

Prognostic Factors Associated with Community and Hospital Acquired Pneumonia

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Abstract

Pneumonia is common among patients with co-existing illnesses and it can be the initial manifestation of these co morbid conditions. It is one of the leading causes of death in both developed and developing countries.

Purpose: The objective of the study was to evaluate the various prognostic factors associated with outcomes in patients with community and hospital acquired pneumonia.

Material and Methods: This hospital-based study enrolled 282 consecutive patients with Pneumonia between January 2001 and December 2005. They were divided into two groups: Community acquired pneumonia (CAP) and Hospital acquired pneumonia (HAP). Clinical, laboratory, radiological and microbiological data were collected. Clinical data consisted of age, sex, religion, underlying disease, co-morbidity, surgery and mortality.

Results: Co morbidity was found in 94% patients, of which septicaemia (OR = 23.32), diabetes (OR = 3.18), Hypertension (OR = 4.1), Ischaemic Heart Disease (OR = 3.78), were most common in CAP and HAP and odds ratio show, these co-morbid conditions are significantly high in HAP. Renal (26%), Cancer (6.25%) and HIV (3.12%) were the co-morbid conditions seen in-HAP only. Overall mortality was 29.43%. No patient died in CAP. 43% patient died only in HAP. It was observed that most of the deaths occurred in higher age group.

Conclusion: Deaths during hospitalization occurred only in HAP group. The impact of septicaemia, diabetes, renal disease and heart disease, hypertension, hypothyroidism in deaths associated with pneumonia was substantiated.

Introduction

Pneumonia is an infection of lung parenchyma involving alveolar spaces. Recently diabetes was found to be an independent disease modifier for pneumonia in young and older patients.¹ Diabetes is found to be associated with poor outcome from community acquired pneumonia.^{2,3} Community acquired pneumonia is common among patients with co-existing illnesses and it can be the initial manifestation of these co

morbid conditions.⁴ Many studies are documented from West⁵⁻⁸ as well as from east^{9,10} either in community acquired or hospital acquired pneumonia. However, comparative study has not been reported.

Purpose

The objective of the study was to evaluate the various prognostic factors associated with outcome in-patients with community and hospital acquired pneumonia.

Material and Methods

This hospital-based study enrolled 282 consecutive patients with Pneumonia between January 2001 and December 2005.

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They were divided into two groups: Community acquired (CAP) and Hospital acquired (HAP). Clinical, laboratory, radiological and microbiological data were collected. Clinical data consisted of age, sex, religion, underlying disease, co-morbidity surgery and mortality.

Pneumonia was defined by clinical and radiographic criteria.¹¹ It was labelled as Community acquired pneumonia (CAP) if it was acquired before hospitalization, and was labelled as Hospital acquired pneumonia (HAP) when the onset was after 48 hours of hospital admission.

Statistical analysis

Data was expressed as the mean (SD) for basic parameters. Odds Ratio and Paired t-test was used to compare categorical variables. $P < 0.005$ is considered to be significant.

Results

There was significant difference in the mean age in both groups (24.09 Vs 51 $p < 0.0019$). In CAP admissions declined with age. However, in HAP maximum patients were admitted in the age group of 61-80 years (Fig. 1). Demographic data showed similar hospital stay in both the groups but having male preponderance. Systolic Blood Pressure was high in HAP. (Table 1) Radiological investigations revealed that bilateral infiltration, pleural effusion as well as pneumonic patch indicating severe pneumonia in HAP (Table 2).

Co morbidity was found in 94% patients, of which septicaemia (1.11% Vs 19.27%, OR = 4.75, $p < 0.01$), diabetes (13.21% Vs 32.81% OR = 3.19, $p < 0.01$), Hypertension (7.78% Vs 25.52%, OR = 3.07, $p < 0.01$), Ischaemic Heart Disease (3.33% Vs 19.79% OR = 3.78, $p < 0.01$), (most common in CAP and HAP) and odds ratio show (Table 3), these co-morbid

