

Clinical Profile, Radiological Resolution and Risk Factors Associated with Community Acquired Pneumonia

Singh DS¹, Shrestha NC², Joshi A³

Abstract

Introduction: Pneumonia is a widespread and commonest infectious lung disease that causes inflammation which lead to reduced oxygenation. Indeed, it is the leading cause of child death in the world. The study was carried out to fine out the demographic, clinical characteristics and radiologic resolution of Pneumonia in children between two months to 16 years of age. **Material and Methods:** A prospective study done in 121 cases over 18 month period in patients admitted in paediatric department of Dhulikhel hospital. Demography, clinical profile, diagnosis, Down's scoring at presentation, response of treatment and risk factor for Community acquired pneumonia were analysed using descriptive statics. Chest radiography was done on admission and every two weeks until its complete resolution occurred. **Results:** Community acquired pneumonia was significantly common in children less than one year ($p=0.022$). The common symptoms of Community acquired pneumonia observed in this study were cough (80%) and fever (66%). The total leukocyte count had low degree of association with pneumonia. More than half of patients (54.08%) with community acquired pneumonia had radiographic resolution at two weeks. The respiratory distress was significantly high ($p<0.0001$) in children who delayed to seek medical treatment in a health facility by three days. Anaemia, lymphopenia, thrombocytopenia, sepsis and haemorrhagic pleural effusion were the clinical characteristics associated with fatal Community acquired pneumonia. **Conclusion:** Clinical presentations varied in Community acquired pneumonia with different age groups. Chest radiography was still the best investigation for the diagnosis of pneumonia and most of the radiological clearance occurred in two weeks.

Key words: Community acquired pneumonia, chest radiography

¹Dr Srijana Dongol Singh, MBBS, MD, Associate Professor, ²Dr. Narayan Charan Shrestha, MBBS, MD, Lecturer, ³Dr. Anish Joshi, MBBS, MD, Lecturer. All from the Department of Paediatrics, Dhulikhel Hospital, Kathmandu University Teaching Hospital, Dhulikhel, Kavre, Nepal.

Address for correspondence

Dr. Srijana Dongol Singh, Associate Professor
Department of Paediatrics, Dhulikhel Hospital
Kathmandu University Teaching Hospital
Dhulikhel, Kavre, Nepal
Tel No; +9779818073553
E-mail: docsrijana@yahoo.com

Acknowledgements: None

Funding: Nil

Conflict of Interest: None

Permission from IRB: Institutional Review committee of Kathmandu University School of Medical Science.

How to cite

Singh DS, Shrestha NC, Joshi A. Clinical Profile, Radiological Resolution and Risk Factors Associated with Community Acquired Pneumonia. J Nepal Paediatr Soc 2018;38(1):8-13.

doi: <http://dx.doi.org/10.3126/jnps.v38i1.18854>

Introduction

Pneumonia is an acute illness in which the alveolar air spaces of the lung become inflamed and filled with fluid and white blood cells, giving rise to the appearance of consolidation on the chest radiograph. In developing countries, where patients are often treated

This work is licensed under a Creative Commons Attribution 3.0 License.



without seeing a doctor, the World Health Organization (WHO)¹ defines clinical pneumonia simply as an acute episode of cough or difficulty breathing associated with an increased respiratory rate. Most recently, the WHO² has also pioneered the standardized interpretation of chest x-ray to define bacterial pneumonia. (i.e. signs of alveolar consolidation and/or pleural effusion)

Nearly one to two million children younger than five years die every year from pneumonia³. In Nepal, annual incidence of pneumonia in under-five year's children is 90/1000. This incidence was found in 2006 survey.⁴ Another Nepal demographic health survey 2011/ 2012⁵, done by Ministry of Health and Population, has also shown similar. It affects all paediatric age groups, though the highest incidence is in the under-five years⁶. Anaemia, lymphopenia, thrombocytopenia, sepsis and haemorrhagic pleural effusion were the clinical characteristics associated with fatal Community acquired pneumonia⁷.

