Prevalence and Clinical Presentations of Atypical Pathogens Infection in Community Acquired Pneumonia in Thailand

Nuanchan Prapphal MD*,
Subharee Suwanjutha MD**, Pravin Durongkaveroj MD***,
Sorasak Lochindarat MD****, Mongkol Kunakorn MD**,
Jitladda Deerojanawong MD*, Teerachai Chantarojanasiri MD**,
Yingsak Supanitayaonon MD*****, Pisit Janedittakarn MD******

** King Chulalongkorn Memorial Hospital, Chulalongkorn University*
*** Ramathibodi Hospital, Mahidol University*
**** Rajavithi Hospital, Ministry of Public Health*
***** Queen Sirikit National Institute of Child Health, Ministry of Public Health*
****** Vajira Hospital, Bangkok*
******* Police General Hospital, Bangkok*

Objectives: *To determine the prevalence of atypical pneumonia and clinical presentations in patients with community acquired pneumonia (CAP).*
Material and Method: *A prospective multi-centered study was performed in patients aged ≥ 2 years with the diagnosis of CAP who were treated at seven governmental hospitals in Bangkok from December 2001 to November 2002. The diagnosis of current infection was based on ≥ 4 fold rise in antibody sera or persistently high antibody titers together with the presence of DNA of M.pneumoniae or C.pneumoniae in respiratory secretion or antigen of L. pneumophila in the urine. Clinical presentations were compared between patients with atypical pneumonia and unspecified pneumonia.*
Results: *Of 292 patients, 18.8% had current infection with atypical respiratory pathogens (M. pneumoniae 14.0%, C.pneumoniae 3.4%, L.pneumophila 0.4% and mixed infection 1.0%). Only age at presentation was significantly associated with atypical pneumonia in adults, while absence of dyspnea, lobar consolidation, and age ≥ 5 years were significant findings for atypical pneumonia in children.*
Conclusion: *The present study confirms the significance of atypical pathogens in adults and children. Moreover, lobar consolidation is likely to predict atypical pneumonia in childhood CAP.*

Keywords: *Prevalence, Clinical, Atypical pathogens, Pneumonia*

J Med Assoc Thai 2006; 89 (9): 1412-9
Full text. e-Journal: *http://www.medassocthai.org/journal*

Atypical pathogens including *Mycoplasma pneumoniae*, *Chlamydophila pneumoniae*, and *Legionella* spp. are increasingly recognized as common causes of community acquired pneumonia (CAP)[1]. These agents have been reported to cause up to 60% of etiology - proven CAP in adult patients[2]. *M. pneumoniae* and *C. pneumoniae* also play a more significant role, than previously thought, as causes of CAP in children of all ages[3-5]. Moreover, co-infections with other atypical pathogens and other bacteria have been reported both in adults and in children with CAP[5-7].

Although studies to determine the prevalence and clinical presentations of respiratory tract infections due to these pathogens especially *M. pneumoniae* and

Correspondence to : Prapphal N, Department of Pediatrics, Faculty of Medicine, Chulalongkorn University, Rama IV Rd, Bangkok 10330, Thailand. Phone: 0-2256-4951, 0-2256-4996 ext 128, Fax: 0-2256-4911, E-mail: fmednph@md2,md.chula.ac.th, nprapphal@hotmail.com

C. pneumoniae have been carried out in Southeast Asia, most of them are serological studies[8-14]. Serologic diagnosis of these infections have significant limitations in terms of cross reactivity, delayed or abated antibody response and the inability to differentiate current from previous infections especially when only a single serum sample is available[5,15]. Accurate diagnosis requires a combination of serology and polymerase chain reaction (PCR) assay or antigen detection in respiratory secretions or urine, which is not available in most health care settings[5,15,16]. Therefore, the authors still lack of good epidemiological data on the frequency and clinical features of CAP due to atypical pathogens in the region.

The present study was designed to determine the prevalence of atypical respiratory pathogens infection and their clinical presentations in patients with CAP following the introduction of standardized diagnostic tests for nucleic acid antigen and antibody detection of *M. pneumoniae*, *C. pneumoniae*, and *L. pneumophila*.

