CHAPTER IV

RESULT

A total of 293 children under 5 years old visiting the Pediatric Outpatient Department Kariadi Hospital in Semarang, were enrolled in this study. Of these , 14 were infants below 2 months of age, 145 infants 3-12 months, and 134 children 13-60 months. Most of the children were males. Chest radiographs were available in all children. Eleven had radiological findings of diffuse alveolar infiltrates or frank consolidation and were considered as pneumonia, while 282 were considered as non-pneumonia.

Baseline data of these children are shown in table 1.

Table 1 Baseline data of children with and without radiological pneumonia

	Pneumonia n = 11	Non-pneumonia n = 282	Total n = 293
Age (months)			
0 - 2	2	12	14
3 - 12	7	138	145
13- 60	2	132	134
Sex			
Boys/Girls	6/5	167/115	173/120
Nutritional Status			
Normal	2	195	197
Undernourished *	5	69	74
Malnourished +	4	18	22
Duration of illness (days)			
Mean	3.64	3.66	
SD	2.37	1.66	
Range	1-7	1-7	

* Body weight range 60-90% of P 50 by Gomez's criteria
\+ Body weight < 60% of P 50 by Gomez's criteria

Twenty two (7.5%) of the children were malnourished, and 74 (25%) were undernourished . There was no difference in age, sex, nutritional status and duration of illness between the 2 groups.

Clinical data of the children are given in Table 2.

Table 2 Clinical data of children with and without pneumonia

	Pneumonia n = 11	Non-pneumonia n = 282	p value
RR group (/min)			
Mean	45.18	38.75	< 0.05
SD	13.56	9.57	
Rales			
Yes	9	92	< 0.01
No	2	190	
Chest indrawing			
Yes	9	100	< 0.01
No	2	182	
Temperature (°C)			
Mean	37.87	37.89	0.9
SD	.62	.98	
Leucocyte (/ml)			
Mean	9972.72	10058.87	0.9
SD	5106.09	3910.94	

Looking at the mean and SD of respiratory rate in pneumonia and non-pneumonia cases, it showed a significant difference.

In this study rales were heard in 9 out of 11 (82%), but also heard in 33% of non-pneumonia cases.

Chest indrawing were observed in 82% of pneumonia cases, but also observed in 35% of non-pneumonia cases.

Temperature and leucocyte counts showed no significant difference

Blood culture were only performed if indicated by Bactec method. The results showed mostly sterile, 2 revealed H.influenzae or 18% of all culture, while none revealed Streptococcus pneumoniae. Follow-up of the patients showed no complication in 64% of pneumonia and 99% of non-pneumonia patients,2 developed sub-acute cor pulmonale and 2 respiratory failure both in the pneumonia cases.

The method of counting the respiratory rate of the children is very important. This study used observation of either abdominal or chest wall movement in a child's naked chest for 60 seconds, twice in 2 minutes interval then average the count while the child is calm, using an electronic timer. To ascertain the accuracy and reliability of the respiratory rate count, 2 senior nurses were trained. After the training, for the first 62 children, measurement were done by the 2 raters, and the reliability of the measurement was defined by intra-class correlation coefficient. Table 3 shows analysis of variance summary.

Table 3 Analysis of variance summary table

Source	d.f	Sum of squares	Mean squares	F ratio	F Prob.
Between gr	1	2.3306	2.3306	.0146	.9041
Within gr	122	19491.6935	159.7680		
Total	123	19494.0242			

$$R\ (2\ observer) = \frac{\frac{MSB - MSW}{2}}{\frac{MSB - MSW}{2} + MSW}$$

Then R = 0.97

It revealed an acceptable reliability, almost perfect.

For each respiratory rate group and several relevant clinical signs compared to radiologically confirmed pneumonia, 2 by 2 tables were constructed and all properties of a diagnostic test were calculated. To establish the diagnostic test usefulness, the associated likelihood ratios were calculated.

Table 4 shows the usefulness of clinical characteristics for identification of pneumonia.

