

# Changing Bacteriological Profile and Mortality Trends in Community Acquired Pneumonia

Sagar Khadanga, Tadeballi Karuna<sup>1</sup>, Pravat Kumar Thatoi<sup>2</sup>, Sarat Kumar Behera<sup>3</sup>

Department of Medicine, LN Medical College and JK Hospital, <sup>1</sup>Department of Microbiology, All India Institute of Medical Science, Bhopal, Madhya Pradesh, <sup>2</sup>Department of Medicine, SCB Medical College, Cuttack, <sup>3</sup>Department of Pulmology, Hitech Medical College, Bhubaneswar, Odisha, India

## ABSTRACT

There are very few and conflicting Indian data regarding the bacteriological etiology of community acquired pneumonia (CAP). Adding to this agony, there is no credible data from the eastern part of India. This is a cross-sectional study and descriptive in nature over a period of 1-year. Of the 464 cases of the study population, we could isolate aerobic bacteria in 149 patients (32.1%). *Streptococcus pneumoniae* has been identified as the most common organism causing CAP (68/149). Gram-negative bacilli (GNB) as a group exceeded marginally over *S. pneumoniae* (69/149). Among GNB, *Pseudomonas aeruginosa* was the most common organism (31/69), followed by *Klebsiella pneumoniae* (29/69). *Staphylococcus aureus* was identified in (12/149) cases. Co-amoxycylav is still the most sensitive drug for *S. pneumoniae*. *P. aeruginosa* was most sensitive to imipenam followed by piperacillin-tazobactam.

**Key words:** Community acquired pneumonia, Gram-negative bacilli, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Streptococcus pneumoniae*

## MICROBIOLOGY REPORT

Around 20% of the mortality due to infectious diseases in India is caused by lower respiratory tract infections among which pneumonia is the most important culprit.<sup>[1]</sup> Bacteriological profile in community acquired pneumonia (CAP) is different in different countries and changes with time even within the same country. Looking at world literatures microbiological diagnosis could be made in only 40-71% of cases of CAP even when extensive methods have been used when compared to >90% cases in pre-antibiotic era.<sup>[1]</sup> The widespread antibiotic (mis) use is probably responsible for decreasing culture rates in CAP. *Streptococcus pneumoniae* remains the most common organism in CAP in most part of Europe,<sup>[2]</sup> United States,<sup>[3]</sup> United Kingdom,<sup>[4]</sup> and Iraq.<sup>[5]</sup> However, their proportion varies in different studies. Viruses are responsible for CAP in as much as 10-36% of the cases.<sup>[1]</sup> In India, the etiological

agent of CAP varies with geographical distribution. *S. pneumoniae* predominates as an etiological agent of CAP in Shimla<sup>[6]</sup> and Delhi<sup>[7]</sup> whereas *Pseudomonas aeruginosa* predominates in Ludhiana,<sup>[8]</sup> Karnataka, and Srinagar.<sup>[9]</sup> In the study from Delhi, *S. pneumoniae* (35.3%) was the most common isolate, followed by *Staphylococcus aureus* (23.5%), *Klebsiella pneumoniae* (20.5%), and *Haemophilus influenzae* (8.8%).<sup>[7]</sup> The study from Shimla showed *S. pneumoniae* to be the most common cause (35.8%).<sup>[6]</sup> *Legionella pneumophila* is an important cause,, which is often not considered in the Indian setting. In a recent study, 27% of patients with CAP were serologically positive for this organism and around 18% demonstrated its antigenuria.<sup>[10]</sup> *Mycoplasma* was found to be the etiological agent in 35% of cases in one study.<sup>[11]</sup> There are no large studies that have specifically addressed viruses as the cause of CAP apart from pandemic influenza H1N1 virus.<sup>[1]</sup>

After carefully considering the inclusion and exclusion criteria among adult patients >14 years, as per the definition provided by National Joint The Indian Chest Society (ICS)/National College of Chest Physicians (NCCP) (I) recommendations 2012,<sup>[1]</sup> a total number of

