

Original Research Article

A Cross-Sectional Study On Community-Acquired Pneumonia With Special Reference To Its Aetiology, Clinical Profile And Risk Factors On Elderly Population Aged Above 65 Years

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Received: 09-10-2021/ Revised: 13-11-2021 / Accepted: 26-12-2021

Abstract

Aim: To investigate the clinical profile, radiographic, and microbiological features of community-acquired pneumonia in the elderly & also to assess its risk factors & complications. **Methods:** This is a cross-sectional study conducted on a total of 100 subjects of either sex. Initially, the subjects were particularly asked about the initial presenting symptoms, including fever, cough with sputum, chest pain, breathlessness and haemoptysis. Then, the subjects were examined in detail for the evidence of clinical pneumonia-like restricted movements of the chest, inspired percussion note, accentuated vocal fremitus and vocal resonance, abnormal breath sounds and adventitious sounds. Statistical Package for Social Sciences (SPSS) version 20 was used for the statistical analysis. **Results:** Most study participants were between the age of 66-70 years (41%) with male predominance (55%). The most common chief complaint was fever, cough and chest pain presented in 30%. The most common comorbidities found was Type 2 diabetes (12%). 34% and 32% of subjects had a history of smoking alcohol consumption, respectively. X-ray findings revealed that majorly right lower zone consolidation was detected in 17% of the study subjects. The most common organism causing community-acquired pneumonia (CAP) in study subjects was found to be *S. pneumoniae* (36%). **Conclusion:** The incidence of CAP is affected by the presence of predisposing factors, patient's age and geographic region. The common predisposing factors observed were chronic obstructive pulmonary disease (COPD), hypertension, type 2 diabetes mellitus (DM), smoking and alcohol consumption. The most common clinical presentation of chest pain, cough and fever. This study demonstrated that chest radiography is a useful diagnostic tool to confirm or rule out pneumonia in subjects suspected of suffering from lower respiratory tract infection. *S. pneumoniae* was found to be the most common bacterial pathogen that causes Community-acquired pneumonia.

Keywords: Community-acquired pneumonia (CAP), COPD, Type 2 diabetes, Smoking, Alcohol, *S. pneumoniae*.

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Introduction

Pneumonia is well-defined as "An acute inflammation of lung parenchyma of non-infective or infective origin, presented with radiological as well as physical features compatible with pulmonary consolidation"[1]. While, community-acquired pneumonia (CAP) is defined as an infection of the lung parenchyma that is not acquired in a hospital, long-term care facility, or other recent contact with the health care system. CAP is the main morbidity and death cause, with significant economic & clinical effect[2]. A new pulmonary infiltrate on a chest radiograph is required for a definite suspected CAP diagnosis, which is defined by acute symptoms and signs of lower respiratory tract infection (LRTI) with no obvious causes[3]. Despite the fact that various organisms have been linked to the disease, information regarding the distribution of pathogen isn't represented uniformly across countries. In adults, the CAP incidence is influenced by many factors like study period, geographic region and age. India accounts for around thirty-six per cent of the World Health Organization (WHO) regional burden & twenty-three per cent of the global pneumonia burden in children aged below 5 years[4]. As per the estimates of WHO global health, LRTIs killed 783,000 people in Southeast Asia in 2016[5]. Jokinen et al., confirmed the *S. pneumoniae* as an important cause for CAP as *Streptococcus*

