

FACTORS ASSOCIATED WITH THE SEVERITY OF COMMUNITY - ACQUIRED PNEUMONIA IN CHILDREN AT CAN THO CHILDREN'S HOSPITAL, 2024 - 2025

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ABSTRACT

Objectives: To investigate the factors associated with the severity of community - acquired pneumonia (CAP) in children at Can Tho Children's Hospital from 2024 to 2025.

Methods: A cross - sectional descriptive study was conducted on 113 children admitted to the Respiratory Department of Can Tho Children's Hospital from June 2024 to June 2025.

Results: Children with CAP are most commonly under 5 years of age (71.7%). The predominant clinical symptoms included cough (100%), fever (87.6%), tachypnea (87.6%), and crackles (89.4%). Elevated neutrophil count accounted for 61.1% and lymphocytes accounted for 54.9%. Severe CAP accounted for 18.6%. Tachycardia and elevated lymphocyte count were significantly associated with severe CAP, with odds ratios of 6.18 (95%CI: 1.72 - 22.12; $p=0.005$) and 4.41 (95%CI: 1.14 - 17.09; $p=0.032$), respectively.

Conclusion: Tachycardia and elevated lymphocyte count are two independent factors significantly associated with the severity of CAP in children.

Keywords: Pneumonia, associated factors, severity, children, Can Tho.

I. INTRODUCTION

Pneumonia is one of the leading causes of death in children under the age of five worldwide, particularly in developing countries [1]. According to the World Health Organization (WHO), pneumonia accounts for approximately 15% of all deaths in children under five, with an estimated 800,000 deaths annually equivalent to more than 2,000 children per day [2]. The mortality rate associated with community - acquired pneumonia (CAP) is influenced by several factors affecting the severity of CAP, such as malnutrition, underlying medical conditions, and incomplete immunization [3]. Early identification of factors associated with CAP severity plays an important role in preventive strategies and in improving the mortality rate of severe CAP in children. In Can Tho, data on this issue needs to be updated. Therefore, this

study was conducted with the objective of investigating the factors associated with the severity of CAP in pediatric patients at Can Tho Children's Hospital during the years 2024 - 2025.

II. RESEARCH SUBJECTS AND METHODS

2.1. Research subjects

All pediatric patients aged from 2 months to 15 years diagnosed with CAP and treated at the Respiratory Department of Can Tho Children's Hospital from June 2024 to June 2025.

* Patient inclusion criteria:

Children aged 2 months to 15 years diagnosed with CAP according to WHO criteria, presenting with cough or difficulty breathing, accompanied by at least one of the following clinical signs: tachypnea, chest indrawing, or abnormal findings on lung auscultation such as

Received: November 25th, 2025; Reviewed: November 30th, 2025; Accepted: December 15th, 2025

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decreased breath sounds or adventitious sounds (crackles or bronchial breath sounds) [4]. Patients admitted within 48 hours, including time spent at a referring healthcare facility (if applicable). Chest X - ray showing heterogeneous patchy opacities in the lung parenchyma, with poorly defined margins, localized in one or both lungs. Parental or guardian consent to participate in the study.

** Exclusion criteria:*

Children with congenital or acquired immunodeficiency, or those with chronic diseases such as nephrotic syndrome, congenital heart disease, or bronchial asthma. Children previously hospitalized within the past 30 days.

2.2. Research methods

** Research design:*

Analytical cross - sectional study

** Sample size:*

Formula for calculating sample size:

$$n = Z_{1-\frac{\alpha}{2}}^2 \times \frac{p(1-p)}{d^2}$$

Where n represents the minimum required number of patients for the study; $\alpha=0.05$, $Z=1.96$; $d=0.06$; and $p=26.9\%$, defined as the prevalence of severe CAP based on the study by Ngo Chi Quang conducted at Children’s Hospital 1, Ho Chi Minh City [5]. The calculated sample size was

$n \approx 107$. A total of 113 patients were ultimately included in the study.

** Research variables:*

All pediatric patients admitted to the Respiratory Department who met the inclusion criteria were invited to participate in the study. For each patient, general information was collected, along with clinical symptoms including fever, cough, tachypnea, chest indrawing, crackles, wheezing, and tachycardia. Laboratory parameters included total white blood cell count (WBC), neutrophil count, lymphocyte count, with age - adjusted determination of increased or decreased values and serum C - reactive protein (CRP).

2.3. Data processing method

The collected data were entered and analyzed using SPSS version 27.0 biomedical statistical software.

2.4. Ethical considerations

The study was approved by the Ethics Committee in Biomedical Research of Can Tho University of Medicine and Pharmacy, approval number 24.303.HV - ĐHYDCT, dated June 28, 2024.

III. RESEARCH RESULTS

Over the course of the study from June 2024 to June 2025, a total of 113 pediatric patients with pneumonia were admitted to the Respiratory Department of Can Tho Children’s Hospital.

Table 1. General characteristics of the study population (n=113)

	Characteristic	Frequency (n)	Percentage (%)
Age	Median (IQR), months	33 (16.5 - 64.0)	0,36
	<5 years	81	71.7
	≥5 years	32	28.3
Gender	Male	64	56.6
	Female	49	43.4

Comments: CAP was predominantly observed in children under 5 years of age (71.7%), with a higher proportion in males (56.6%) compared to females (43.4%).