Access this article online	
<b>Quick Response Code:</b> 	<b>Website:</b> <a href="http://www.jgid.org">www.jgid.org</a>
	<b>DOI:</b> 10.4103/0974-777X.145251

**Address for correspondence:**

Dr. Sagar Khadanga, E-mail: sagarkhadanga@yahoo.com

464 cases were included in the study. All the patients were hospitalized and risk stratified according to ATS-IDSA criteria. Depending on the risk factors, the patients were triaged into non Intensive Care Unit (ICU) or ICU care. Sputum collection was done at the time of admission for Gram stain, acid-fast bacillus (AFB) stain and culture. Two samples of blood (30 min apart) was sent for culture and antibiogram. All the patients were treated empirically with co-amoxiclav (625 mg thrice daily orally or 1.2 g thrice daily intravenous [IV]) and azithromycin (500 mg daily oral/IV). Those patients who have been shifted to ICU and deteriorated over the next 48 h, co-amoxiclav was changed over to piperacillin-tazobactam (4.5 g 3 times daily) until we received the antibiogram.

The overall microbial diagnosis of CAP was confirmed in 32.1%, which is very low compared with other parts of India: 75.6% in Shimla,<sup>[6]</sup> 47.7% in Chandigarh<sup>[8]</sup> or other parts of world 62% in United Kingdom,<sup>[4]</sup> 68% in Singapore,<sup>[12]</sup> and 56% in Philippines.<sup>[13]</sup> This can be explained by the fact that the serology for both atypical and viral pathogens was not done in our study in addition to restricted source of samples as we did not perform trans-thoracic needle aspiration or BAL. Our study matches that of a recent study from Srinagar probably because they have also not identified atypical bacteria and viruses, where the overall bacterial yield was 29%. In our study, the sputum culture positivity was 29%. Previous Indian studies showed sputum culture positivity in the range of 10-33% of patients, which is no different from our observation.<sup>[14-16]</sup> Blood culture positivity of 8.1% observed in our study is lower than observed by others 10-24%.<sup>[17,18]</sup>

The most common organism isolated in our study was *S. pneumoniae* (68). However, Gram-negative bacilli (GNB) as a group exceeded them marginally (69). *P. aeruginosa* was the second most common organism (31) followed by *K. pneumoniae* (29) and *S. aureus* (12) cases. *S. pneumoniae* has been identified as the most common organism responsible for CAP all over the world (1).<sup>[4,5,7,19]</sup> *S. pneumoniae* predominates as etiological agent of CAP in Shimla<sup>[6]</sup> and Delhi<sup>[7]</sup> In Delhi, *S. pneumoniae* (35.3%) was the most common isolate, followed by *S. aureus* (23.5%), *K. pneumoniae* (20.5%), and *H. influenzae* (8.8%).<sup>[7]</sup> In Shimla, *S. pneumoniae* is the most common cause (35.8%), but it also reported *Mycoplasma pneumoniae* in 15% of the microbiologically positive cases.<sup>[6]</sup> Over the past three decades, many studies have reported a higher incidence of Gram-negative organisms among culture positive pneumonias.<sup>[19-23]</sup> *P. aeruginosa* predominates as an etiological agent in Ludhiana,<sup>[15]</sup> Karnataka, and Srinagar.<sup>[9]</sup> It has been reported that old age, smoking and chronic obstructive

pulmonary disease (COPD) impair pulmonary defenses and predispose to CAP caused by Gram-negative bacteria. In our study, we excluded the patients with concomitant illness such as Diabetes and COPD. If we would have taken into consideration these concomitant diseases, then probably the incidence of GNB might have been much higher. The high incidence of Staphylococci in CAP can be explained by spread of Staphylococci from hospital setting to community and Staphylococci complicating virus illness esp. influenza. Interestingly, AFB positivity was not observed in our study although AFB has been identified in 5% cases presenting as acute pneumonia in India<sup>[8]</sup> and Japan.<sup>[24]</sup> Our study is in accordance to Srinagar study where they also did not observe sputum AFB positivity.