Material and Method

This prospective multi-centered study was conducted from December 2001 to November 2002 at 7 hospitals in Bangkok including, King Chulalongkorn Memorial Hospital, Ramathibodi Hospital, Queen Sirikit National Institute of Child Health, Rajavithi Hospital, Vajira Hospital, Police General Hospital and Bhumibol Adulyadej Hospital. The study design was approved by the Research Review Board and Ethics Committee of each hospital. Written inform consent was obtained from all patients or their legal representatives in the case of children (≤ 15 years of age) before the study enrollment.

Patients

Both outpatients and hospitalized patients aged ≥ 2 years with clinical and radiological diagnosis of CAP were recruited in the present study. CAP was defined as the presence of 3 or more of the following symptoms and signs: cough, acute change in the quality of sputum, documented fever or hypothermia within the preceding 24 hours, rales or evidence of pulmonary consolidation, leukocytosis or malaise, and myalgia or gastrointestinal symptoms, accompanied by new infiltrates or consolidation on chest X-ray that could not be attributed to other etiologies. The patients with evidence or history of tuberculosis, nosocomial pneumonia, lung cancer, aspiration pneumonia, or bronchiectasis were excluded from the present study. Those HIV- positive or who had been hospitalized within 2 weeks prior to consultation were also excluded.

Laboratory tests

All laboratory tests were done at the Clinical Immunology Laboratory, Department of Pathology, Faculty of Medicine, Ramathibodi Hospital. To ensure that all centers used the standardized protocol for specimen collection, a training workshop was carried out before the start of the present study. A courier service was hired to transport the specimens once they could be collected. An External Quality Assurance System program was carried out twice during the present study to assess the competency of laboratory in chlamydophila microimmunofluorescence (MIF) serology and PCR assays. Acute and convalescent (2-4 weeks apart) sera were collected aseptically for serologic testing. Throat swabs, sputum, nasopharyngeal aspirate, bronchoalveolar lavage, or sample of pleural fluid were collected for PCR analysis.

Specific antibodies to *M. pneumoniae* were measured using a particle agglutination test (Serodia Myco II, Fujirebrio, Japan), while antichlamydial antibodies were measured using a modified MIF test (Focus Technologies, USA). Legionella antibodies were detected by an indirect immunofluorescence antibody test (MarDx Diagnostics Inc, USA) for IgG antibodies to *L. pneumophila* serogroup 1-7. For the qualitative detection of *L. pneumophila* serogroup 1 soluble antigens in urine, specimens were tested by a microtiter enzyme-linked immunosorbent assay (EIA) (Biotest Legionella Urine Antigen EIA, Biotest AG, Dreieich, Germany). Test for Legionella infection were carried out only in adult patients.

PCR assays for detection of *M. pneumoniae* and *C. pneumoniae* nucleic acids were performed with primers targeting the p1 adhesin gene of *M. pneumoniae*[17] and 16 S rRNA gene of *C. pneumoniae*[18]. The presence of PCR products of 209 bp size or 463 bp size on gel electrophoresis was considered indicative of infection with *M. pneumoniae* or *C. pneumoniae* respectively.

Establishment of infection due to atypical pathogens

Current infection with *M. pneumoniae*, *C. pneumoniae*, or *L. pneumophila* was based on 4- fold or greater rise in antibody titers between paired acute and convalescent sera. Results of single serum samples were excluded from the analysis. In cases with high antibody titers (IgG) in both serum samples (≥ 1:160 for *M. pneumoniae*, ≥ 1:512 for *C. pneumoniae* and ≥

1:256 for *L. pneumophila*), the presence of positive PCR for *M. pneumoniae* or *C. pneumoniae* in respiratory secretions, or the presence of legionella antigen in urine was also considered as current infection. The presence of positive PCR for *M. pneumoniae* or *C. pneumoniae* in the absence of a positive serologic response was interpreted as possible carriage.

Data analysis

Chi-square or Fischer's exact test was used to determine the significance of difference in proportions between groups. Student's t-test was used to compare continuous variables. A p-value of less than 0.05 was considered to indicate statistical significance.

Results

Patient characteristics

Paired sera could be obtained from 292 cases (245 children, 47 adults) of the 319 patients with a diagnosis of CAP that were initially included in the present study (257 children ≤ 15 years old, 62 adults > 15 years old). Failure to obtain paired serum specimens was mainly due to the loss of follow up or those suspected to have tuberculosis or aspiration pneumonia. The demographic data and clinical status at baseline of the 292 patients are summarized in Table 1. Most of the patients were hospitalized. Only 1.2% of pediatric patients and 10.6% of adults required treatment in the ICU. All of them had underlying diseases e.g. asthma, chronic obstructive lung disease (COPD), diabetes mellitus, hypertension, SLE.

