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RISK FACTOR OF BACTEREMIA IN CHILDREN WITH PNEUMONIA

Retno Asih, Zuhrotul Aini, Landia Setiawati
Department of Child Health ,Medical Faculty
Airlangga University/Dr. Soetomo Hospital - Surabaya

ABSTRACT

Background: Pneumonia is known as a frequent cause of morbidity and mortality among children in developing countries. In children,it caused predominantly by bacteria. Bacteremia has been associated with severity and mortalitas of pneumonia. Identify factors caused bacteremia important to prevent severity and mortalitas of pneumonia. Objective: The objective of this study was to identify risk factors of bacteremia in children with pneumonia. Methods: A retrospective study was conducted in children with pneumonia in Dr. Soetomo Surabaya Hospital from January 2007 to December 2008. Blood cultures be performed on all of this patients. Factors associated with bacteremia were identified following review of medical records include clinical features, laboratory , radiology and blood culture results. Results: Frequency of bacteremia was 8,2% (36 patients) of 438 children with pneumonia. Interval from onset of symptoms to hospital admission more than 5 days (22.69 CI 95%), severe malnourished (OR 9.05 CI 95%), anemia (OR 2.44 CI 95%), leucocyt counts less than 5000/mm^3 and more than 20.000/mm^3 (OR 2.41 CI 95%) and paO2 less than 80 mmHg (OR 4.25 CI 95%) were at increased risk of bacteremia in children with pneumonia. Conclusion: Risk factors bacteremia in children with pneumonia included age under 1 year, symptoms more than 5 days, severe malnourished ,anemia, leucosyt counts less than 5000/mm^3 and more than 20.000/mm^3 and paO2 less than 80 mmHg.

Key words: *Risk factors, bacteremia, pneumonia*

INTRODUCTION

Pneumonia is an acute inflammatory disease of the lung parenchyma involving the distal terminal bronchioles, respiratory bronchioles, alveoli ducts, alveoli sacs, and alveoli .. This disease is one of the most common infections in the pediatric age group. In developing countries, researchers estimate that more than 150 million new cases occur annually in children < 5 years. It is well known as a frequent cause of morbidity and a leading cause of mortality among children.[1] One in five of childhood deaths in developing countries have been ascribed to acute respiratory tract infections (ARI) and 90% of these deaths are due to pneumonia.[2]

A variety of microorganisms can cause pneumonia in children-bacteria, viruses or fungi. Pneumonia in developing countries is caused predominantly by bacteria.[1] The frequency of bacteremia in pneumonia patients varies from 4% to 18%.[3] Bacteremic pneumonia are potentially life-threating in children.[4]

Predictor of bacteremia in pneumonia included recent antibiotic treatment, comorbidity disease,increase respiratory rate, temperature, pulse and laboratory abnormalities. [3]

The objective of this study was to identify risk factors of bacteremia in children with pneumonia. A retrospective study was conducted in children with pneumonia in Dr. Soetomo Surabaya Hospital from January 2007 to December 2008. Blood cultures be performed on all of this patients. Factors associated with bacteremia were identified following review of medical records include clinical features, laboratory , radiology and blood culture results. Identify factors caused bacteremia important to prevent severity and mortalitas of pneumonia

SUBJECTS AND METHODS

A retrospective study was conducted in children age 1 months until 5 years with diagnosis community acquired

pneumonia in Dr. Soetomo Surabaya Hospital from January 2007 to December 2008. This formed part of larger study investigating epidemiology study Streptococcus pneumoniae at Surabaya. The diagnosis of pneumonia in this study was made based on clinical symtomps presenting of lower respiratory tract infection. Sex, age, clinical characteristics, laboratory and radiology findings were collected by medical records review.

Patients were defined as bacteremic if a blood culture drawn of presentation to the hospital before antibiotic treatment grew an organism, and not defined as a contaminant.

From the time of admission, we noted duration of symptoms, clinical manifestation, nutritional state, laboratory and radiological findings. We classified temperature into 2 categories, less than 36,5^{o} C, or more than 38,5^{o} C and between 36.5^{o} C and 38,5^{o} C. Nutritional state were classified into 3 categories, well nourished if ideal body weight more than 90%, moderate malnutrition if ideal body weight between 70%–90% and severe malnutrition if ideal body weight less than 70%.

