyspnea in 33 patients, chest pain in 7 patients, and almost all patients showed dullness on chest percussion, decreased breath sound, tachypnea, and tachycardia.

Table 1 : Symptoms and signs on admission

Symptoms	N	%	Signs	N	%
Cough	37	100	Fever	37	100
Dyspnea	33	89.2	Dullness on chest percussion	35	94.6
Lethargy	14	37.8	Decreased breath sound	34	91.9
Chest pain	7	18.9	Tachypnea	34	91.9
Vomiting	6	16.2	Tachycardia	34	91.9
Abdominal pain	1	2.7	Intercostal retraction	12	32.4
			Rales	5	13.5

### History of illness prior to admission

All patients suffered from acute respiratory infection (ARI) 7 to 30 days prior to admission. Earlier treatments indicated that 26 patients (70.2%) received inadequate medication from local health personnel or inadequate dosage of self administered antibiotics; 5 persons (13.5%) received no treatment at all and only 6 (16.2%) had ever gone to a physician. Three patients were referred from other hospitals.

### Nutritional status

Application of 'Wellcome' classification (1976) showed 21 patients (56.8%) were undernourished and nutritional status of the other 16 patients (43.2%) was inadequate (border line status). Five among the 21 undernourished patients had very bad nutritional status giving 4 marasmic cases and case of marasmic kwashiorkor who soon died of suspected sepsis.

### Laboratory

Hemoglobin concentration examination on admission showed 24 children (64.9%) with anemia according to WHO standards (WHO Group of Experts Report, 1972). White blood cell (WBC) count showed: lower than 10,000 per cu.mm. in 14 patients (37.8%), between 15,000 and 20,000 in 12 patients (32.4%), between 20,000 and 30,000 in 8 patients (21.6%) and 3 patients (8.1%) had WBC more than 30,000 per cu.mm.

Gram staining of pleural fluid on admission was done on all patients and 13

(35.1%) showed Staphylococcus. Blood culture and pleural fluid culture were done but could not be reported due to technical difficulties giving unreliable data.

### Roentgenography

Chest roentgenographs were taken on admission, following chest tube placement and after removal, and on discharge. Occasional roentgenographs were taken also when the patients showed changes in vital signs and became worse. Chest roentgenographic assessment showed 3 patients (8.1%) with loculated empyema, 16 patients (43.2%) empyema sinistra, 18 patients (48.7%) empyema dextra, and no case of bilateral empyema was found.

### Treatment and outcome

All patients were given parenteral ampicillin and cloxacillin at 100 mg per kilogram body weight per 24 hours each without confirmation of bacteriological examination. Chest tube drainage was done on 34 of 37 patients (91.9%) and not done on the remaining 3 patients who had loculated fluid due to difficulties in placing the chest tube. The chest tube was kept in place between 2 to 45 days ( $38.0 \pm 11.1$  days). No open thoracotomy had been performed. Hospitalization lasted from 4 to 50 days ( $30.4 \pm 9.6$  days). Three patients died suspected sepsis. The 34 other patients (91.9%) were discharged in good condition but the last chest roentgenographs before discharge showed pleural thickening. Unfortunately, pulmonary function tests could not be performed.

### Discussion

This study shows that the number of empyema patients at the Child Health Department Hasan Sadikin General Hospital, Bandung, Indonesia, is high compared to earlier reports (Hertzler et al., 1954; Lionakis et al., 1958; McLaughlin et al., 1984). This is also the case when compared to two other large general hospitals in Indonesia. In the Child Health Department of Cipto Mangunkusumo General Hospital, Jakarta, in 1984 and 1985, 13 and 12 empyema patients respectively were hospitalized (data from the Child Health Department of Cipto Mangunkusumo General Hospital, Jakarta, 1984 and 1985). In Semarang, at Dr. Kariadi General Hospital only 3 patients were admitted in the same 18 months period (data from the Child Health Department of Dr. Kariadi General Hospital Semarang, 1984-1985). Since the three hospitals are referral hospitals of about the same status, the high number of empyema cases in Bandung becomes interesting. Observations on the 37 patients lead to several possible factors, namely nutritional status, anemia and delayed and inadequate medication. Of the patients, 56.7% were undernourished and on the other 43.3% the nutritional status was on the borderline, and 65% of the patients were anemic. The poor nutritional status and anemia not only made children vulnerable to infections but

also hindered recuperation from infections, including acute respiratory infections, so that empyema complication easily set in on a child with pneumonia; the case became aggravated by delayed treatment and inadequate dosage of medication. Among the 37 patients, only 16.2% had gone to a physician before, 70.2% went to paramedics or bought their own medicines and 13.5% never went to medical personnel. This could imply parents' ignorance of the danger of complications arising from acute respiratory infection. This lack of knowledge on the part of the parents and field health officers is certainly detrimental to the children's health. Three children died in this study. All recuperated patients had pleural thickening. These facts could influence results of respiratory function tests; unfortunately, these tests could not yet be performed locally. McLaughlin et al. (1984) indicates that the long term prognosis of empyema in children is excellent.

To reduce empyema incidence in children, a widespread and concerted cooperation is necessary among nutritionists, field health officers, paramedics, physicians, and parents. To support such an effort, further research on the epidemiology of empyema and acute respiratory infection in children should be continued and encouraged.

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