Current infection due to atypical pathogens

On the basis of 4 fold or greater rise in antibody titers between acute and convalescent sera, current infection rate of all atypical pathogens among the 292 patients was 13.7% (Table 2). When positive results of PCR or EIA were added to the serology results, the overall current infection rate increased to 18.8%. Rate of infection due to *M. pneumoniae* and *C. pneumoniae* were 14.0% and 3.4% respectively. Since children in the present study were not screened

Table 1. Demographic data of patients with community-acquired pneumonia

Variables	Pediatric patients n = 245 (%)	Adult patients n = 47 (%)
Male/Female	135/110	22/25
Age, n (range)	181 (2-5 years)	15 (16-30 years)
	64 (6-15 years)	16 (31-60 years)
	16 (> 60 years)	
Outpatient	43 (17.6)	15 (31.9)
Inpatient (open ward)	199 (81.2)	27 (57.5)
Intensive care unit	3 (1.2)	5 (10.6)

Table 2. Rate of current infection with atypical respiratory pathogens in patients with CAP

Etiologic agent	Pediatric patients (n = 245)		Adult patients (n = 47)		Total (n = 292)	
	4 fold rising	4 fold rising & PCR[1] + high antibody	4 fold rising	4 fold rising & PCR[1] / EIA[2]+ high antibody	4 fold rising	4 fold rising & PCR[1] / EIA[2]+ high antibody
M. pneumoniae (%)	23 (9.4)	35 (14.3)	6 (12.8)	6 (12.8)	29 (9.9)	41 (14.0)
C. pneumoniae (%)	4 (1.6)	7 (2.9)	3 (6.4)	3 (6.4)	7 (2.4)	10 (3.4)
L. pneumoniae (%)	ND3	ND3	1 (2.1)[a]	1 (2.1)[a]	1 (2.1)[a]	1 (2.1)[a]
Mixed infection (%)	1 (0.4)*	1 (0.4)*	2 (4.2)**	2 (4.2)**	3 (1.0)	3 (1.0)
Total (%)	28 (11.4)	43 (17.6)	12 (25.5)	12 (25.5)	40 (13.7)	55 (18.8)

1 = Polymerase chain reaction 2 = Enzyme-linked immunosorbent assay 3 = Not done [a] n = 47,
* *C. pneumoniae* + *M. pneumoniae*,
** *C. pneumoniae* + *M. pneumoniae*; *C. pneumoniae* + *L. pneumoniae*

for *L. pneumophila*, the figure of infection with *L. pneumophila* (2.1%) was derived only from adult patients.

M. pneumoniae was the most common atypical pathogen with comparable prevalence in adults and children while the infection rate of *C. pneumoniae* was higher in adult patients (6.4% vs 2.9%). Two adult patients who were admitted to the ICU had current infection with *C. pneumoniae*. Both of them were over 70 years old and had underlying diseases (stroke and hypertension).

Mixed infections were found in three patients. Two cases (1 pediatric and 1 adult patient) had concurrent infections with *M. pneumoniae* and *C. pneumoniae*, another patient was infected with *C. pneumoniae* and *L. pneumophila*. None of the patients with mixed infections needed ICU treatment. CAP associated with atypical pathogens infection occurred throughout the study period. No definite seasonal preference was noted (Fig. 1).

Clinical presentations

The clinical presentations and co-morbidities of CAP with atypical pathogens infection were compared with those of CAP with unspecified etiology (Table 3). The age at presentation was significantly associated with atypical pathogens infection in adults and pediatric patients. Sixty percent of the patients infected with atypical pathogens were 5-35 years of age (33/55 cases). Symptoms and signs of CAP with atypical respiratory pathogens infection were not significantly different from the the CAP of other etiologies in adult patients. However, children with infection due to atypical pathogens had less dyspnea than children with CAP of unspecified etiology (65.1% vs 79.2%; p = 0.04).

