Original Research Paper

Volume - 7 | Issue - 7 | July - 2017 | ISSN - 2249-555X | IF : 4.894 | IC Value : 79.96

Pulmonary Medicine

MICROBIOLOGICAL AND IMAGEOLOGICAL PROFILE OF PNEUMONIAS IN ACUTE MEDICAL CARE IN A TERTIARY CARE HOSPITAL

Dr. Alekhya A	Junior Resident, Department of General medicine, Nizams Institute Of Medical Sciences, Hyderabad, Telangana.500082.
Dr. Bhaskar K	Assistant Professor, Department of Pulmonary Medicine, Nizams Institute Of Medical Sciences, Hyderabad, Telangana., 500082. - Corresponding Author
Dr.NageshwarRao M	Professor, Department of General Medicine, Nizams Institute Of Medical Sciences, Hyderabad, Telangana 500082
Dr. Paramjyothi G.K	Professor, Department of Pulmonary Medicine, Nizams Institute Of Medical Sciences, Hyderabad, Telangana 500082
Dr.Sujata Patnaik	Additional Professor, Department of Radiology, Nizam's institute of Medical Sciences, Hyderabad, Telangana. 500082

ABSTRACT A prospective and observational study of 200 adult patients with symptoms, signs suggestive of and radiological evidence of pneumonia, admitted in Acute Medical care unit during one year period. Pregnant women and Post operative patients were excluded. After obtaining a detailed history, a complete general physical and systemic examination, patients were subjected to relevant investigations. Pleural fluid analysis, throat swab c/s, Computerised Tomography of thorax, bronchoscopy with Broncho alveolar lavage (BAL) were done if necessary. Majority were males (57%) . Mean age of the study group was 50.5 ± 2.38. Risk factors for developing pneumonia were diabetes, smoking, alcoholism, hematological disorders and connective tissue disorders . Microbiological yield was present in 78 cases (39%) and was more from bronchosecretions (Tracheal aspirate/Broncho Alveolar Lavage). Gram negative organisms were more common. Klebsiella and E.coli were the common organisms. By serology, Scrub typhus was common and among viral, H1N1 was more common. Chest radiograph showed predominantly bilateral lower zone involvement with alveolar pattern. CT scan had a better delineation with diagnostic accuracy. Mortality (19%) was more in patients with multiorgan dysfunction, ARDS .

KEYWORDS : pneumonia, radiograph, computerised tomograph, bronchoscopy

INTRODUCTION:

Pneumonia is defined as an inflammation of the pulmonary parenchyma caused by an infectious agent. The clinical syndrome of pneumonia includes fever or hypothermia, sweats, rigors, or chills, pulmonary symptoms such as cough, sputum production, dyspnea, pleurisy, or pulmonary lesions observed on radiographic examination. Despite being the cause of significant morbidity and mortality, pneumonia is often misdiagnosed, mistreated, and underestimated. Pneumonia is a common cause of infection-related mortality and is one of the most important challenges in clinical medicine[1]. Inappropriate or delayed treatment of pulmonary infection contributes to poor clinical outcomes, avoidable drug exposures, and emergence of antimicrobial resistance. Pneumonias are classified as Community Acquired Pneumonia (CAP), Health care Associated pneumonia (HCAP), Hospital acquired pneumonia (HAP) and Ventilator associated pneumonia (VAP) based upon the settings where they are treated[2]. In clinical practice, ambiguity exists in distinguishing between CAP, HCAP, HAP and VAP and patients are usually treated with empirical therapies. But proper evaluation of patients by clinical, laboratory, imageological and microbiological evaluation may contribute to the diagnosis and treatment of pneumonia. So this study targets all types of pneumonias whether community acquired or hospital acquired and focuses on etiology and radiological presentation. Although an etiological diagnosis is optimal in the management of pneumonia the responsible pathogens are not identified in 40% of the patients even when extensive diagnostic tests are performed[3].

Radiology is useful in diagnosing suspected pneumonias, characterise the extent and severity of disease, identification of complications and monitor response[4].The radiologic pattern can help to differentiate from non infectious diseases and suggest specific pathogen also.. In some cases this can facilitate treatment decisions despite the absence of diagnostic cultures. Diagnostic accuracy increases with the use of CT. A CT scan must be carried out when there is a strong clinical suspicion of pneumonia that is accompanied by normal, ambiguous, or nonspecific radiography. CT allows clinicians to detect associated abnormalities(like endobronchial growths) or an underlying condition and it can guide bronchoalveolar lavage or a percutaneous or transbronchial lung biopsy. Imaging may reveal signs like pneumatoceles which may be nonspecific but narrows the differential diagnosis[5].

