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Community Acquired Pneumonia : An overview

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Community acquired pneumonia (CAP) is an important cause of morbidity and mortality world-wide, affecting all age groups, particularly children under the age of 5 years and the elderly. Burden of disease is higher in developing countries, specially in children under the age of 5 years. Prevalence of various risk factors for pneumonia in developing countries is higher, namely, under-nutrition in children, inadequate coverage with childhood immunization program, indoor and outdoor air-pollution, tobacco-smoking, and over-crowding. Being in a state of epidemiologic and demographic transition, well recognized risk factors in the west such as old age, chronic cardiopulmonary disease, malignancy, diabetes mellitus, chronic renal failure, immuno-suppressed state are also quite prevalent in developing countries.

Early detection and prompt treatment of CAP with appropriate antibiotics saves lives, and is an extremely cost-effective intervention which has reduced mortality from 30-35% in the pre-antibiotic era to ~5% in adults in the western world (1). Decline in mortality from pneumonia has been less impressive in developing countries including India, more so in children under the age of 5 years, on account of lack of timely access to health-care providers and appropriate antibiotics. Facilities for management of severe pneumonia requiring hospital treatment or intensive care are limited even in urban areas adding to increased mortality. There is lack of consensus amongst physicians regarding the choice of antibiotics for patients in different clinical settings, largely because of limited information on the causative microbial pathogens and

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their antibiotic susceptibility patterns. Frequency of pneumonia caused by atypical pathogens, namely Legionella, Chlamydia and Mycoplasma, remains a matter of speculation. High prevalence of tuberculosis in the community adds to difficulty in diagnosis of pneumonia. Consensus guidelines for the management of community acquired pneumonia recommended by the professional societies of North America, Britain and Europe are sometimes used in the absence of reliable data from India, but their appropriateness in the local context has not been evaluated. Specifically, recommendation for the use of newer fluorquinolones to cover atypical pathogens and drug resistant *Streptococcus pneumoniae* remains questionable in countries with high prevalence of tuberculosis. Similarly the recommendation for routine immunization of patients with pneumococcal and influenza vaccines before discharge from the hospital is also debatable in view of different serotypes prevalent in India compared to other parts of the world.

CAP may develop in healthy individuals, or in persons with pre-existent lung diseases such as COPD, asthma, bronchiectasis or pulmonary fibrosis which impair local defense mechanism against microbial invasion. Lung defense mechanisms are also impaired in the very old, and are inadequately developed in the very young, making these subjects more vulnerable. Other common predisposing factors for pneumonia include immunosuppressed state, altered consciousness, impaired swallowing mechanism, gastro-oesophageal reflux disease, substance abuse and alcoholism.

Pneumonia is diagnosed by an acute febrile illness with cough and expectoration, and presence of inspiratory crackles over localized region(s) of the chest. Demonstration of consolidation by radiological examination is not mandatory, particularly in the ambulatory primary care setting. Tachypnoea (with hypoxemia), hypotension, mental confusion, elevated blood urea and age over 65 years are adverse prognostic factors and the presence of three or more of them signifies need for hospitalization, close monitoring and need for intravenous antibiotics (British Thoracic Society CURB-65 criteria) (2). Pneumonia Severity Index is more elaborate scoring system for scoring severity of pneumonia (3). The two methods for assessing severity are complimentary; CURB-65 being more

suited to identify patients requiring urgent hospitalization. Presence of one or more co-morbidities, such as diabetes, congestive heart failure or COPD increases the risk of death. Co-morbidities and certain epidemiologic factors need to be considered during initial evaluation as they increase the risk of infection with certain specific organisms, e.g., *Pseudomonas* spp (bronchiectasis, steroid or antibiotic therapy), *Staphylococcus aureus* including methicillin resistant strains (chronic renal failure, regional prevalence), *Hemophilus influenzae* (COPD), drug resistant *Streptococcus pneumoniae* (old age, steroid or antibiotic therapy, regional prevalence), *Klebsiella pneumoniae* (alcoholism), *Pneumocystis carinii* pneumonia (immunosuppressed subjects) and infection with anaerobic pathogens (aspiration). Atypical pathogens are more likely in patients requiring hospitalization, and *Legionella* spp in ICU patients. A detailed discussion of risk factors for specific pathogens causing CAP is included in guidelines recommendations of the ATS (4).