Table 2. Clinical and paraclinical characteristics (n=113)

	Characteristic	Frequency (n)	Percentage (%)
Clinical	Cough	113	100.0
	Fever	99	87.6
	Tachypnea	99	87.6
	Chest indrawing	42	37.2
	Crackles	101	89.4
	Wheezing	69	61.1
	Tachycardia	14	12.4
Diagnosis	Pneumonia	92	81.4
	Severe pneumonia	21	18.6
White blood cell count	Median (IQR), G/L	13.84 (9.06 - 19.04)	
	Elevated	59	52.2
	Not elevated	54	47.8
Neutrophil count	Median (IQR), G/L	7.60 (4.59 - 12.69)	
	Elevated	69	61.1
	Not elevated	44	38.9
Lymphocyte count	Median (IQR), G/L	3.36 (1.93 - 4.85)	
	Elevated	62	54.9
	Not elevated	51	45.1
C - reactive protein (n=110)*	Median (IQR), mg/L	15.25 (6.37 - 49.20)	
	Elevated (>10 mg/L)	67	59.3
	Not elevated	43	38.1

*Three cases were not tested for CRP due to reagent shortage.

Comments: Cough, fever, crackles, and tachypnea were the most common symptoms in children with CAP, with respective rates of 100%, 87.6%, 89.4%, and 87.6%. Severe CAP accounted for 18.6% of cases. The proportions of elevated neutrophil count, elevated lymphocyte count, and elevated CRP were 61.1%, 54.9%, and 59.3%, respectively.

Table 3. Comparison of clinical and paraclinical characteristics between children with pneumonia and severe pneumonia

Characteristic		Pneumonia n (%) (n=92)	Severe pneumonia n (%) (n=21)	P
Age	<5 years	64 (69.6)	17 (81.0)	0.42
	≥5 years	28 (30.4)	4 (19.0)	
Gender	Male	52 (56.5)	12 (57.1)	1.00
	Female	40 (43.5)	9 (42.9)	
Wheezing	Present	53 (57.6)	16 (76.2)	0.14
	Absent	39 (42.4)	5 (23.8)	
Tachycardia	Present	6 (6.5)	8 (38.1)	<0.001
	Absent	86 (93.5)	13 (61.9)	
Neutrophil count	Elevated	58 (63.0)	11 (52.4)	0.46
	Not elevated	34 (37.0)	10 (47.6)	
Lymphocyte count	Elevated	44 (47.8)	18 (85.7)	0.003
	Not elevated	48 (52.2)	3 (14.3)	
CRP (n=110)	Elevated	57 (64.0)	10 (47.6)	0.22
	Not elevated	32 (36.0)	11 (52.4)	

Comments: Tachycardia and elevated lymphocyte count were more frequently observed in children with severe CAP, with statistically significant differences ($p < 0.001$ and $p = 0.003$, respectively).

Table 4. Multivariate logistic regression analysis of factors associated with pneumonia severity

Factor	OR	95%CI	p
Tachycardia	6.18	1.72 - 22.12	0.005
Wheezing	1.61	0.49 - 5.32	0.436
Elevated lymphocyte count	4.41	1.14 - 17.09	0.032

Comments: Tachycardia and elevated lymphocyte count were independently associated with the severity of CAP, with odds ratio (OR) of 6.18 (95%CI: 1.72 - 22.12; $p = 0.005$) and 4.41 (95%CI: 1.14 - 17.09; $p = 0.032$), respectively.

IV. DISCUSSION

The study found that the most commonly affected age group with CAP was children under 5 years old, accounting for 71.7%. This result is consistent with the literature and previous studies [6, 7]. Additionally, the study observed a higher incidence of CAP in boys, with a male/female ratio of 1.3/1. In this study, the most frequent symptoms were cough (100%), fever (87.6%), tachypnea (87.6%), and crackles (89.4%). These are typical clinical manifestations of pneumonia in children. The study by Nguyen Tran Kim Ngoc

et al. also reported cough and fever as the most common symptoms, accounting for 95.1% and 89.7%, respectively [8].

The median WBC count was 13.84 G/L. Among the patients, 61.1% had elevated neutrophil count, and 54.9% had elevated lymphocyte count. According to the summary by the British Thoracic Society (BTS), elevated neutrophil count has been reported in over 60% of bacterial CAP cases, whereas viral pneumonia is often associated with a higher lymphocyte count compared to bacterial pneumonia [9]. Therefore,

alterations in peripheral WBC composition may be associated with the underlying microbial etiology of CAP in children.

Multivariate logistic regression analysis identified tachycardia ($p=0.005$) and elevated lymphocyte count ($p=0.032$) as two independent factors associated with the severity of CAP. Specific research data on the association between tachycardia and pneumonia severity in children remain limited. However, according to recommendations from the WHO and the BTS, tachycardia is considered a warning sign of severe disease [4, 9].

One limitation of this study is that it was conducted solely at Can Tho Children's Hospital, with a short study duration and a relatively small sample size. Another limitation is that the study did not investigate microbial etiology or vaccination status, both of which may be important contributing factors.

V. CONCLUSION

The study demonstrated that tachycardia and elevated lymphocyte count are two factors associated with the severity of CAP in children. Clinicians should be attentive to these indicators during clinical assessment to facilitate early identification of severe cases and ensure timely management.

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