MATERIALS AND METHODS:

Prospective and observational study. A total number of 200 adult patients with symptoms, signs suggestive of and radiological evidence of pneumonia, admitted in Acute Medical care unit during one year period were included. Pregnant women and Post operative patients were excluded. After obtaining a detailed history, a complete general physical and systemic examination, patients were subjected to relevant investigations. Chest radiograph, Sputum Analysis, blood cultures, serological tests like weil felix. Pleural fluid analysis, throat swab c/s, Computerised Tomography of thorax, bronchoscopy with Broncho alveolar lavage (BAL) were done if necessary. Written and informed consent was obtained from all the patients/ family members. The complete data is recorded in a specially designed Case Recording form and entire data was subjected for statistical analysis after approval from Institutional ethical committee was obtained

STASTISTICALANALYSIS:

The obtained data is represented statistically using the terms of count, maximum, minimum, mean ± standard deviation (SD), percentage, t-test and ANOVA. All statistical calculations are done using Microsoft Access version 11® and SPSS® program. Microsoft word and Excel have been used to generate graphs, tables etc

RESULTS:

TABLE 1 : Risk factors for developing pneumonia

Risk factors	No: of patients	Percentage (%)
DM	57	28.5
HTN	60	30
COPD	13	6.5
Asthma	7	3.5
Malignancy	24	12
PTB	11	5.5
CVA	6	3
CTD	28	14

CAD	16	8
HIV	8	4
Alcoholism	55	27.5
Smoking	68	34

TABLE 2 : List of organisms isolated

Organism	No of patients
Klebsiella	17
E.coli	13
Pseudomonas	8
Burkholderia	2
Acinetobacter	9
Polymicrobial	3
Aspergillus	2
Candida	4
Staphylococcus	4
Enterococcus	2
Plasmodium	3
Scrub typhus	9
H1N1	3
Others (Mucor, Salmonella, Leptospira, Dengue, Diphtheria)	5
Total	84

Though the total number above is 84, etiological diagnosis was found in 78 patients. (6 patients had more than one etiological agent found through different investigations)

TABLE 3: SOURCE OF SAMPLE

Investigation	No: of samples positive	Percentage(%)
SPUTUM C/S	13	6.5
Tracheal aspirate/ BAL	31	15.5
PLEURAL C/S	4	2
BLOOD C/S	23	11.5
SEROLOGY	11	5.5
OTHERS	6	3

TABLE 4: FINDINGS ON CT SCAN OF CHEST

Pattern seen on CT	No of patients
CONSOLIDATION	38
AIRBRONCHOGRAM	38
GROUND GLASSING	8
NODULARITY	10
EFFUSION	25
FIBROSIS & CALCIFICATION	1
MEDIASTINAL LYMPHADENOPATHY	6
BRONCHIECTATIC CHANGES	3
BOOP (? post viral)	1

DISCUSSION:

Pneumonia is an inflammation of the pulmonary parenchyma caused by an infectious agent. Mortality is estimated to be approximately 14% among hospitalized patients and less than 1% for patients who do not require hospitalization[6].

In the present study 54% are elderly and males (57%). This could be attributed to the fact that cigarette smoking, alcoholism as well as the underlying lung disease e.g.COPD which are predisposing factors to pneumonia are more prevalent in males in a developing country like India.

In this study, predominant risk factors found in order are Smoking[7] (34%), DM[8] (28.5%), Alcoholism[9] (27.5 %), Connective tissue disorders (14%), Malignancy (12%) ,CAD (8%), COPD (6.5%), PTB (5.5%), HIV (4%), Asthma (3.5%), CVA (3%), etc .(Table 1).HTN was a common comorbid condition found in 30% of patients.

Isolation of etiological agent /bacteriological agent was more in diabetics and connective tissue disorders and smokers. In this study, Connective tissue disorders with pneumonia included patients with SLE (14 patients), Rheumatoid Arthritis (8 patients), Scleroderma (4 patients), Dermatomyositis with scleroderma overlap (1 patient) and Sjogrens (1 patient). Haematological disorders included Aplastic anaemia(8 patients), Acute myeloid leukemia (4 patients), plasma cell leukemia (1 patient), Hodgkins lymphoma (1patient), Myelodysplastic syndrome(2 patients), myelofibrosis(2 patients), Auto immune hemolytic anemia(1 patient), Idiopathic thrombocytopenic purpura(1 patient) and all these patients were on immunosuppressive therapy for their underlying disease which could be predisposing them to pneumonia. Chronic liver disease was predisposed in 11 patients , OSA and bronchiectasis were seen in 4 and 1 patient respectively .Psychiatric illness (3 patients), Epilepsy (3 patients) and Graves disease (1 patient).

Microbiological yield was common from bronchopulmonary secretions by BAL /tracheal aspirate(15.5%) followed by blood c/s (11.5%), Sputum c/s (6.5%), Serology(5.5%) and others.(Table 3).Pleural fluid showed growth of klebsiella (1), Pseudomonas (1), Aspergillus(1) and polymicrobial growth (1). In almost all cases, pleural fluid was exudative with predominant neutrophils with normal ADA and negative for malignant cytology.Blood culture was positive in 23(11.5%) cases. Most common organisms isolated were E. coli (5), Candida(4), Staphylococcus aureus (4) , Klebsiella (3), Enterococcus (2), Acinetobacter (1) and Salmonella typhi (1). Blood cultures were more often positive in patients with hypotension, renal and liver dysfunction. Serology was positive in 11 patients, Weil felix (9), Dengue(1) and leptospira (1). Throat swab for H1N1 was positive in 3 cases. Smear for malarial parasite was positive in 3 cases.