Lobar consolidation was the only chest X-ray finding that associated significantly with atypical pneumonia in children (13.9% vs 1.5%; p = 0.001). Its presence could predict atypical pathogen infection in childhood CAP with 13.9% sensitivity, 98.5% specificity and 83.7% accuracy. Twenty-five percent (3/12 cases) of adult patients with atypical pneumonia had lobar consolidation but was not significantly different from unspecified CAP. Peripheral white blood cell count was not significantly different between the two groups of pneumonia.

Concerning *L. pneumophila* infection, only two cases (2.1%) of the presented adult patients had infection due to this pathogen. Both of them presented with fever, productive cough, dyspnea and lobar consolidation or patchy infiltration on chest X-ray. None of them needed ICU treatment.

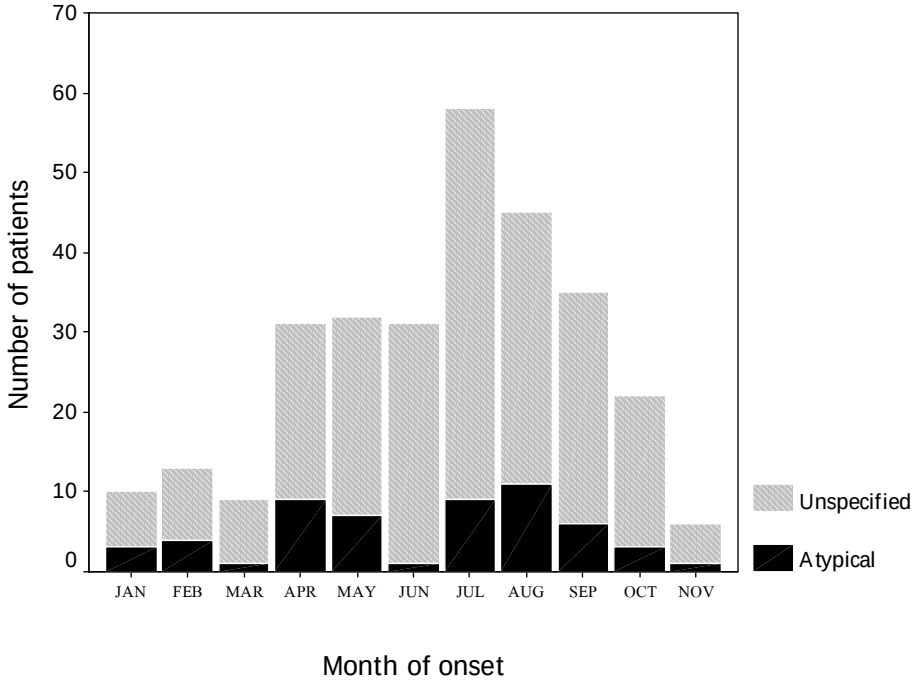

Fig. 1 Monthly distribution of atypical pneumonia and unspecified pneumonia

Table 3. Comparison of atypical pneumonia and unspecified pneumonia

Characteristics	Pediatric CAP (245)		Adult CAP (47)	
	Atypical (n = 43)	Unspecified (n = 202)	Atypical (n = 12)	Unspecified (n = 35)
Male:Female	27:16	108:94	6:6	16:19
Mean age (yrs) ± SD	6.4 ± 3.6*	4.4 ± 2.8*	36.8 ± 22.3***	51.5 ± 18.6***
ICU admission (%)	0	3 (1.5)	2 (16.7)	3 (8.6)
Symptoms & signs(%):				
- Cough	43 (100)	202 (100)	12 (100)	35 (100)
- Fever	41 (95.3)	198 (98.0)	11 (91.7)	34 (97.1)
- Chill	12 (27.9)	32 (15.8)	4 (33.3)	12 (34.3)
- Chest pain	7 (16.3)	14 (6.9)	6 (50.0)	14 (40.0)
- Dyspnea	28 (65.1)**	160 (79.2)**	8 (66.7)	30 (85.7)
- Malaise	21 (48.8)	92 (45.5)	7 (58.3)	25 (71.4)
- Myalgia	8 (18.6)	24 (11.9)	5 (41.7)	15 (42.9)
- Diarrhea	5 (11.6)	31 (15.3)	2 (16.7)	2 (5.7)
- Wheezing	7 (16.3)	48 (23.8)	2 (16.7)	5 (14.3)
- Rales	39 (90.7)	182 (90.1)	10 (83.3)	33 (94.3)
- Rhonchi	18 (41.9)	99 (49.0)	1 (8.3)	7 (20.0)
- Bronchial breath sound	3 (7.0)	7 (3.5)	0 (0)	1 (2.9)
Co-morbidity(%):				
- Asthma	9 (20.9)	42 (20.8)	2 (16.7)	2 (5.7)
- COPD	0 (0)	0 (0)	2 (16.7)	3 (8.6)
- DM	0 (0)	0 (0)	2 (16.7)	6 (17.1)
- Hepatic failure	0 (0)	1 (0.5)	0 (0)	0 (0)
- Renal failure	1 (2.3)	0 (0)	2 (16.7)	2 (5.7)
- Previous antibiotics	35 (81.4)	154 (76.2)	11 (91.7)	21 (60.0)