In our study, the ICU admission rate was 16.1% (75/464). This is probably the first study of its kind in India mentioning the ICU admission rate as there is no available published literature considering the ATS-IDSA criteria as per National Joint ICS/NCCP (I) recommendations. The overall mortality in our study is 7.3%. However if we consider the ICU admission and death among these patients, then the ICU mortality is 45.3%. In one report of 150 patients admitted with CAP, 12 (8%) patients died in hospital, while 4 (2.7%) succumbed within 30 days after discharge.<sup>[25]</sup> Our study has also similar mortality. In another study on 72 consecutive patients with CAP over 18 months, 35% of elderly and 14% of young patients succumbed to fulminant sepsis or respiratory failure.<sup>[11]</sup> The mortality has been variably reported between 3.3% and 11% in other studies from India.<sup>[6,7,25]</sup> All the studies cited above regarding the mortality had been done prior to the publication of ICS National Joint ICS/NCCP (I) recommendations. Hence, we could not compare our data with others following these guidelines. Looking at the world literature the mortality rate of CAP in various hospital-based studies is variable, being 5.7% in a British Thoracic Society multi-centric study<sup>[26]</sup> to a higher mortality of (21-25%) in other studies.<sup>[14,15]</sup> The etiology remained undetermined in five cases of total 34 patients who died (14.7%) when compared to the Srinagar study where it was 50%. Co-amoxiclav is still the most sensitive drug for *S. pneumoniae* in the region. *P. aeruginosa* was most sensitive to imipenam followed by piperacillin-tazobactam. This antibiogram was in accordance to the national Joint ICS/NCCP (I) recommendations for CAP.

## SUMMARY

Sputum and blood culture positivity for conventional aerobic bacteriology was documented in 29% and 8%

of cases, respectively and the overall identification of bacteriological identity is 32%. The bacteriological profile of CAP in eastern part of India is different from rest of India, but similar to that of Shimla and Delhi as *S. pneumoniae* is still the most common pathogen. GNB as a group is more common than *S. pneumoniae*. *P. aeruginosa* is the most common organism among the GNB which along with *K. pneumoniae* account for >85% of GNB cases. Co-amoxiclav is still the most sensitive drug for *S. pneumoniae*. *P. aeruginosa* was most sensitive to imipenem followed by piperacillin-tazobactam. ICU admission rate among the hospitalized patients of CAP is 16.1%. The overall mortality is 7.3% and the ICU mortality rate was 45.3%, which is quite high considering to the fact that we did not include patients having concomitant diseases such as diabetes and COPD. Hence to conclude, we must have a suspiciousness of GNB in CAP in eastern India, which can save many precious lives in ICU.