pneumoniae was the main etiologic agent in forty-eight percent subjects with age \geq sixty years followed by *Chlamydia specios* spotted in twelve per cent, ten per cent people were spotted by *Mycoplasma pneumoniae*, four per cent people were spotted by *Haemophilus influenzae* and ten percent people were spotted by (respiratory syncytial virus, parainfluenza virus, influenza virus and adenovirus,) respiratory viruses[6]. Factors of risk for drug-resistant *Streptococcus pneumoniae* (DRSP) comprise beta-lactam therapy within the past three months, >sixty-five years of age, multiple medical comorbidities, immunosuppression (either as an outcome of a disease or induced by treating with corticosteroids), exposure to a child in a day-care centre and alcoholism[7]. Underlying cardiopulmonary illness, recent antibiotic treatment, multiple medical comorbidities and nursing facility residence are also factors of risk for enteric gram-negative organisms[8]. Broad-spectrum antibiotic medication for at least seven days in the previous month, structural lung illnesses, like bronchiectasis, malnutrition and corticosteroid treatment of at least ten mg of prednisone per day are all factors of risk for *P. aeruginosa*[9]. Cough, fever, breathing difficulty, sputum as well as pain in the chest are frequent concerns among CAP subjects[10]. Chest radiography, blood testing and different tests to determine the causative organism are carried out whenever clinical symptoms imply Community-acquired pneumonia [11]. The rate of erythrocyte sedimentation, C reactive protein and white blood count (WBC) count are generally elevated in lab results. Blood culture (in case of suspected sepsis), sputum culture, several antigen tests (such as pharyngeal swab tests for influenza viruses or urine antigen tests for *Streptococcus pneumoniae* & *Legionella*

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pneumophila), Gram's stain, antibody tests, cold agglutination tests and paired serum tests are all pathogen tests[12]. Imaging investigations are necessary for CAP management. The prime objective of imaging investigations is to validate pneumonia diagnosis.¹³ Though treatment outcomes can be assessed purely on the basis of clinical findings, imaging examinations serve a crucial additional role in the assessment of antibiotic treatment effects[14].

Data about the microbiological causes of CAP, clinical profile, radiological features, risk factors and complications associated with CAP in developing countries, like India, are scarce and vulnerable by the available data being old and limited to small sample size. CAP imaging findings are diverse and quite often non-specific.¹¹ Furthermore, certain distinctive observations can sometimes point to a specific pathogen. Furthermore, imaging studies, particularly Computed tomography, can provide insight into the differences between non-infectious and infectious pneumonia. With these viewpoints, the present study was designed with the primary aim to examine the clinical profile, microbiological as well as radiological features of CAP in the elderly population and also to assess its risk factors & complications.

Subjects and Methods: This is a cross-sectional analysis carried out on subjects admitted to the department of respiratory medicine, Bapuji Hospital, Davangere, Karnataka, India, with a clinical picture of pneumonia confirmed by radiological evidence of pneumonia. A total of 100 subjects of either sex was included, and the research was carried out for 1-year period from August 2018 to August 2019.

Inclusion criteria

1. Sixty-five years or older
2. Acute onset of respiratory illness
3. New shadow in the chest radiograph compatible with pneumonia
4. Any 2 of the following
 - a. Increased or new cough
 - b. Increased or new production of sputum
 - c. Increased or new shortness of breath
 - d. Physical examination shows signs of consolidation.

Exclusion criteria

1. Active tuberculosis
2. Subjects under the age of 65 years
3. Unrelated life-threatening major illness
4. Significant bronchiectasis
5. Significant risk factors for aspiration

Methodology

A pre-structured proforma was used to record the details of each case. All of the study subjects had given their informed written consent after getting approval from the institutional ethical committee. Initially, the subjects were particularly asked about the initial presenting symptoms, including fever, cough with sputum, chest pain, breathlessness and haemoptysis. In addition, the habit of smoking with a quantity of cigarettes/beer is per day and smoking duration and any contact with birds, cattle or other pets will be recorded. Then all the subjects were examined in detail for the evidence of clinical pneumonia-like restricted movements of the chest, inspired percussion note, accentuated vocal fremitus and vocal resonance, abnormal breath sounds and adventitious sounds.

Statistical analysis: Descriptive analysis was performed by the mean, standard deviation for frequency and quantitative variables and proportions for qualitative variables. By using Statistical Package for Social Sciences (SPSS) version 20. [IBM SPSS statistics (IBM Corp. Armonk, NY, USA released 2011)] statistical analysis was carried out.