* p-value = 0.001 ** p-value = 0.04 *** p-value = 0.02
(Statistical analysis by Chi-square or Fisher exact & Student - t-test)

Discussion

The present study detected atypical pathogens including *M. pneumoniae*, *C. pneumoniae*, and *L. pneumophila* in 18.8% of patients ≥ 2 years of age with CAP. This infection rate was comparable to previous reports[7,8,19,20]. The use of direct antigen and DNA tests combined with the results of serologic tests on paired sera in the present study had shown to increase the diagnostic yield from 13.7% on serologic basis to 18.8%. This finding confirmed the previous studies on the diagnostic utility and significance of PCR assay and EIA for atypical respiratory pathogens [16-18]. Moreover, the collection of paired sera from 95.3% (245/257 cases) of the presented pediatric patients and 75.8% (47/62 cases) of adult patients, much higher than previous reports, helped increase the reliability of the obtained data.

The major limitation of the present study in determining the causative role of the three atypical pathogens in CAP was the lack of etiologic identification for other bacterial and viral pathogens. However, evidence of current infection with the atypical pathogen in a patient with acute pneumonia could not rule out its causative role either as a sole pathogen or as part of mixed infections with other unidentified pathogens. Treatment with specific antibiotics for this atypical pathogen should be also considered.

Despite limitations, the results of this prospective multi-centered study illustrate the importance of atypical respiratory pathogens as the etiology of CAP both in adults and in children. The percentage of CAP cases attributed to *M. pneumoniae* and *C. pneumoniae* in a Thai population was similar to that recently reported by Schneeberger PM in which the same laboratory diagnostic criteria were used[19]. Moreover, the authors found an age-dependent increase in the occurrence of *M. pneumoniae* and *C. pneumoniae* infection in children with CAP as has been observed in a previous report[3]. On the contrary, the current infection rate of atypical pathogens decreased with

increasing age among adult patients, which was the same as found in other studies[21,22].

M. pneumoniae has been reported to account for 6-40% in childhood CAP[3,14,20] and 1.9% to over 30% in adult patients[7,12,14,15]. However, *M. pneumoniae* attributed to the comparable percentage in childhood (14.3%) and adult CAP (12.8%) in the present study.

In most of the previous studies, *C. pneumoniae* was the leading cause of atypical pneumonia in adults[7,21,22]. Wattanathum, et al found that *C. pneumoniae* was responsible for 36.7% of adult outpatients and 16.3% of inpatients with CAP in Thailand[12]. In children, *C. pneumoniae* was also a common cause of atypical pneumonia with a higher infection rate among those $\geq$ 10 years of age[4,5,20]. Although there is limited data on the prevalence of *C. pneumoniae* infection in CAP among children in this region, a recent study of Likitnukul et al demonstrated high percentage of *C. pneumoniae* infection (39.2-57.0%) in children with CAP of all age groups including young infants under 6 months[13]. The lower prevalence of *C. pneumoniae* in the presented patients may be due to different laboratory methods and diagnostic criteria.

In the present study, *L. pneumophila* was found only in two cases. Therefore, the authors postulate that this pathogen is not a common cause of CAP in Thailand.

Concerning clinical presentations, although recent studies suggested that some underlying diseases and acute phase reactants might predict CAP caused by atypical pathogens[23,24], many reports have shown that CAP caused by atypical pathogens cannot be differentiated from other bacterial pneumonia[7,25]. The results of the present study are similar to previous reports. The authors found no clinical difference between CAP due to atypical pathogens and CAP of unspecified etiology except for the age at presentation both in adult and pediatric patients. The presence of dyspnea is less likely found in childhood CAP caused by atypical pathogen.