We collected laboratory finding includes hemoglobin level, leucocyte level, C Reactive Protein and blood gas analyse. Anemia if hemoglobin level less than 10 gr/dl. Leucocyt counts classified into less than 5000/cmm, between 5000/cmm and 20.000/cmm and more than 20.000/cmm.

X^2 tests, Fisher's exact test and odds ratio and relative risks with 95% confidence intervals were used to determine whether an association was significant ($p < 0.05$).

Table 1. Characteristic of children with Pneumonia at Dr. Soetomo Hospital, January 2007–December 2008.

Age (months) mean ± SD (range)	12.2 ± 11.2
1–12 month, n (%)	293 (66.9)
13–36 month	126 (28.8)
> 36 month	19 (4.3)
Sex ratio (male: female)	1.6: 1
Interval from onset of symptoms to hospital admission , n (%)	226 (51.6)
< 3 days	199 (45.4)
≥ 3–< 5	13(3.0)
≥ 5	
Nutritional state, n (%)	
Well nourished	281(64.2)
Moderate malnourished	150 (34.2)
Severely malnourished	7 (1.6)
Temperature, n(%)	
< 36.5 C or > 38.5 C	124 (28.3)
36.5 C – 38.5 C	314 (71.7)
Blood culture, n (%)	
Sterile	329 (75.1)
Bacteremia	36 (8.2)
Contaminant	73 (16.7)
Chest X-ray, n(%)	
Normal	60 (13.7)
Lobar consolidation	21 (4.8)
Patchy infiltrate	354 (80.8)
Pleural effusion	3 (0.7)

Table 2. Based line characteristic of children with Pneumonia at dr. Soetomo Hospital January 2007–December 2008

Variable	Bacteremia n (%)	No Bacteremia n (%)	p value
Sex			
Male	25 (5.7)	248 (56.6)	0.169
Female	11 (2.5)	154 (35.2)	
Age group (months)			
1–12 month	27 (6.2)	266 (60.7)	0.307
13–36 month	9 (2.1)	117 (26.7)	0.431
> 36 month	2 (0.5)	17 (38.8)	0.548

RESULTS

We identified 440 patients with pneumonia who met the inclusion criteria for the study. Blood culture was performed on 438 patients, bacteremia was detected in 36 patients (8.2%) and 73 patients (16.7%) had a contaminated bacteria (Table 1)

Of the total cases, ratio male and women was 1.6:1. The mean age was 12.2 months with the majority at the age of 1–12 months as many as 293 (66.9%) children. The majority interval from initial symptoms until it is brought to the hospital was less than 3 days (51.6%) children. Most nutritional status is well nourhised as much as 281 (64.2%) children.

Anemia was found in 251 (57.3%) children, levels of leukocytes less than 5000/mm3 or more than 20.000/mm3 many as 116 (26.5%) children, positive CRP was found in 329 (75.1%) of children and acidosis obtained in 75 (17.1%) children. Preview photos thoracic infiltrates was found in 354 (80.8%) children.

There were no significant difference of based line characteristic children with bacteremia positive and bacteremia negative include sex ang age. (Table 2)

Table 3 shows risk factors several variables on the occurrence of bacteremia in patients with pneumonia of children. From the table, the risk factors of pneumonia were the Interval from onset of symptoms to hospital admission more than 5 days, severely malnutrition, anemia , leukocyte less than 5000/mm^3 or more of 20.000/mm^3 and pO_2 less than 80%.

DISCUSSION

The aetiology of pneumonia in developed countries is predominantly viral, associated with a low case fatality rate, whereas in developing countries bacteraemia is common and associated with a high case fatality rate. Poor sanitation,

Table 3. Risk Factors Bacteremia of children with Pneumonia at dr. Soetomo Hospital January 2007 – December 2008