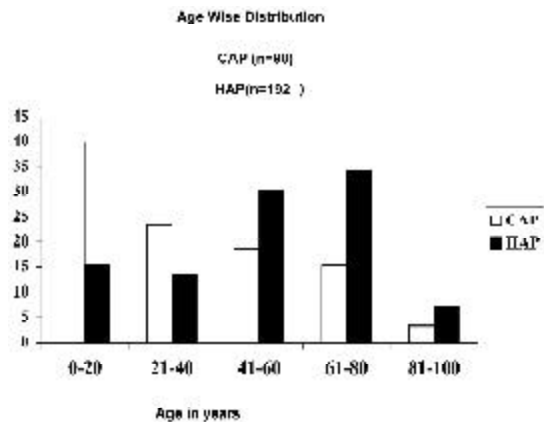


Fig 1: Most of the patients were from higher age group in HAP. Younger subjects suffered from CAP.

Table 1 : Male preponderance was seen in both the groups. Significant difference was seen in HAP group with respect to age and Blood Pressure

	Demographic Data	
	CAP (n=90)	HAP (n=192)
Age	24.09 ± 22.11	51 ± 24.9*
Stay	10.2 ± 10	10.5 ± 10.8
M:F Ratio	56 : 34	134 : 58
Systolic BP	115.8 ± 12.94	124.2 ± 77.62**
Diastolic BP	78.38 ± 15.39	77.62 ± 19.19

* $p < 0.0019$, ** $p < 0.05$

Table 2 : Significant changes in infiltration in both lobes, pleural effusion and pneumonic patches were the main features of HAP

	Radiological finding	
	CAP(%)	HAP(%)
Right lobe infiltration	26.67	17.18
Left lobe infiltration	18.89	12.5
Both lobe infiltration	3.33	19.27*
Pleural Effusion	10	78.13**
Consolidation	14.44	9.89
Pneumonic Patch	5.21	78.13**
Haziness	4.44	6.25

* $p < 0.05$; ** $p < 0.001$

conditions were significantly high in HAP. However, Renal (26%), Cancer (6.25%) and HIV (3.12%) were the co-morbid conditions seen in-HAP only (Fig. 2).

In HAP group, ventilator-associated pneumonia (mechanically ventilated patients more than 48 hours) was seen in 11.98%, (n = 23) with average stay of 14 ± 12.65 days of which 95.83% patients died. Mean age was 58.51 ± 23.53 years in HAP group while it was 28 in CAP septicaemia (69.57% Vs 35.82%) was the main cause of death in ventilator associated pneumonia ($p < 0.05$) followed by renal disorders (41.75% Vs 23.88%, $p < 0.05$) compared to non ventilatory support. However, diabetes mellitus was comparable in both the groups (31.25% Vs 29.85%). In CAP group, only one patient needed ventilatory support (4.1667%) with stay of 10 days. Age, coexisting septicaemia, renal diseases, were predictors of mortality in ventilatory associated pneumonia in HAP.

Bacterial aetiology was more frequently found in patients with co morbid conditions ($p < 0.01$).

The most common pathogens were gram negative bacilli among the patients on

ventilatory and non ventilatory support (47.82% Vs 17.75% $p < 0.01$) Commonest bacteria was pseudomonas (13.04 % Vs 3.55%, $p < 0.0015$).

In this series, 11.25% (22/192) patients were anaemic (haemoglobin level was 8.087 ± 2.42 gm%) with low platelet count in HAP group only requiring blood transfusion in cases of Acute Myeloid Leukaemia, Renal transplant, Empyema, vitamin B12 deficiency, septicaemia and aplastic anaemia etc. None of the patients needed blood transfusion in CAP group.

Pathology Findings

Most of the biochemical parameters viz. Creatinine, LDH and Blood Urea were significantly high in both groups ($p < 0.002$). But blood sugar comparatively high only in HAP. However, serum sodium and serum chloride were significantly low ($p < 0.001$) while cholesterol was low in HAP (Table 4).

Overall mortality was 29.43%. No patient died in CAP and 83/192 i.e. (43%) patient died only in HAP. It was observed that most of the deaths occurred in higher age group. Main risk factors were septicaemia (40.96%), DM (30.12%), HTN (29%), Renal Diseases (27.71%) and IHD (21.69%) (Fig 3). 16/22 (72.73%) deaths occurred in patients requiring blood transfusion in HAP group only.