Table 4 Usefulness of clinical characteristics for identification of pneumonia (prevalence 4%)

Clinical charact.	Sensitivity (%)	Specificity (%)	+ p v (%)	- p v (%)	LR + 95%CI
RR > 30/m	82	11	3	94	0.57 0.13-2.53
RR > 40/m	73	59	6	98	3.63 0.98-13.42
RR > 50/m	45	89	14	98	5.77 1.85-17.95
RR > 60/m	9	96	8	96	2.34 0.33-16.84
Chest indr.	82	65	8	99	7.6 1.67-34.5
Cyanosis	9	82	2	96	0.46 0.06-3.54
Rales	82	67	9	99	8.55 1.88-38.3

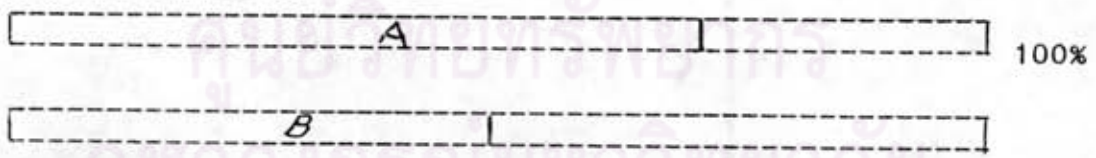
Using radiologically confirmed pneumonia as the best available gold standard,radiographs were read "blindly" by an experienced paediatric radiologist that make independent review on 2 separate occasions of each radiograph. But due to time constraint only 179 radiographs were read twice independently. The agreement between those 2 observations was calculated.

		Observ. II +	Observ. II −	
Observ I	+	87	27	113
	−	5	61	66
		92	87	179

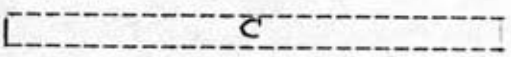
$$\text{Observed agreement} = \frac{87 + 61}{179} = 82.7\ \% \qquad (A)$$

Expected agreement on the basis of chance =

$$\frac{\frac{113 \times 92}{179} + \frac{66 \times 87}{179}}{179} = 50.4\ \% \qquad (B)$$



Actual agreement beyond chance = 82.7 % - 50.4 % = 32.3 %
(A - B) = (C)



Potential agreement beyond chance = 100 % - 50.4 % = 49.6 %

$$\text{Kappa} = \frac{\text{actual agrr. beyond chance}}{\text{potential agrr. beyond chance}} = \frac{32.3}{49.6} = 0.65$$

Having Kappa 0.65 means substantial agreement between the first and second observation. .

The sensitivities and specificities of different respiratory rates as indicator of pneumonia are represented in the receiver operating characteristic (ROC) curve in figure 1.

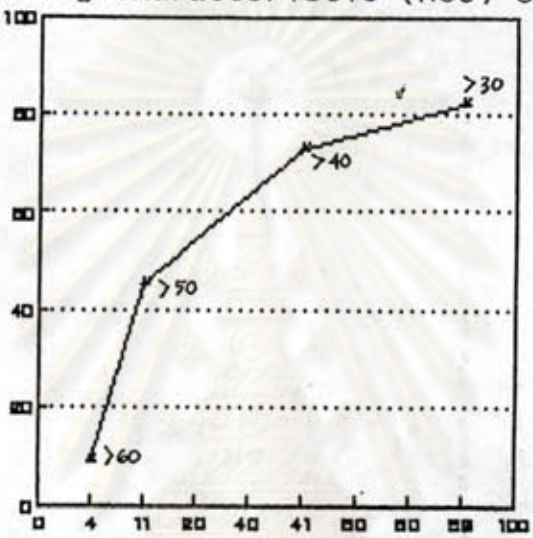


Fig 1 ROC curve for RR as indicator of pneumonia in children under 5 years old.

It showed that RR over 40/m had the point closest to the top left corner indicating that this is the best indicator of radiologically confirmed pneumonia with 73% sensitivity (95% CI 47-99) and 59% specificity (95% CI 53-65).

Since different age group has a different range of normal respiratory rate, and also a different cut-off point as indicator of pneumonia according to the World Health Organization definition, an attempt was made to make a ROC curve for various respiratory rates stratified by age.

If stratified by age, there were several cells with zero values in 0-2 months and 13-60 months age groups, so it would not be possible to make ROC curves for those 2 groups. There were only 14 infants in the 0-2 months age group, so a ROC curve was made for infants 0-12 months comprising 159 infants.

Figure 2 and 3 shows the ROC curve for various respiratory rates in infants 3-12 months and 0-12 months.