Although this is a leading cause of under five children mortality, the research done in Nepal on this topic is very limited. The aim of this study is to find out the demographic, clinical characteristics and radiological resolution of Community acquired pneumonia. The clinical characteristics associated with Community acquired pneumonia were also studied

Material and Methods

This is a prospective study done for a period of one and half years from December 2014 to May 2016. All children from two month to 16 years who were admitted in Paediatric ward of Dhulikhel hospital with clinically diagnosed and radiologically confirmed cases of pneumonia were included in this study. Every case was subjected to a detailed history and clinical examination, followed by relevant investigations. All cases admitted from emergency department and sick child admitted from OPD, complete blood count and blood culture were sent. On admission, every day after admission and at the time of discharge Downs' score was obtained. Downs Scoring System⁸ is an index designed to objectively

assess the clinical severity of respiratory distress. The scores have therapeutic and prognostic significance but are not as reliable as blood gas measurements. They are to be used as an adjunct to (not as a substitute for) blood gas determinations. Downs Scoring System was shown below.

The patients were followed every day for the response to the treatment till the child cured. The questionnaire contained identification, clinical profile, and investigation, response to drug and radiological response. Written informed consent was taken from the parents before enrolling them in this study after a careful and complete explanation of the study and purpose. Patients were followed for a maximum of three months' time. At each follow up visit in two weeks interval, physical examination was done and repeated chest radiography till it became normal. All chest radiographs were re-evaluated by an experienced radiologist. The Institutional review committee approved the study.

Results

A total of 121 patients with community acquired pneumonia were enrolled where 35.5% were females and 64.5% males. In the present study as shown in Table 1, the incidence of pneumonia was higher among children less than five years (n=81), out of which 44 (36.34%) were infants and 37 (30.57%) were between 1-5 years. Here, 40 (33.05%) were more than 5 years.

The most common symptoms among all age group was cough, observed in total 80%, which was most significantly common in children less than one year ($p=0.022$). The next common presenting symptom was fever 72%, shortness of breath 38%, common cold 38%. Chest pain and myalgia were significantly seen in children more than five years with p -value of 0.001 and 0.003 respectively. Among the clinical sign, crepitation were heard in 72.72%, decreased air entry in 51.23% and rhonchi was heard in 18.18 % cases. Rhonchi was significantly observed in children less than one year with p -value of 0.025.

Downs Score for evaluation of respiratory Distress

Downs Score	0	1	2
Cyanosis	None	Cyanotic in air	Cyanotic in 40% O ₂
Retraction	None	Mild	Severe
Grunting	None	Audible with stethoscope	Audible without stethoscope
Air entry	Clear	Delayed or decreased	Barely audible
Respiratory Rate	60	60-80	80 or apneic episodes

> 4 = Clinical respiratory distress

> 8 = Impending respiratory failure

Community Acquired Pneumonia

The complete blood count was done in total 95 Cases where 35.8% had high white blood cell count and 30.9% had high neutrophil count. Increased ESR was noted in 11.8% children with pneumonia. Blood cultures were obtained from 40 (33.1%) children. Overall, the prevalence of bacteremia (blood culture positive) was 9.9%. Among the culture positive cases, 75% has *Streptococcus pneumoniae* followed by *Klebsiella* in 25% cases.

Consolidation was more prevalent in the right than left lung (100Vs11), and was most frequent in right middle zone 47.9% followed by right upper zone 22.3% and then in right lower zone 12.4%. Bronchopneumonia was observed in 8.3% cases shown in Table 3. Pleural effusion with consolidation was seen in 5.78% children. Six 4.95% children had consolidation with collapse of lung.

The radiographic resolution was slightly slower in patients with pleural effusion. A total of 121 patients with CAP, 80.99 % had regular follow up in every two weeks

with chest x-ray till complete resolution. After two weeks follow-up, 53/98 (57.6%) had complete radiographic resolution. After six weeks follow-up, 90/98 (91.83%) had complete radiographic resolution. None of the patients developed deterioration of chest radiography during the follow up period.

The median delay from the onset of illness to the time seeking treatment in a health facility was 5.5 days (Table 5). Twenty six percent cases sought treatment within two days, 66.11% to 3-7 days and 7.3% took more than eight days. Children who delayed to seek medical treatment in a health facility by three days were more likely to present with moderate to severe respiratory distress with high significance ($p=0.0001$).