## REFERENCES

- Gupta D, Agarwal R, Aggarwal AN, Singh N, Mishra N, Khilnani GC, *et al.* Guidelines for diagnosis and management of community-and hospital-acquired pneumonia in adults: Joint ICS/NCCP(I) recommendations. *Lung India* 2012;29:S27-62.
- Lode HM. Managing community-acquired pneumonia: A European perspective. *Respir Med* 2007;101:1864-73.
- Bartlett JG, Mundy LM. Community-acquired pneumonia. *N Engl J Med* 1995;333:1618-24.
- Howard LS, Sillis M, Pasteur MC, Kamath AV, Harrison BD. Microbiological profile of community-acquired pneumonia in adults over the last 20 years. *J Infect* 2005;50:107-13.
- Al-Ghizawi GJ, Al-Sulami AA, Al-Taher SS. Profile of community-and hospital-acquired pneumonia cases admitted to Basra General Hospital, Iraq. *East Mediterr Health J* 2007;13:230-42.
- Bansal S, Kashyap S, Pal LS, Goel A. Clinical and bacteriological profile of community acquired pneumonia in Shimla, Himachal Pradesh. *Indian J Chest Dis Allied Sci* 2004;46:17-22.
- Capoor MR, Nair D, Aggarwal P, Gupta B. Rapid diagnosis of community-acquired pneumonia using the BacT/Alert 3D system. *Braz J Infect Dis* 2006;10:352-6.
- Oberoi A, Agarwal A. Bacteriological profile, serology and antibiotic sensitivity pattern of microorganisms from community acquired pneumonia. *JK Sci* 2006;8:79-82.
- Shah BA, Singh G, Naik MA, Dhobi GN. Bacteriological and clinical profile of Community acquired pneumonia in hospitalized patients. *Lung India* 2010;27:54-7.
- Javed S, Chaudhry R, Passi K, Sharma S, K P, Dhawan B, *et al.* Sero diagnosis of Legionella infection in community acquired pneumonia. *Indian J Med Res* 2010;131:92-6.
- Dey AB, Chaudhry R, Kumar P, Nisar N, Nagarkar KM. *Mycoplasma pneumoniae* and community-acquired pneumonia. *Natl Med J India* 2000;13:66-70.
- Lee KH, Hui KP, Tan WC, Lim TK. Severe community-acquired pneumonia in Singapore. *Singapore Med J* 1996;37:374-7.
- Ong G, Antonio-Velmonte M, Mendoza MT. Etiologic agents of community acquired pneumonia in adults: The PGH experience. *Philipp J Microbiol Infect Dis* 1995;24:29-32.
- Kulpati DD, Kumar A. Flexible fiberoptic bronchoscopy in lower respiratory tract infection. *Indian J Chest Dis Allied Sci* 1980;22:39-46.
- Kulpati DD, Khashtgir T. Reappraisal of pneumonias. *J Assoc Physicians India* 1988;36:660-4.
- Sharma BK, Manjunatha S, Verma S, Singh S, Sagar S. Profile of pneumonias in hospitalized medical patients. *Indian J Chest Dis Allied Sci* 1988;30:199-204.
- Barlett JG. Bacteriological diagnosis of pulmonary infections. In: Sackner MA, editor. *Diagnostic Techniques in Pulmonary Disease. Part 1.* New York: Marcel Dekker Inc.; 1980. p. 707-45.
- Wollschlager C, Khan F. The contribution of blood cultures to the diagnosis and management of community acquired pneumonia. *Am Rev Resp Dis* 1985;131:80.
- Chawla K, Mukhopadhyay C, Majumdar M, Bairy I. Bacteriological profile and their antibiogram from cases of acute exacerbations of chronic obstructive pulmonary disease: A hospital based study. *J Clin Diagn Res* 2008;2:612-6.
- Ailani RK, Agastya G, Ailani RK, Mukunda BN, Shekar R. Doxycycline is a cost-effective therapy for hospitalized patients with community-acquired pneumonia. *Arch Intern Med* 1999;159:266-70.
- Almirall J, Morató I, Riera F, Verdaguer A, Priu R, Coll P, *et al.* Incidence of community-acquired pneumonia and *Chlamydia pneumoniae* infection: A prospective multicentre study. *Eur Respir J* 1993;6:14-8.
- Amsden GW. Pneumococcal macrolide resistance — Myth or reality? *J Antimicrob Chemother* 1999;44:1-6.
- Berntsson E, Lagergård T, Strannegård O, Trollfors B. Etiology of community-acquired pneumonia in out-patients. *Eur J Clin Microbiol* 1986;5:446-7.
- Ishida T, Hashimoto T, Arita M, Ito I, Osawa M. Etiology of community-acquired pneumonia in hospitalized patients: A 3-year prospective study in Japan. *Chest* 1998;114:1588-93.
- Shah BA, Ahmed W, Dhobi GN, Shah NN, Khursheed SQ, Haq I. Validity of pneumonia severity index and CURB-65 severity scoring systems in community acquired pneumonia in an Indian setting. *Indian J Chest Dis Allied Sci* 2010;52:9-17.
- Macfarlane J. Community-acquired pneumonia. *Br J Dis Chest* 1987;81:116-27.

**How to cite this article:** Khadanga S, Karuna T, Thatoi PK, Behera SK. Changing bacteriological profile and mortality trends in community acquired pneumonia. *J Global Infect Dis* 2014;6:186-8.  
**Source of Support:** Nil. **Conflict of Interest:** None declared.