Results

Most of the study participants fit in to the group of 66-70 years of age (41%), followed by 76-80 years (24%), 71-75 years (22%) and >80 years (13%). Male predominance (55%) of subjects enrolled was observed as compared to females (45%) (Table 1). The most common chief complaint was fever, cough and chest pain presented in 30% of

the study subjects. It was followed by fever, cough + sputum (28%), Cough + Sputum along with Chest pain (16%), Cough and breathlessness (11%) (Table 2). The most common comorbidities found was Type 2 diabetes in 12% of the study subjects, followed by hypertension (11%), COPD (5%), and type-2 diabetes mellitus (T2DM), hypertension (HTN) (4%). Whereas, in the majority of the subjects, i.e., 62/100 (100%), there were no comorbidities recorded (Table 3). 34/100 (34%) and 32/100 (32%) subjects had a history of smoking alcohol consumption, respectively (Table 4).

Crepitations and bronchial breath sounds were heard in 51% and 49% of study subjects, respectively (Table 5). X-ray findings revealed that majorly right lower zone consolidation was detected in 17% of the study subjects. Left middle zone consolidation and B/L lower zone consolidation was detected in 15% of each study subjects. Right middle zone consolidation and left lower zone consolidation were seen in 13% of each study subject (Figure 1). The most common organism causing CAP in study subjects was found to be *S. pneumoniae* (36%), followed by *Klebsiella* (22%), *Commensals* (20%), *H. influenza* (9%) (Table 6). Pleural effusion was the commonest problem noted in 12% of study subjects, followed by haemoptysis (8%) and lung abscess (2%) of the study subjects, respectively (Table 7).

Discussion

In spite of the powerful new antimicrobials' availability and efficient treatment modalities, community-acquired pneumonia remains a prevalent and serious disease. Because pneumonia isn't a notifiable disease, data on its incidence is on the basis of crude estimates. Nevertheless, it is estimated that up to 4 million CAP cases happen each year, with up to 20 per cent of them requiring hospitalization[15]. The rate of mortality of subjects suffering from pneumonia in outpatient settings is low, in the range of 1 to 5%, but among subjects who were required to ICU admissions, it approaches as high as 25%[16-18]. Hence, the present conducted with the main purpose to study the clinical profile, microbiological and radiological features of community-acquired pneumonia in the aged population, and also to access its risk factors & complications. Both the treatment and epidemiology of pneumonia has changed in recent years. Pneumonia is commonest amongst elderly subjects, especially in individuals with comorbidities such as DM, chronic liver disease, COPD, congestive heart failure, renal failure and other conditions[19]. The initial presentation's severity, as well as the existence of either advanced age or co-existing ailment, are 2 significant factors that determine the spectrum of etiologic agents as well as the initial strategy towards treatment[20]. Subjects with CAP severity have distinctive epidemiology and somewhat different etiologic pathogens' distribution compared to subjects suffering from other forms of pneumonia. Likewise, advanced age or the existence of comorbidities can help identify the pathogens that are most likely to be involved[21]. Even when rigorous diagnostic tests are conducted, the causative organisms aren't recognized in fifty per cent of cases, despite the fact that an etiological diagnosis is ideal in CAP management[22]. *Streptococcus pneumoniae* continues to remain the most common CAP causing organism[23]. It is documented well that the occurrence of pneumonia is common in the community, & also its incidence increases rapidly as people grow older. The elderly have a different outcome, etiology and clinical presentation of CAP compared to other population. In the current research, the majority of the study patients fitted in were 66-70 years of age group (41%), followed by 76-80 years (24%), 71-75 years (22%) and >80 years (13%). Research performed by Abdullah et al. stated that 64% of study subjects were 65-74 years of age, followed by 28% of subjects were aged 75-84 years, and 8% were ≥85 years of age, and the mean age was 72.22 ± 6.14 years[24]. In another research carried out by Torres et al., the mean age of the subjects presented with CAP was 42.5 ± 10.2 years (mean ± SD)[25]. These disparities might be caused by differences in the hospitalization rates and healthcare access among the older in the different