Out of 121 patients, 119 (98.34%) patients improved and were discharged. Three (2.47%) patients died. Among all deaths, one occurred due to sepsis with pulmonary haemorrhage and two were caused by sepsis with multiple organ failure. All of them at the time of presentation had anaemia, leukopenia, lymphopenia and thrombocytopenia.

Table 1: Age and Sex Distribution of community acquired Pneumonia

		Sex				Total	
		Male		Female		Total	%
		Total	%	Total	%		
Age	< 1 Year	24	54.5%	20	45.5%	44	100.0%
	1-5 years	24	64.9%	13	35.1%	37	100.0%
	> 5 Years	30	75.0%	10	25.0%	40	100.0%
	Total	78	64.5%	43	35.5%	121	100.0%

Table 2: Clinical profile of CAP in different age group

Clinical Profile	Age			Total	p-value
	<1year	1-5 years	>5 years		
1. Fever	26	26	28	80	0.46
2. Headache	2	5	13	20	0.002
3. Cough	41	26	30	97	0.022
4. Nausea/Vomiting	13	7	8	28	0.448
5. Common cold	18	17	11	46	0.221
6. Anorexia	11	12	13	36	0.688
7. Myalgia	0	1	7	8	0.003
8. Chest pain	0	7	15	22	0.001
9. Dyspnoea/SOB	19	15	13	47	0.585
10. Effusion/empyema	1	1	5	7	0.084
11. Collapse lung	2	2	2	6	0.984
12. Sepsis	0	0	1	1	0.360
13. Decrease air entry	21	19	22	62	0.791
14. Crepitation	35	27	24	86	0.136
15. Rhonchi	12	8	2	22	0.025

Table 3: Distribution of lobar pneumonia according to zone involved in roentgenogram.

Distribution of lobar pneumonia	Total (n=121)	Percent (%)
Rt. Upper Zone	27	22.3
Rt. Middle Zone	58	47.9
Rt. Lower Zone	15	12.4
Lf. Upper Zone	6	5.0
Lf. Middle Zone	3	2.5
Lf. Lower Zone	2	1.7
Broncho Pneumonia	10	8.3
Total	121	100.0

Table 4: Pattern of Resolution of Radiological abnormalities associated with CAP.

Duration of radiological resolution	Total (n=98)	Percentage (%)
2 weeks	53	54.08%
4 weeks	7	7.14%
6 weeks	30	30.61%
8 weeks	6	6.12%
10 weeks	1	1.02%
12 weeks	1	1.02%

Table 5: Relation between the duration of health seeking time to the hospital and Down' Scoring

Health seeking time to hospital	Down' Scoring Group			Total	p-value
	0-3	4-7	>8		
1-2	31	1	0	32	.000
3-7	64	16	0	80	
>8	0	7	2	9	
Total	95	24	2	121	

Discussion

The study identified a significant proportion of under-five pneumonia burden with male and female ratio of 1.69:1. A study conducted on children hospitalized with pneumonia in Dhulagiri Zonal Hospital of Nepal showed male to female ratio of 1.5:1 with a significant proportion of the under-five pneumonia burden.⁹ The same finding of health disparity being associated with higher pneumonia cases among hospitalized male children than in female has been reported by the studies conducted in Bangladesh^{10,11}, where the male female ratio were 2:1 and 1.4:1 respectively. This could also be due to higher rates of care seeking for male children than for female children, giving strong preference for sons in the south Asian regions¹².

The common symptoms of CAP, observed in this study was consistent with other studies where Shamo'on data showed, the most sensitive and specific symptoms for prediction of pneumonia was cough in 71%, fever in 70% and fast breathing in 65% children¹³. Another study done in Manipal Teaching hospital¹⁴ also showed, the commonest mode of presentation to be

cough 76% followed by fever in 64%. All the cases of CAP had radiological confirmation with consolidation in one or multiple lobes. On the basis of roentgenogram, right lung was involved in 82.6% cases in which right middle zone were most frequently involved in 47.9% children. This is because of large diameter and more vertical direction of the right main bronchus. Ude data¹⁵ showed, right lung involvement in 79.0% of children but in contrast right upper zone consolidation was much higher around 37.0% of children. Another retrospective study done by P Rijal¹⁶ in Nepal Medical college also showed right sided lobar pneumonia in 60.6% and right middle zone was most commonly involved in 42.4% but in contrast left lower zone in 33.3%. The incidence of consolidation with effusion (5.7%) and atelectasis (4.9%), was almost similar in comparison to the previous study done by P Rijal¹⁶ where incidence of consolidation with effusion was 8.3% and with atelectasis was 4.1%.