From previous reports, the role of white blood cell count in differentiation between bacterial pneumonia and atypical pneumonia, was inconclusive[3,24,25]. The present study supports that white blood cell count cannot differentiate the etiologic agents of CAP both in adult and pediatric patients. Lobar consolidation and interstitial infiltration on chest X- ray have been described as significant predictors of *C. pneumoniae* in adults[24]. However, the present study demonstrated that lobar consolidation could differentiate CAP associated with atypical pathogens including *C. pneumoniae* from other CAP, only in pediatric patients, but not in adults. This might be due to the small sample size of the adult patients.

Conclusion

The prevalence of current infection due to atypical pathogens in patients with community-acquired pneumonia in the present study is 18.8%, which is similar to that observed in many western countries. *M. pneumoniae* is the most common pathogen, followed by *C. pneumoniae*. Age at onset between 5-35 years is significantly associated with atypical pneumonia. Neither clinical presentation nor chest X-ray finding can predict respiratory atypical pathogen infections in adults while less dyspnea and lobar consolidation are significantly associated with atypical pneumonia in children. The present study confirms the increasing significance of atypical pathogens in CAP of all age groups. This supports the empirical use of antibiotics for treatment of atypical pathogens in certain age groups of patients with CAP.

Acknowledgements

This study was supported by a grant from Pfizer Inc., New York. The authors wish to thank to the following persons who participated in this study: Professor Sasithorn Likitnukul, Assistant Professor Rujipat Samransamruajkit, Ms. Chanthana Harnruthakorn (King Chulalongkorn Memorial Hospital); Assistant Professor Charn Kiatboonsri, Associate Professor Aroonwan Preuthipan, Dr. Karl Kalavantanich, Dr. Pichet Laouthaiwatana, Ms.Metta Kham-in, Ms. Sumanat Amsthan, Assistant Professor Kalayanee Attamasirikul, Ms. Arree Pornvoranunt, Ms. Suwanee Chanampakul, Mr. Chavachol Setthaudom, Ms. Kanchana Sriwanicharak (Ramathibodi Hospital); Dr. Somkit Oonsamathum, Dr. Piraj Kateruttanakul, Ms. Penpun Sutham (Rajavithi Hospital); Dr. Panida Srisan, Dr. Thanyanat Bunnag, Dr. Pravit Jetanachai, Dr. Wiboon Kanjanapattanakul, Ms. Ura Charoenwan, Ms. Wanee Manyam (Queen Sirikit National Institute of Child Health); Dr. Phanvadee Ratanasumawong, Ms. Jarrevun Jankana, Ms. Sunanta Boonyuen (Police General Hospital). Group Captain Suchada Voratarach, Wing Commander ThanasonThummakul, Squadron Leader Taweesak Sirikunalai (Bhumibol Adulyadej Hospital). We would also like to express our thanks to Professor Yun-Fong Ngeow from University of Malaya, Medical Center, Petaling Jaya, Malaysia for the QA program, and Dr. Yuet - Meng Cheong, Pfizer Global Pharmaceuticals, Asia, and Pfizer (Thailand) Ltd, for

their support in providing the coordination for the study.