Variable	Bacteremia positive n (%)	Bcteremia negative n (%)	OR (95% CI)	p value
Interval from onset of symptoms to hospital admission , n (%)				
< 3 days	36 (8.2)	199 (43.4)	1.35(0.69-2.67)	0.386
> 3–< 5	31 (7.1)	168 (38.3)	0.97(0.48-1.97)	0.933
≥ 5	8 (1.8)	5 (1.1)	22.69(6.96-73.9)	0.000*
Nutritional state, n (%)				
Well nourished	26 (5.9)	255 (58.2)	1.52(0.71-3.23)	0.279
Moderate malnourished	8 (1.8)	142 (32.4)	0.52(0.23-1.18)	0.113
Severely malnourished	3 (0.7)	4 (0.9)	9.05(1.94-42.13)	0.001*
Temperature				
< 36.5 C or > 38.5 C	8 (1.8)	116 (26.5)	0.70(0.31-1.59)	0.397
Laboratory findings				
Hb < 10 g/dl	21(4.8)	230(52.5)	2.44(1.04-5.71)	0.034*
Leucocyte < 5,000/cmm or > 20,000/cmm	16(3.7)	100(22.8)	2.41(1.21-4.84)	0.011*
CRP positive	25(5.7)	304(69.4)	0.67(0.26-1.72)	0.404
Blood Gas Analysis				
pH < 7.35	6(1.4)	69(15.8)	0.85(0.29-2.44)	0.766
pO_2 < 80 mmHg	3(0.7)	100(22.8)	4.25(1.18-15.4)	0.018*
pCO_2 > 50 mmHg	5(1.1)	27(6.2)	0.48(0.15-1.60)	0.236
SpO_2 < 95%	7(1.6)	89(20.3)	1.19(0.27-5.31)	0.858
Chest X-ray				
Lobar consolidation	7(1.6)	14(3.2)	1.19(0.27-5.310	0.833

overcrowding, inadequate nutrition, insufficient vaccination coverage, low levels of education, and accumulation of other diseases have been suggested as reasons for the differences in aetiology and mortality. [5]

To reduce mortality from pneumonia in developing countries the problem has to be addressed from a number of aspects, social and environmental as well as medical.[5]

In this comparative study of bacteremic and non bacteremic patients,we found that bacteremia was detected in 8.2% children. The previous study reported frequency of bacteremia in patients pneumonia varies from as low as 4% to as high as 14 to 18%. [3].

We found that bacteremic and non-bacteremic pneumonia patients not differed in baseline characteristics. The study by Spooner et al from Papua New Guinea(PNG) identified firstborn children and female children to have increased bacteremia and mortality risk in children with pneumonia.[5] Meanwhile Jover et al, in research on adult patients with pneumonia, bacteremia get no difference between men and women.[6]

We have identified six independent factors of bacteremia in children with pneumonia.. Five of these significantly associated with bacteremia. Include interval from onset of symptoms to hospital admission has significantly associated with bacteremia, the Interval from onset of symptoms to hospital admission more than 5 days, severely malnutrition, anemia, leukocyte less than 5000/mm^3 or more of 20.000/mm^3 and pO_2 less than 80%. Spooner *et al.* identified that poor feeding, cyanosis, bronchial breathing, and a temperature > 38° C were all associated with bacteraemia.[5]

Interval from onset of symptoms to hospital admission more than 5 days has significantly associated with bacteremia. Previous study reported that history of fever for more than 7 days significantly increased the chance of dying.[5] The onset to hospital admission associated with prior use of antibiotic. Metersky et al,reported that the risk of bacteremia could be predicted by assessing the prior use of antibiotics.[3]

Malnourished children are particularly at risk as demonstrated in this study. A study in PNG reported that malnourished patients had a significantly higher risk of dying.[5]

In our study, bacteremic patients were more likely to be anemic than non-bacteremic patients and to have abnormal leucocyt counts and pO_2 less than 80%. Brandeburg found that bacteremic patients were more likely to have anemia, lower albumin, and elevated blood urea and serum creatinine levels.[7] While Metersky reported that lood urea nitrogen more than 30 mg/dl (11 mmol/L) , sodium less than 130 mmol/L and WBC less than 5,000/mm^3 or more than 20,000/mm^3 were independent predictors of bacteremia in community-acquired patients with pneumonia.[3]

Results of radiological findings in association with bacteraemia have been analysed. They showed that a peripheral homogeneous opacity was the best predictor of bacteraemia.[5] Jover reported that although not statistically significant, pleural effusion was more frequent in bacteremic patients.[6] In this study,the most radiological finding was infiltrate.

There are some limitations in this study. The main weakness of our study is its retrospective design. Collection of some data was therefore incomplete. Another limitation could be the lower number of non-bacteremic cases compared to bacteremic cases.

CONCLUSION

Risk factors bacteremia in children with pneumonia included age under 1 year,symptoms more than 5 days, severe malnourished ,anemia, leucosyt counts less than 5000/mm^3 and more than 20.000/mm^3 and PO_2 less than 80 mmHg.

Bacteremia has been associated with severity and mortalitas of pneumonia. Identify factors caused bacteremia important to prevent severity and mortalitas of pneumonia.

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