

Assessment of Microbiological Spectrum of Pneumonia in Lung Cancer Patients

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ABSTRACT

Background: Lung cancer is one of the common types of tumour encountered these days. Thousands of new cases are recorded every year and remains a matter of concern because of its high morbidity index. The malignancies of the respiratory tract most frequently lead to the infections of respiratory system and further spread and metastasis to involve the other tissues. Hence; we retrospectively analyzed the microbial profile of pneumonia in lung cancer patients.

Materials & Methods: The present study was carried out on the patients that were diagnosed with lung cancer and pneumonia in the institution from April 2013 to March 2015. A total of 107 patients were included in the present study. 26 patients underwent surgery as a part of treatment protocol either palliative or curative. Simultaneous chemotherapy therapy was given to 32 patients while 21 patients received simultaneous radiotherapy. Sterile specimen containers and test tubes were used for the collection of the expectorated sputum samples and were sent to the department of microbiology for assessment. Gram staining and cultural method was used for the processing of the sputum samples.

Results: Mean age of the patients was 60.2 years while 92 percent patients were males. Approximately 12 percent of the total candidates were diabetic while 11 percent of the total patients were affected by chronic obstructive pulmonary disease (COPD). Maximum number of patients had Stage 4 of tumour while approximately 65 percent of the tumours were peripheral in location. Of the 107 study patients, 84 (78.5%) had positive isolates from sputum cultures. The most frequent isolate from the sputum of lung cancer patients with pneumonia was *Aspergillus fumigatus* ($n = 25$), followed by *Haemophilus influenzae* ($n = 13$), *Staphylococcus aureus* ($n = 11$), *Klebsiella pneumoniae* ($n = 09$), *Pseudomonas aeruginosa* ($n = 08$), *Streptococcus pneumoniae* ($n = 08$), *Acinetobacter baumannii* ($n = 05$), *Escherichia coli* ($n = 2$), *Staphylococcus epidermidis* ($n = 2$), and *Enterobacter cloacae* ($n = 1$).

Conclusion: Surgeons should take into consideration about the microbial flora of the infections while making treatment plan for such patients with malignancies.

KEYWORDS: *Aspergillus fumigates*, Lung cancer, Pneumonia.

INTRODUCTION

One of the common types of tumour encountered these days is the Lung cancer. Thousands of new cases are recorded every year and remains a matter of concern because of its high morbidity index.^{1,2} Metastasis and spread of cancer to other organs including the respiratory system remains the chief cause of death in lung cancer patients.^{3,4} Most frequent complications that occur during the treatment protocol of lung cancer patients is the infections of various organs. The malignancies of the respiratory tract most frequently lead to the infections of

respiratory system and further spread and metastasis to involve the other tissues. Bacteria, viruses and fungi are all involved microorganisms responsible for causing infections in lung cancer patients.^{2,4} Hence; we retrospectively analyzed the microbial profile of pneumonia in lung cancer patients.

MATERIALS & METHODS

The present study was carried out on the patients that were diagnosed with lung cancer and pneumonia in

Chintpurni Medical College & Hospital, Bungal, Pathankot, Punjab (India) from April 2013 to March 2015. Criteria in the past literature were used for confirming the diagnosis of pneumonia.⁵ Pneumonia was further categorized into community acquired pneumonia (CAP) and hospital acquired pneumonia. Complete demographic details of the patients along with clinical data were recorded. Ethical approval was taken from the institution after explaining them the entire research protocol in written. A total of 107 patients were included in the present study. 26 patients underwent surgery as a part of treatment protocol either palliative or curative. Simultaneous chemotherapy therapy was given to 32 patients while 21 patients received simultaneous radiotherapy. Sterile specimen containers and test tubes were used for the collection of the expectorated sputum samples and were sent to the department of microbiology for evaluation. Gram staining and cultural method was used for the processing of the sputum samples. Examination of the gram stained slides was done by trained professionals. Around 09 specimens were rejected because of improper staining or processing defect. Blood agar, chocolate agar and lactose agar medium was used for the growth of microorganisms. 18 patients underwent empiric treatment were evaluated by antibiogram of the microorganisms. All the results were analyzed by SPSS software.

RESULTS

Graph 1 shows the demographic details of the patients. Mean age of the patients was 60.2 years while 92 percent patients were males. Approximately 12 percent of the