populations examined. A study reported by Laporte et al. revealed that the CAP incidence in very aged subjects continues to increase. This increasing age for CAP found in our study might be because of other comorbid conditions linked to rising age. These findings were in accordance with various other research investigations reported by various other researchers in the literature [24-27]. In the present study, the prevalence of Community-acquired pneumonia is more in males (55%) than females (45%). These findings were at par with the findings of various other researchers reported in the literature. This gender distribution is similar to the study stated by Abdullah et al., wherein the incidence of CAP was observed in 70% of male study subjects compared to females (30%). In a similar kind of study conducted by Barbagelata et al., males showed more severe CAP case compared to females, which leads to a higher rate of mortality among males, specifically as they get older [28]. In males, this could be attributable to higher smoking & alcoholism rates and also owing to a higher association of comorbid illnesses. The symptoms of elderly subjects can be both atypical & typical. In a current research study, the commonest chief complaint was fever, cough and chest pain presented in 30% of the study subjects. It was followed by fever, cough + sputum (28%), Cough + Sputum along with Chest pain (16%), Cough and breathlessness (11%). A study done on elderly subjects by Abdullah et al. found that the commonest respiratory indication reported in 74% of study subjects was cough. [24] In Bjarnason et al. study of aetiology & results of CAP, cough, fever, and dyspnea were the most frequent symptoms [29]. Other most common symptoms reported in the literature are gastrointestinal symptoms (8%), dyspnoea (22%), altered sensorium (16%) and chest pain (20%). The existence of chronic comorbidities in the majority of community-acquired pneumonia subjects in our research is comparable with the contention that a vital factor of risk for pneumonia in old aged individuals is the prevalence of other diseases [30]. In our study, the most common comorbidities found was Type 2 diabetes in 12% of the study subjects, followed by hypertension (11%), COPD (5%), and T2DM, HTN (4%). There were no comorbidities found in 62% of the study subjects. In our study, (34%) and 32/100 (32%) of the study subjects had a history of smoking alcohol consumption, respectively. Smokers have an increased pneumonia risk owing to changes in mechanical clearance, cellular defences and respiratory flora. Smokers, as compared to non-smokers, have bacterial colonization of the lower respiratory tract as mucociliary clearance is defective due to ciliary beat frequency reduction as well as variations in viscoelastic properties of respiratory secretions and volume. A review study reported by Cilloniz et al. discovered that cigarette smoking were risk factors for community-acquired pneumonia. Baskaran et al. stated that exposure to smoke of tobacco is considerably related to CAP development. According to Chang, smoking tobacco seems to be the most significant factor of risk for COPD development, as well as it is identified as a factor of risk for other respiratory illnesses [31]. Alcoholism is a factor of risk because it hinders various respiratory tract defences, including increased aspiration risk, mechanical clearance impairment, changes in normal flora, as well as lack of cellular and humoral immunity. Among the respiratory indications stated in our research, crepitations and bronchial breath sounds were heard in 51% and 49% of study subjects, respectively. Crepitations have been the most typical respiratory symptom in seventy-nine per cent of participants in a research carried out by Zalcaín et al. Other characteristic respiratory symptoms included an increase in vocal fremitus, vocal resonance and bronchial breathing, and an impaired note on percussion in < one-third of participants. This demonstrates the dearth of distinctive clinical signs in pneumonia subjects who are older, as well as the necessity for diagnosing pneumonia in older subjects with atypical presentations and few symptoms as well as signs. In another study conducted by Spiteri reported that among the physical signs