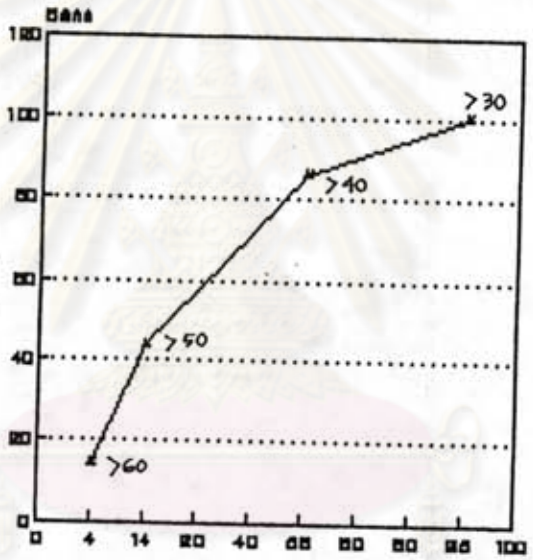


Fig 2 ROC curve for RR as indicator of pneumonia in infants 3 - 12 months

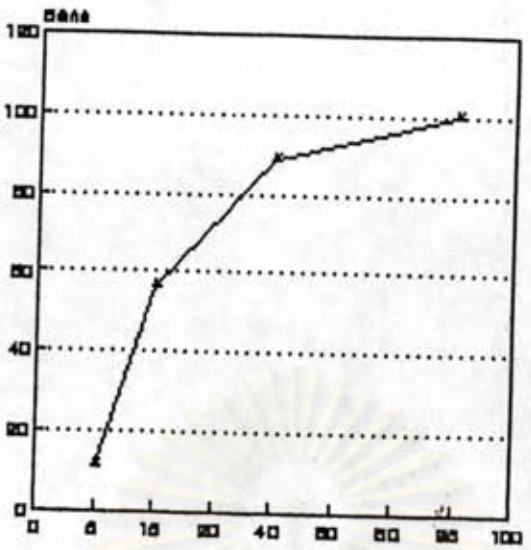


Fig 3 ROC curve for RR as indicator of pneumonia in children 0-12 months

These ROC curves showed that RR over 40/m had the point closest to the top left corner, indicated the RR that would be the best indicator of pneumonia with a sensitivity of 86% (95% CI 35-137) and specificity 44% (95% CI 40-48) in infants 3-12 months and 89% sensitivity (95% CI 69-109) and 60% specificity (95% CI 48-72) in infants 0-12 months.

To measure the extent of relationship between heart rate and respiratory rate, and temperature and respiratory rate in pneumonia cases, a regression analysis was made.

Figure 4 showed the linear correlation between heart rate and respiratory rate, with a correlation of 0.86.

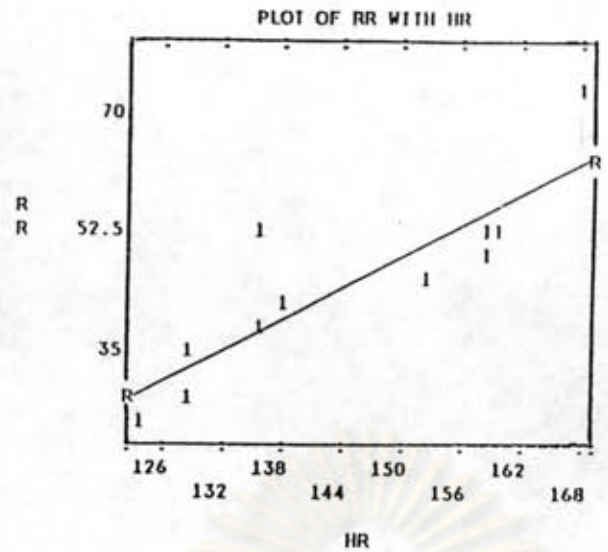


Fig 4 Linear correlation between HR and RR

Figure 5 showed the linear correlation between temperature and respiratory rate, with a correlation of 0.60.

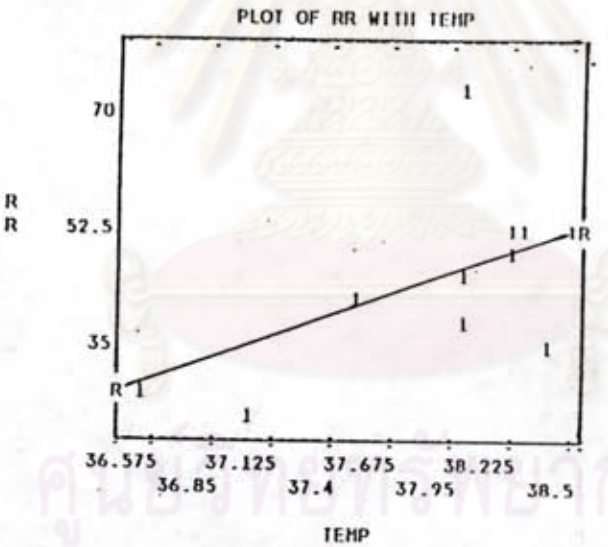


Fig 5 Linear correlation between temperature and RR

There was a very good degree of relationship between heart rate and RR , and a moderate degree of relationship between temperature and RR.