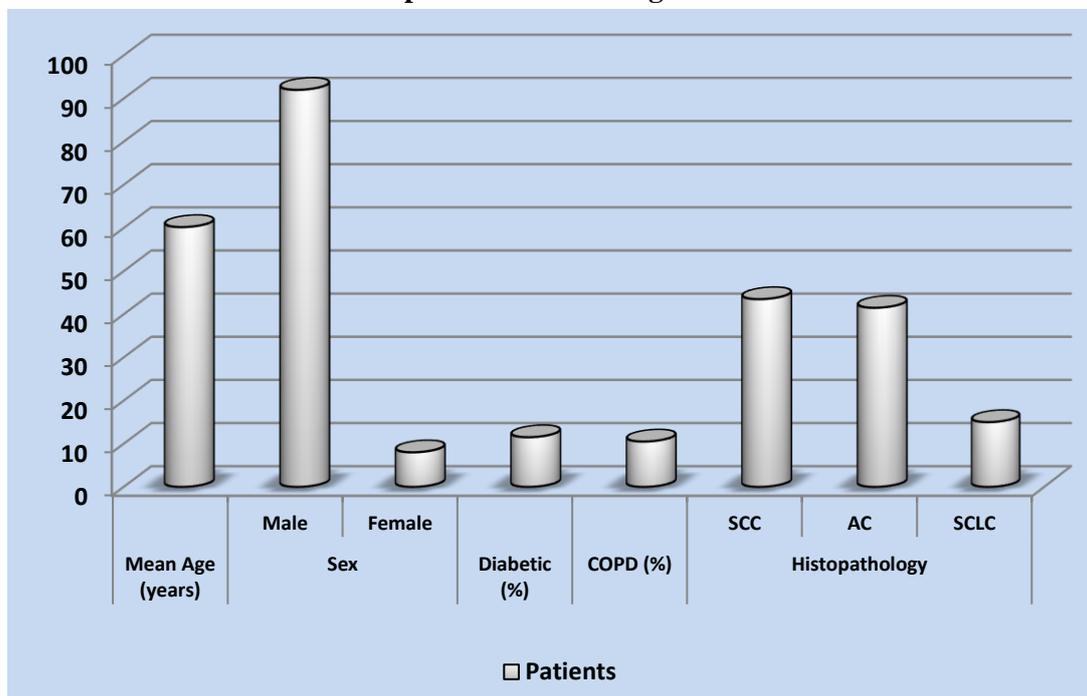
total candidates were diabetic while 11 percent of the total patients were affected by chronic obstructive pulmonary disease (COPD). Graph 2 highlights the histopathologic tumour details of the patients regarding pneumonia and lung cancer. Maximum number of patients had Stage 4 of tumour while approximately 65 percent of the tumours were peripheral in location. Mean haemoglobin levels in patients were 11.1 gm/dl.

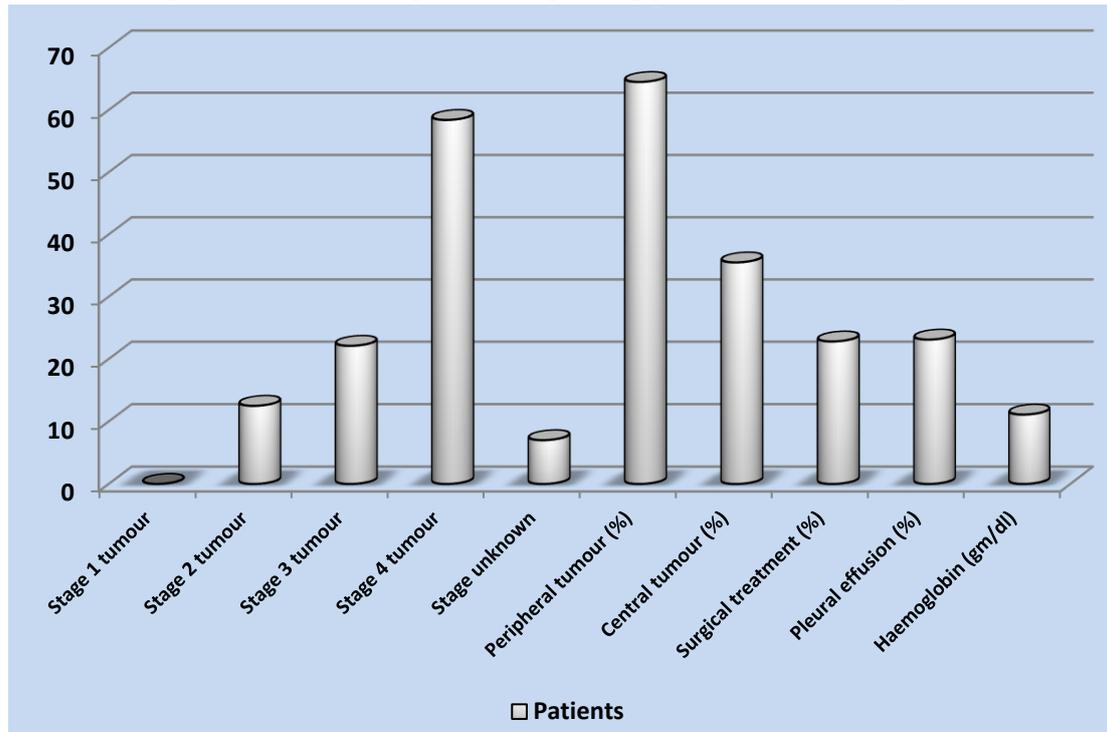
Of the 107 study patients, 84 (78.5%) had positive isolates from sputum cultures. The most frequent isolate from the sputum of lung cancer patients with pneumonia was *Aspergillus fumigatus* (n = 25), followed by *Haemophilus influenzae* (n = 13), *Staphylococcus aureus* (n = 11), *Klebsiella pneumoniae* (n = 09), *Pseudomonas aeruginosa* (n = 08), *Streptococcus pneumoniae* (n = 08), *Acinetobacter baumannii* (n = 05), *Escherichia coli* (n = 2), *Staphylococcus epidermidis* (n = 2), and *Enterobacter cloacae* (n = 1).