documented in cases of pneumonia, bronchial breath Sounds (72%) were the commonest focal sign of CAP. Furthermore, the commonest presenting clinical indications in Abdullah et al. investigation's were bronchial breath sounds in twelve (24 per cent) and crepitations in forty-seven (94 per cent) of the individuals [24]. All CAP cases should have radiological confirmation with consolidation in 1 or multiple lobes. In our study, majorly, right lower zone consolidation was detected in 17% of the study subjects. Left middle zone consolidation and B/l lower zone consolidation was detected in 15% of each study subjects. Right middle zone consolidation and left lower zone consolidation were seen in 13% of the study subjects. Abdullah et al. study found that of thirty-nine subjects suffering from lobar pneumonia, the distribution was twelve to left lung, twenty-four to the right lung & three bilateral. Nine (18%) subjects showed indication of bronchopneumonia, two (4%) subjects showed interstitial pneumonia, six (12%) subjects showed pleural effusion, and two subjects showed cavitation (4%) [26]. In the study of Zhou et al., study about 59% of consolidation was found. The bacteriological CAP profile differs from country to country. It evolves over time the in same country, owing to the impact of environmental pollution, frequent antibiotics use, greater disease awareness, sanitation and vaccination coverage. In several research study in western countries undertaken to examine CAP causes in the older subjects, the causative pathogens' distribution seemed to have differed from that in younger adults; the commonest CAP cause was *S. pneumoniae* in almost fifty percent of infections, *L. pneumophila*, respiratory viruses, *H. influenzae*, *C. pneumoniae* and gram-negative bacilli, were others commonly reported. A systematic review reported by Jaiswal et al. from India suggested that about 15-24% of bacterial pneumonia in South Asian countries could be due to infection of *S. pneumoniae*. In the current study, the commonest pathogen causing CAP in study subjects was found to be *S. pneumoniae* (36%), followed by *Klebsiella* (22%), *Commensals* (20%), *H. influenzae* (9%). These findings were in accordance with the findings of Abdullah wherein the majority of the bacteria isolated were *Streptococcus pneumoniae* (16%), followed by *Klebsiella pneumoniae* (6%), *Pseudomonas* (4%), *Haemophilus influenzae* (4%), *Staphylococcus aureus* (1%) and *Escherichia coli* (2%).

CAP can be caused by a variety of organisms. *Streptococcus pneumoniae*, on the other hand, is the commonest cause. Adults suffering from chronic illnesses (like COPD), infants, and senior citizens are especially vulnerable to CAP-causing organisms. CAP caused by *Pneumocystis jirovecii* or *Haemophilus influenzae* is more common among alcoholics and individuals with weakened immune systems. Various complications noted in our study, such as pleural effusion, were the commonest complication noted in 12% of the study subjects. Other complications were haemoptysis and lung abscess in 8% and 2% of the study subjects. These findings were comparable to findings of other researcher reported in the literature. Similarly, another study conducted by Zalcaín et al. reported pleural effusion in 12%, septic shock in 8%, lung abscess 4%, and emphysema 3% of study subjects as common complications in their study. These results were consistent with the present study findings. Increased mortality, morbidity & rapid CAP growth in older people above the age of sixty-five years in the general population are disturbing. In addition, aged people are at a higher risk of catching respiratory infections & are much more prone to develop severe illness.

Conclusion

The incidence of CAP is affected by the patient's age, the existence of predisposing factors and geographic region. The common predisposing factors observed were COPD, hypertension, type 2 DM, smoking and alcohol consumption. The most common clinical presentation of chest pain, cough and fever. This study showed the diagnostic approach to tackle community-acquired pneumonia. In subjects suspected of suffering from lower respiratory tract infection, chest radiography is used as an essential tool to confirm or rule out

pneumonia diagnosis. *S. pneumoniae* was found to be the most common bacterial pathogen causing CAP.

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Conflict of Interest: Nil

Source of support: Nil