The radiographic resolution seen in the present study is comparable to previous study¹⁷ that reported radiological cure rate of 50.6% after two weeks and 66.7% after four weeks of diagnosis of CAP. This is

also comparable to previous studies^{18, 19} that reported radiological cure rates of 35.1% to 87% 3-4 weeks after diagnosis of CAP.

Similar to our study other authors Kumar A¹⁹ and Lakhani D²⁰ also reported high count of 48.5% and 43.8% respectively. These all studies also suggest that total leukocyte count has low degree of association with pneumonia. Blood culture was positive in 30% cases (among those cases whose blood culture was sent) which was higher in comparison to other studies^{20,21} where positive blood culture were seen in 6.1% and 7.1% respectively. This may be due to late presentation in our country. In the present study blood culture was positive usually in children who were sick for more than five days without any treatment outside and admitted in PICU with sepsis. Streptococcus pneumonia was the commonest bacteraemia seen in Pneumonia. Studies conducted in Manipal Teaching Hospital¹⁴ and Children's hospital of Philadelphia²² had shown, the Streptococcus pneumoniae being commonest organism isolated in blood.

Children who delayed to seek medical treatment in a health facility by three days or more were more likely to present with moderate to severe respiratory distress. This finding was consistent with a study in Kenya²³ that found median duration of illness before care is sought to be four days and maximum number

of patients presented with in 3-7 days with moderate to severe respiratory distress. Another study in Uganda²⁴ also found the median duration of illness before care is sought to be seven days and more likely to present with severe pneumonia.

Among the clinical characteristics, severe CAP was associated mainly with initial presentation of anaemia, lymphopenia, thrombocytopenia, sepsis and haemorrhagic pleural effusion. This finding was consistent with the study done by Wang in Taiwan⁷ where fatal CAP was associated mainly with initial presentation of anaemia, lymphopenia, thrombocytopenia, sepsis and disseminated intravenous coagulopathy.

Conclusion

The incidence of pneumonia was higher among children less than five years. The most common symptom was cough and fever. The laboratory investigation like total count, differential leukocyte count and blood culture has low degree of association with pneumonia. Chest radiography is an important diagnostic tool in patients suspected of having lower respiratory tract infection to confirm or exclude a diagnosis of pneumonia. Consolidation was more prevalence in right middle zone. Radiographs are not always recommended for routine follow-up in patients that has clinically improved.

References

1. WHO Programme for control of Acute Respiratory Infection 1990. Acute respiratory infection in children: case management in small hospital in developing countries. A manual for doctors and other senior health workers. WHO. Geneva, Switzerland.74pp. Document Number: 185594
2. Cherian T, Mulholland K E, Carlin B J, Harald O, Amin R et al. Standardized interpretation of pediatric chest radiographs for the diagnosis of pneumonia in epidemiological studies. *Bull WHO* 2005;83(5):353-359. DOI: /S0042-96862005000500011
3. United Nations Inter-Agency Group for child Mortality Estimation. Levels and trends in child mortality report 2012. United Nations children's Fund.
4. Basnet S, Adhikari RK, Gurung CK. Hypoxia in children with pneumonia and its clinical predictors. *Indian J Pediatr* 2006; 73(9):777-81.
5. Ministry of Health & Population, New ERA ICF International Inc. Nepal demographic health survey 2011/2012.
6. Zimmerman DR, Kovalski N, Nahir B. Diagnosis of childhood pneumonia: clinical assessment without radiological confirmation may lead to overtreatment. *Pediatr Emerg Care* 2012;28(7):646-9. DOI: 10.1097/PEC.0b013e31825cfd53
7. Wang LJ, Mu SC, Lin CH, Lin MI, Sung TC. Fetal community-acquired pneumonia: 18 years in a medical center. *Pediatr Neonatol* 2013;54(1):22-7. DOI: 10.1016/j.pedneo.2012.11.003
8. Downess JJ, Vidyasagar D, Baggs TR et al. Respiratory distress syndrome of newborn infants. New clinical scoring system with acid base and blood gas correlations. *Clin Pediatr* 1970; 9:325-331. DOI: 10.1177/000992287000900607
9. Banstola A, Banstola A. The Epidemiology of Hospitalization for pneumonia in children under five in the rural western region of Nepal: A Descriptive study. *PLOS one* 2013;8(8) e71311. DOI: <https://doi.org/10.1371/journal.pone.0071311>
10. Akbar MS, Ehsan A, Ali CMH. Clinical Profile and Management of Acute respiratory Infection at Dhaka Shishu (children) Hospital, Bangladesh. *J Child Health* 1992;16:5-8. DOI: <http://dx.doi.org/10.3329/nimcj.v7i1.25703>
11. Wahed Ma, Islam MA, Khondakar P, Hague MA. Effect of micronutrients on morbidity & duration of hospital stay in childhood pneumonia. *Mymensingh Med J* 2008;17(2):77-83.