DISCUSSION

Because of several other reasons and facts, the patients with lung cancer are particularly prone for the development of various respiratory system infections. This high affinity of these patients to infections is mostly due to the dysregulation of immune system, immunosuppressive medicines given as a part of treatment therapy, change in the microbial flora of the respiratory tract.⁶⁻⁹ Therefore necessary controls and precautions should be taken for controlling the wide spectrum of pulmonary infections in lung cancer patients.¹⁰ Hence; we retrospectively analyzed the microbial profile of pneumonia in lung cancer patients.

Graph 1: Demographic and clinical details of the patients with pneumonia and lung cancer.



Graph 2: Details of the patients regarding pneumonia and lung cancer.

We observed that the most frequently isolated and detected microorganism was *Aspergillus fumigatus* although a high diversity of micro-pathogens were also present. Empirical treatment is recommended in the past literature as the therapy for severe pulmonary infections in lung cancer, but our study hypothesizes that a rational use of antibiotic agents along with other parameters is required for the treatment of patients with concomitant malignancies.^{10,11} Despite the high and vast diversity in the microbial flora detected, *Aspergillus fumigatus* was the most common predominate microorganism detected. Our results were in correlation with the results of previous studies who also observed similar findings in their analysis.^{12,13} Li et al. evaluated the alterations in the pattern of distribution of microbial pathogens and susceptibility of antibiotics in between the patients with exacerbation of COPD and patients suffering from community based pneumonia. They retrospectively analyzed the data records of over 550 patients suffering from COPD and over 340 patients suffering from community based pneumonia from 2007 to 2008. They observed that in less than 50 percent of the cases of patients with exacerbation of COPD and over 50 percent cases of patients suffering from pneumonia had positive results for sputum culture. From the results, they concluded that most common pathogens involved in COPD exacerbation and community-acquired pneumonia were *P. aeruginosa* and *S. Pneumonia* respectively.¹⁴ Al-Ali et al. evaluated the etiologic factors responsible for the community acquired pneumonia (CAP) in Jordanian patients. They prospectively analyzed patients with the diagnosis of CAP from April to October 2002. They observed that 35

patients with mean age of 47 years were admitted to the hospital with the diagnosis of CAP. From the result, they concluded that most common etiologic microbial agents responsible for causation of CAP are *Streptococcus pneumoniae* and atypical microorganisms.¹⁵ Behbehani et al. determined the microorganisms responsible for causation of CAP in Kuwait. They evaluated all the consecutive CAP cases that were admitted in three hospitals over a period of one year and observed that a total of 135 admissions were done with the most commonly isolated and detected microorganisms being *Mycoplasma pneumonia*, *Legionella pneumophila* and *Chlamydia pneumonia*. From the results, they concluded that in the etio-pathogenesis of CAP, atypical pathogens play a significant role.¹⁶ Ko et al. examined the microbial flora of the sputum of the patients with acute exacerbations of chronic obstructive pulmonary disease (AECOPD). This retrospectively analyzed the patient's records of 2000 admitted in the tertiary health care centre in Hong Kong. From the above results, they observed that there were 118 patients that had pneumonia and had concomitant 150 episodes of AECOPD. From the above results, they concluded that in sputum in patients with AECOPD and concomitant pneumonia, *H. influenzae* was the commonest bacterium isolated.¹⁷ Ko et al. evaluated the infectious etiologic factors for patients with AECOPD who were hospitalized with concomitant pneumonia. They analyzed the patients admitted to the medical ward of the hospital from 2004 to 2005. They observed that *Streptococcus pneumoniae*, *Pseudomonas aeruginosa* and *Haemophilus influenza* were the most common bacteria that were identified. From the results, they

concluded that bacterial infection was the main cause for AECOPD patients with concomitant pneumonia in their study.¹⁸ Remiszewski et al. reported that the most frequent aetiological agents of infections resulting in the death of patients with lung cancer were Gram-negative bacteria.¹⁹ Although a high diversity of pathogens was found in the current study, *Aspergillus fumigatus* was predominant in the majority of our lung cancer cases with pneumonia. Previous studies have shown that *Aspergillus fumigatus* infections are common in immunocompromised patients, and that the lungs are the most common organ involved.^{12,13}

CONCLUSION

From the above results, the authors concluded that surgeon should take into consideration about the microbial flora of the infections while making treatment plan for such patients with malignancies.

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