References

1. File TM Jr, Tan JS, Plouffe JF. The role of atypical pathogens: *Mycoplasma pneumoniae*, *Chlamydia pneumoniae*, and *Legionella pneumophila* in respiratory infection. Infect Dis Clin North Am 1998; 12: 569-92, vii.
2. Marston BJ, Plouffe JF, File TM Jr, Hackman BA, Salstrom SJ, Lipman HB, et al. Incidence of community-acquired pneumonia requiring hospitalization. Results of a population-based active surveillance study in Ohio. The Community-Based Pneumonia Incidence Study Group. Arch Intern Med 1997; 157: 1709-18.
3. Principi N, Esposito S, Blasi F, Allegra L. Role of *Mycoplasma pneumoniae* and *Chlamydia pneumoniae* in children with community-acquired lower respiratory tract infections. Clin Infect Dis 2001; 32: 1281-9.
4. Korppi M. Community-acquired pneumonia in children: issues in optimizing antibacterial treatment. Paediatr Drugs 2003; 5: 821-32.
5. Hammerschlag MR. Pneumonia due to *Chlamydia pneumoniae* in children: epidemiology, diagnosis, and treatment. Pediatr Pulmonol 2003; 36: 384-90.
6. Lieberman D, Schlaeffer F, Boldur I, Lieberman D, Horowitz S, Friedman MG, et al. Multiple pathogens in adult patients admitted with community-acquired pneumonia: a one year prospective study of 346 consecutive patients. Thorax 1996; 51: 179-84.
7. Lee SJ, Lee MG, Jeon MJ, Jung KS, Lee HK, Kishimoto T. Atypical pathogens in adult patients admitted with community-acquired pneumonia in Korea. Jpn J Infect Dis 2002; 55: 157-9.
8. Wattanathum A, Boonyongsunchai P, Palwatwichai A, Limpairojn N, Chanbancherd P, Chanthadisai N. *Chlamydia pneumoniae* in community-acquired pneumonia. J Med Assoc Thai 2001; 84: 69-74.
9. Suttithawil W, Wangroongsarb P, Naigowit P, Nunthapisud P, Chantadisai N, Ploysongsang Y. *Chlamydophila (Chlamydia) pneumoniae* as a cause of community-acquired pneumonia in Thailand. J Med Assoc Thai 2001; 84: 430-7.
10. Chaoprasong C, Chanthadisai N, Buasap U, Tirawatnapong S, Wattanathum A. *Mycoplasma pneumoniae* community-acquired pneumonia at three hospitals in Bangkok. J Med Assoc Thai 2002; 85: 643-7.
11. Reechaipichitkul W, Tantiwong P. Clinical features of community-acquired pneumonia treated at Srinagarind Hospital, Khon Kaen, Thailand. Southeast Asian J Trop Med Public Health 2002; 33: 355-61.
12. Wattanathum A, Chaoprasong C, Nunthapisud P, Chantaratchada S, Limpairojn N, Jatakanon A, et al. Community-acquired pneumonia in southeast Asia: the microbial differences between ambulatory and hospitalized patients. Chest 2003; 123: 1512-9.
13. Likitnukul S, Nunthapisud P, Prapphal N. Prevalence of *Chlamydia pneumoniae* infection in Thai children with community-acquired pneumonia. Pediatr Infect Dis J 2003; 22: 749-50.
14. Srifuengfung S, Techachaiwiwat W, Dhiraputra C. Serological study of *Mycoplasma pneumoniae* infections. J Med Assoc Thai 2004; 87: 935-8.
15. Hammerschlag MR. *Mycoplasma pneumoniae* infections. Curr Opin Infect Dis 2001; 14: 181-6.
16. Lefmann M, Honisch C, Bocker S, Storm N, von Wintzingerode F, Schlotelburg C, et al. Novel mass spectrometry-based tool for genotypic identification of mycobacteria. J Clin Microbiol 2004; 42: 339-46.
17. Ieven M, Ursi D, Van Bever H, Quint W, Niesters HG, Goossens H. Detection of *Mycoplasma pneumoniae* by two polymerase chain reactions and role of M. pneumoniae in acute respiratory tract infections in pediatric patients. J Infect Dis 1996; 173: 1445-52.
18. Gaydos CA, Quinn TC, Eiden JJ. Identification of *Chlamydia pneumoniae* by DNA amplification of the 16S rRNA gene. J Clin Microbiol 1992; 30: 796-800.
19. Schneeberger PM, Dorigo-Zetsma JW, van der ZA, van Bon M, van Opstal JL. Diagnosis of atypical pathogens in patients hospitalized with community-acquired respiratory infection. Scand J Infect Dis 2004; 36: 269-73.
20. Michelow IC, Olsen K, Lozano J, Rollins NK, Duffy LB, Ziegler T, et al. Epidemiology and clinical characteristics of community-acquired pneumonia in hospitalized children. Pediatrics 2004; 113: 701-7.
21. Lim WS, Macfarlane JT, Boswell TC, Harrison TG, Rose D, Leinonen M, et al. Study of community acquired pneumonia aetiology (SCAPA) in adults admitted to hospital: implications for management guidelines. Thorax 2001; 56: 296-301.
22. Woodhead M. Community-acquired pneumonia