12. Pandey A, Sengupta PG, Mandal SK. Gender differences in health care seeking during common illness in a rural community of West Bengal, India. *J Health Popul Nutr* 2002; 20:306-11.
13. Shamoon H, Hawamdah A, Haddadin R, Jmeian S. Detection of pneumonia among children under six years by clinical evaluation. *Health J* 2004;10:482-7.
14. R Shrestha, N Paudel, B Barakoti, D Dhungana, P Sharma. Etiology and Clinical profile of inpatients with community acquired pneumonia in Manipal Teaching hospital, Pokhara, Nepal. *Nepal J Med Sci* 2012;1(2):84-8. DOI: <http://dx.doi.org/10.3126/njms.v1i2.6605>
15. Ude WH. Roentgenologic studies in early lobar pneumonia. *Amer J Roent* 1931; 26:691.
16. P Rijal, A Sharma, S Shrestha, S Upadhyay. Profile of acute lower respiratory tract infection in children under fourteen years of age at Nepal Medical College Teaching Hospital (NMCTH). *Nepal Med Coll J* 2011;13(1):58-61.
17. Mittle RI, Schwab RJ, Duchin JS, Goin JE, Albeida SM, Miller WT. Radiographic resolution of community acquired pneumonia. *Am J Respir Crit Care Med* 1994;149(3pt 1):630-3. DOI: 10.1164/ajrccm.149.3.8118630
18. Solh AA, Aquilina AT, Gunen H, Ramadan F. Radiographic resolution of community –acquired bacterial pneumonia in the elderly. *J Am Geriatr Soc* 2004;52:224-9.
19. Kumar A, Lakhani D. Correction of Clinically suspected Community Acquired Pneumonia(CAP) with reference to chest radiograph & laboratory parameters in rural Set up. *New Indian J Surg* 2011;2(4):270-271.
20. Lakhani D, Muley P. The association of positive chest radiograph and laboratory parameters with community acquired pneumonia in children. *J Clin Diagn Res* 2013;7(8):1629-31.DOI: 10.7860/JCDR/2013/5132.3222
21. Ferrero F, Nascimento-carvalho CM, Cardoso MR, Camargos P, March MF, Berezin E, et al. Radiographic findings among children hospitalized with severe community-acquired pneumonia. *Pediatr Pulmonol* 2010;45(10):1009-13. DOI: 10.1002/ppul.21287.
22. Shah SS, Dugan MH, Bell LM, Grundmeier RW, Florin TA, Hines EM, et al. Blood cultures in the emergency department evaluation of childhood pneumonia. *Pediatr Infect Dis J* 2011;30(6); 475-9. DOI: 10.1097/INF.0b013e31820a5adb.
23. Dickens O, Gideon K, Evans A, Jared O. Risk factors of severe pneumonia among children aged 5-29 months in western Kenya: a case control study. *Pan African Med J* 2012;13(5):3-13.
24. Kallander K, Hildenwall H. Delayed care seeking for fatal pneumonia in children aged under five years in Uganda: a case series study. *Bull WHO* 2008;86(5)332-38. DOI: 10.2471/BLT.07.049353.