Initial diagnostic evaluation in patients with moderate to severe CAP should include an X-ray skiagram of the chest, total and differential white cell count and blood culture before instituting antibiotic therapy. Measurement of oxygen saturation by pulse oximetry is widely available and should be undertaken on all patients. Gram staining of the expectorated sputum and its culture for pyogenic organisms appear to be of limited value. Staining of sputum for acid-fast organisms should be undertaken in all patients with symptoms of longer duration, upper zone infiltrates or even a bronchopneumonic appearance, particularly in presence of diabetes, chronic renal failure or immunosuppression. Failure to do so may lead to transmission of tuberculosis amongst hospitalized patients and health-care providers. Sputum induction and special stains may be required in immunosuppressed patients suspected of *Pneumocystis jiroveci* pneumonia. Bronchoscopic procedures for possible identification of causative pathogen(s) are not recommended during initial evaluation even in patients requiring ICU admission. They may be considered at a later stage in patients with non-resolving pneumonia and suspected bronchial obstruction. Measurement of blood urea is required for assessment of severity of pneumonia and prognostic scoring in patients who are old and appear ill with increased respiratory rate or hemodynamic instability. Appropriate investigations would also

be required for evaluation of co-morbidities. A CT-scan of the chest may be required in patients with unusual radiological findings, poor response to treatment, suspected underlying bronchial obstruction, pulmonary cavitation or pleural complications, or interstitial pneumonia. Several investigators have evaluated the utility of serum markers C-reactive protein (CRP) and serum procalcitonin in diagnosis (bacterial, atypical pathogen or viral), gradation of severity, prognosis and decision regarding duration of antibiotic therapy in CAP (5) but routine use of these investigations does not appear cost-effective in the Indian context.

Treatment of CAP is based on empirical antibiotic therapy which is tailored to cover the most likely pathogens in a given patient taking into account age, underlying lung disease, co-morbidities, previous antibiotic or steroid therapy, immune status and the severity of illness. *Streptococcus pneumoniae* continues to be the most frequent pathogen responsible for pneumonia at all ages and in immuno-competent as well as immuno-suppressed individuals. A β-lactam antibiotic such as amoxicillin, usually in combination with clavulonic acid, cefuroxime axetil or cefpodoxime would be adequate for treatment of ambulatory patients. This may be combined with a macrolide (clarithromycin or azithromycin) or doxycycline to cover atypical pathogens. These agents may be used as stand alone therapy as they also are effective against *Streptococcus pneumoniae,* particularly if there is no underlying cardiopulmonary disease. Levofloxacin and newer fluoroquinolones are also effective against atypical pathogens as well as DRSP but it should be used cautiously in India where prevalence of tuberculosis is high. Concern regarding DRSP in India is perhaps unnecessary since organisms with intermediate sensitivity to respond to β-lactams. Parenteral antibiotics are recommended for patients with more severe CAP who require hospitalization. Intravenous ceftriaxone, cefotaxime and co-amoxyclav in combination with a macrolide are a reasonable choice but there are other options including levofloxacin. Anti-pseudomonas and anti-staphylococcal cover should be considered in patients with modifying risk factors in the ICU. Patients suspected to have aspiration pneumonia would need metronidazol or clindamycin to cover probable anaerobic pathogens. In general, the risk of resistance to a particular antibiotic increases if that agent has

been used by the patient in the past three months; this is particularly true for fluoroquinolones. One may therefore "rotate" antibiotics in a given patient in case of recurrence of infection within 3 months.

Management of a patient with CAP requires decisions regarding the need for hospitalization (in regular ward or in the ICU), use of intravenous antibiotics, monitoring of vital parameters, diagnostic investigations, and appropriate time to switch to oral therapy and discharge from the hospital. All decisions should be made in consultation with the patient and responsible family members who would provide social support after discharge. Advance directives regarding resuscitation in patients with multiple co-morbidities who appear terminally ill should also be obtained and documented.

Recognizing the burden of disease in the community and need for clarity on several issues related to diagnosis, prognosis and management of CAP in India, the National Academy of Medical Sciences sponsored a continuing medical education program which was organized as a National Symposium on 23rd December, 2007 under the aegis of NAMS-Regional Telemedicine Education Center (North) by the Department of Pulmonary Medicine, Postgraduate Institute of Medical Education and Research, Chandigarh. Speakers as well as the audience from three different centers interacted throughout the day-long presentations. The present issue of the Annals of the National Academy of Medical Sciences incorporates contributions at this symposium by the speakers from PGIMER Chandigarh, Postgraduate Institute of Medical Sciences, Rohtak, and Indira Gandhi Medical College, Shimla. I am sure the readers of Annals would find proceedings of the symposium useful and informative.

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