guidelines - an international comparison: a view from Europe. Chest 1998; 113: 183S-7S.
23. Sopena N, Pedro-Botet ML, Sabria M, Garcia-Pares D, Reynaga E, Garcia-Nunez M. Comparative study of community-acquired pneumonia caused by *Streptococcus pneumoniae*, *Legionella pneumophila* or *Chlamydia pneumoniae*. Scand J Infect Dis 2004; 36: 330-4.
24. Socan M, Kosmelj K, Marinic-Fiser N, Vidmar L. A prediction model for community-acquired *Chlamydia pneumoniae* pneumonia in hospitalized patients. Infection 2004; 32: 204-9.
25. Esposito S, Bosis S, Cavagna R, Faelli N, Begliatti E, Marchisio P, et al. Characteristics of *Streptococcus pneumoniae* and atypical bacterial infections in children 2-5 years of age with community-acquired pneumonia. Clin Infect Dis 2002; 35: 1345-52.

ความชุกและลักษณะทางคลินิกของการติดเชื้อ atypical pathogens ในโรคปอดบวม

นวลจันทร์ ปราบพาล, สุภรี สุวรรณจูฑะ, ปวิณ ดุรงคเวโรจน์, สรศักดิ์ โล่จินดารัตน์, มงคล คุณากร, จิตลัดดา ดีโรจนวงศ์, ธีรชัย ฉันทโรจนศิริ, ยิ่งศักดิ์ ศุภนิตยานนท์, พิศิษฐ์ เจนดิษฐการ

วัตถุประสงค์*: เพื่อศึกษาหาความชุกและลักษณะทางคลินิกของการติดเชื้อ atypical pathogens ในผู้ป่วยเด็กอายุตั้งแต่ 2 ปี และผู้ใหญ่โรคปอดบวมซึ่งรับการรักษาที่โรงพยาบาล 7 แห่งในกรุงเทพมหานคร โดยใช้เทคนิคการตรวจทางห้องปฏิบัติการ และเกณฑ์การวินิจฉัยที่ได้มาตรฐานสากล*

วัสดุและวิธีการ*: ตรวจหาระดับแอนติบอดีในซีรัม 2 ครั้งห่างกัน 2 สัปดาห์ และตรวจหาDNA ของ M. pneumoniae, C. pneumoniae ในสารคัดหลั่งจากทางเดินหายใจของผู้ป่วยทุกราย และแอนติเจน ของ L. pneumophila ในปัสสาวะของผู้ป่วยผู้ใหญ่ปอดบวม ถ้าระดับแอนติบอดีเพิ่มเป็น 4 เท่า หรือ ระดับสูงต่อเนื่อง ร่วมกับผลการตรวจหาแอนติเจนให้ผลบวกจะได้รับการวินิจฉัยว่ากำลังมีการติดเชื้อ atypical pathogens แล้วนำลักษณะทางคลินิกของกลุ่มนี้เปรียบเทียบกับกลุ่มที่ให้ผลลบ*

ผลการศึกษา*: จากผู้ป่วย 292 ราย ร้อยละ18.8 มีการติดเชื้อ atypical pathogens เป็น M.pneumoniae ร้อยละ 14.0, C. pneumoniae ร้อยละ 3.4, L. pneumophila ร้อยละ 0.4 และ mixed infections ร้อยละ 1.0 อายุ ≥ 5 ปี, การที่ไม่มีอาการหายใจลำบาก และ lobar consolidationในภาพรังสีปอดสัมพันธ์กับการติดเชื้อ atypical pathogens ในเด็กอย่างมีนัยสำคัญทางสถิติ แต่อายุน้อยเป็นลักษณะเดียวที่สัมพันธ์กับการติดเชื้อในผู้ใหญ่*

สรุป*: การศึกษานี้แสดงว่าความชุกของการติดเชื้อatypical pathogens ในผู้ป่วยโรคปอดบวมเท่ากับร้อยละ 18.8 ลักษณะทางคลินิกแยกยากจากโรคปอดบวมจากเชื้ออื่น แต่พบ lobar consolidationในเด็กที่มีการติดเชื้อ atypical pathogens มากกว่าผู้ป่วยเด็กที่ไม่มีการติดเชื้อเหล่านี้*