Discussion

Results show that the patients with CAP were younger compared to HAP. These results were similar to those reported by Thomas P.¹² However, in HAP maximum patients were admitted in the age group of 61-80 years (Fig. 1). Demographic data showed similar hospital stay in both the groups with male preponderance.

Significant changes in both lobes (19.27%) were associated with HAP compared to CAP (3.33%) indicative of severity of pneumonia

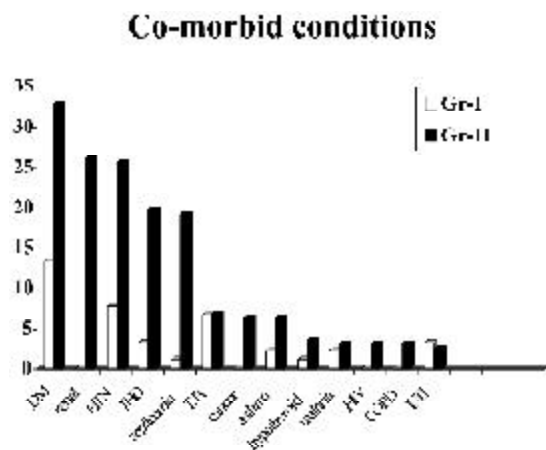


Fig. 2 : Co morbid conditions associated mostly with HAP.

Prognostic factors

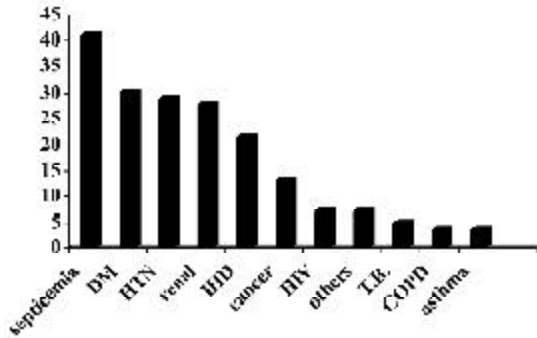


Fig 3 : The impact of septicaemia, diabetes, renal disease and heart disease, hypertension in Deaths associated with hospital acquired pneumonia is substantiated.

in HAP group.³

In the present study, incidence of DM was significantly higher in HAP (32.81%) than CAP (13.21%) group. Incidence of DM in CAP group was lower in our study compared to those reported by Falgeura *et al* showing 16.06%⁴ and as high as 44% by Mc Allister *et al*.¹³ However, incidence of DM was higher in HAP group (32.81%) against (24%) in interstitial pneumonia.¹⁴

Prevalence of hypertension was also higher in HAP (25.52%) than in CAP (7.77%) in the present study, while, Fine *et al*¹⁵ observed hypertension as a risk factor in CAP.

Other risk factors were renal diseases (26.04%), malignancies (19.79%), COPD (3.12%) in HAP group only (Table 3). Comparative study regarding predisposing risk factors for HAP were: chronic lung diseases, renal dysfunction, advanced age, and underlying malignancies.¹⁶ These risk factors were absent in CAP group, however, Falguera reported incidence of malignancy (4.02%) and COPD (1.2%) in CAP.⁴

Pneumonia is a common complication of ventilatory support and is associated with

Table 3 : Various co-morbid conditions significantly associated with HAP. (*p<0.01)

	Various co-morbid conditions in pneumonia		
	CAP	HAP*	OR
N	90	192	282
Septicaemia	1	37	4.75(2.29-9.88)
DM	12	63	3.189(1.56-4.82)
HTN	7	49	3.07(1.64-5.74)
IHD	3	38	3.78(1.86-7.66)
T.B.	6	13	1.028(0.38-2.78)
Asthma	2	12	2.965(1.15-4.68)
Hypothyroid	1	7	2.52(0.56-11.32)
Malaria	2	6	1.4(0.31-6.2)
UTI	3	5	0.78(0.173-3.49)

increased morbidity and mortality. In the present study, total of 24 patients required ventilation, 1(4.167%) from CAP group and 23 (95.83%) patients were from the HAP group. Diaz *et al*¹⁸ reported higher incidence of mechanical ventilation (45%) in severe cases in CAP. Incidence of septic shock was as low as 1.11% in CAP in this series however, it was not ventilator related compared to other series (26%) in severe CAP.¹⁸ Septic shock (13.47%) was low in HAP group.

The major difference between HAP and CAP is the nature of the infective organism. Though HAP may be caused virtually by any microorganism, (aerobic gram-negative bacilli accounting for 60 to 80 per cent) in the present study, among the gram negative isolates: gram negative bacilli were significantly high (28.65%) in HAP compared to CAP group (16.67%) (p < 0.01).

Pseudomonas aeruginosa was the most common isolate in the National Nosocomial infection study (NNIS) survey of ICUs with a frequency of 21%.¹⁶ It was 1.11% Vs 4.68%,(p < 0.01) in this study with higher percentage in HAP than CAP. While among gram positive isolates, staphylococcus aureus (4.17% Vs 6.67%) was low compared to the results

Table 4 : Most of the biochemical parameters viz. Creatinine, LDH and Blood Urea were significantly high in HAP. However, serum sodium and serum Chloride were significantly low in HAP

Biochemical parameters in pneumonia				
Parameters	Normal Range	CAP(n=90)	HAP(n=192)	p
Hb	12 — 15	12.06 ± 1.54	10.3 ± 2.52	NS
Cholesterol	125—200	129 ± 48	125 ± 46.6	NS
Cr	0.6—1.2	0.91 ± 0.4	2.19 ± 2.11	<0.001654
T.Bili	0.0-1.0	0.77 ± 0.69	2.03 ± 1.47	<0.034
LDH	100-190	172.1 ± 66.43	314 ± 574	<0.0018
S.G.P.T.	30-65	39.16 ± 12.4	86.82 ± 200.1	<0.0012
S.G.O.T.	15-37	23.71 ± 10.01	77.4 ± 13.5	<0.0019
Urea	15-40	34 ± 28.17	73.8 ± 67.06	<0.0010
Na	137-150	133 ± 20.01	129.2 ± 12.35	<0.02
Cl	99-111	99.75 ± 4.2	88.8 ± 23.3	<0.043

reported by Patel & Agarwal, it was 20%.¹⁶

Most of the biochemical parameters viz. Creatinine, LDH and Blood Urea were significantly high in HAP group ($p < 0.002$). But blood sugar was comparatively high only in HAP. However, serum sodium and serum chloride were significantly low ($p < 0.001$) while cholesterol was low in HAP (Table 4).

Mortality was 43.23% in HAP group against none in CAP group. However, Liu *et al*¹⁷ reported 12% hospital mortality in CAP. Patients belonged to 40 to 80 years of age group. Studies by Deng *et al* found low mortality (14.90%) among elderly with HAP. Higher mortality in the present study could be due to renal disease (28%), septicaemia (41%), DM(30%) and other cardiac diseases. These results were similar to those by Fine *et al*,¹⁵ he reported various prognostic factors associated with mortality viz. diabetes mellitus (OR= 1.3;95% CI,1.1 to 1.5) neoplastic disease (OR = 2.8; 95% CI, 2.4 to 3.1), neurologic disease (OR = 4.6; 95% CI, 2.3 to 8.9) , bacteraemia (OR= 2.8; 95% CI, 2.3 to 3.6), leucopenia (OR = 2.5; 95% CI, 1.6 to 3.7) and multilobar radiographic pulmonary infiltrate (OR = 3.1; 95% CI, 1.9

to 5.1) . Diaz *et al*¹⁸ reported 16.8% deaths in elderly mainly due to acute renal failure and glycaemia (OR = 7.2). Another study by Mc Allister *et al*¹³ observed DM as the main risk factor resulting into (52%) deaths.

Mortality increased with the severity of pneumonia shown by radiological investigations i.e bilateral infiltration (30%) pleural effusion (10.84%) as well as pneumonic patch (6.02%) in HAP.¹⁹ Banga *et al*²⁰ found bilateral infiltration in 62.96% patients with CAP requiring mechanical ventilation. Since most of the patients in CAP group did not require mechanical support, incidence of bilateral infiltration in our study might have been low. But, in HAP group 95.45% patients were on ventilatory support out of which 69.57% died.

Conclusion

The impact of septicaemia, diabetes, renal disease and heart disease, hypertension in deaths associated with hospital acquired pneumonia is substantiated.

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