Etiological agent was found only in 78 cases (39%) and the rest of the cases were treated empirically(Table 2). Among them, Gram negative organisms (48%), Gram positive (20%), Fungal(8), Viral (5%), parasitic(4%) and others (15%). Smear for AFB was absent in all the cases. Klebsiella was the dominant organism isolated from both sputum and bronchosecretions. Others were Acinetobacter baummannii (7), Pseudomonas (6), E.Coli (5), Polymicrobial (2) .Organisms isolated on sputum culture were Klebsiella pneumoniae (6), E.Coli (2), pseudomonas (2) and Acinetobacter (1).Six patients had growth of more than one organism from different sources of samples. One patient had growth of klebsiella from BAL c/s and blood c/s showed growth of MRSA, one patient had Dengue serology positive along with growth of klebsiella in blood culture. Overall the most common organisms, found in our study in decreasing order of frequency were Klebsiella pneumoniae (17), E.coli (13), Acinetobacter (9), Scrub typhus (9), Pseudomonas (8), Candida (4), Staphylococcus aureus (4) . Various studies have shown organisms like Entereobacteriacea[10], Acinetobacter [11,12]. Due to lack of advanced investigational facilities to identify organisms like chlamydia pneumoniae and legionella spp as well as respiratory viruses like adenoviruses and RSV, patients were empirically treated where there is a strong clinical suspicion.

Left lung was involved in 12%, right lung in 30%, and bilateral in remaining. Lower Zones were involved in 36% of the cases ,diffuse involvement was sent in 11% and ARDS compatible picture in 6% cases. . Most of the patients had multilobar involvement. The pattern of involvement was predominantly alveolar, some cases had broncho laveolar pattern, nodular infiltrates or interstitial pattern . In a study conducted in Spain with 101 patients, the chest radiographic infiltrate pattern was alveolar in 82 cases and unilateral in 71 cases. CT chest was done in 38 patients. Consolidation with air bronchogram was observed in 100% of the CT scans(Table 4). pleural effusions in 25 cases Ground glass pattern was seen in 8 cases, nodularity in 10 cases , mediastinal lymphadenopathy in 6 cases, bronchiectatic changes in 3 cases, BOOP (post viral) in one, fibrosis and calcification in one case. These patterns are generally best defined by CT scanning when compared to chest radiograph. Pleural effusions with underlying collapse consolidation was better appreciated by CT scan rather than chest radiograph in our cases. Studies have shown ground glass pattern as the dominant pattern.

Complications included hypoxic respiratory failure [13] in 82%, renal impairment in 54%, hepatic involvement in 36%, Hypotension was seen in 12% .About 54% of the patients had multiorgan dysfunction involving more than two organs., 25 cases had synpneumonic effusions One patient had pneumotharax. 60% received non invasive or invasive ventilatory support [14] in view of respiratory distress or altered mental status to protect airways.

All the patients were treated depending on their clinical condition with antibiotics either empirically or based on their sensitivity[15]along

with supportive therapy like IV fluids, ionotropic support, mechanical ventilation, bronchodilators. Most of the patients(74%) were treated and discharged in a stable condition with follow up. Mortality rate was 19%. and increased to 40% in patients with multiorgan dysfunction.

Limitations of the study were lack of advanced diagnostic facilities.

CONCLUSION:

In our study, Microbiological agent was identified in only 39% of the cases, yield was more common from tracheal aspirates/BAL. Gram negative organisms (Klebsiella, E.coli) were more commonly isolated. Scrubtyphus was isolated in most of the cases by serology. CT chest had better lineage than Radiograph with more diagnostic accuracy but did not show patterns specific for an etiological agent. Mortality was more in cases with multiorgan dysfunction and more in pateints with nosocomial pneumonia.. Identification of atypical organisms need further investigations for better outcome[16].

REFERENCES:

1. Kasper DL, Fauci AS, Hauser SL, Longo DL, Jameson JL, Loscalzo J. Harrison's principles of Internal Medicine. 19th. USA: Mc Graw Hill; 2015
2. American Thoracic Society, Infectious Diseases Society of America. Guidelines for the management of adults with hospital-acquired, ventilator-associated, and healthcare-associated pneumonia. American journal of respiratory and critical care medicine. 2005 Feb 15;171(4):388.
3. Naderi H, Sheybani F, Sarvghad M, Meshkat Z, Jabbari Nooghabi M. Etiological Diagnosis of Community-Acquired Pneumonia in Adult Patients: A Prospective Hospital-Based Study in Mashhad, Iran. Jundishapur Journal of Microbiology. 2015;8(8):e22780. doi:10.5812/jjm.22780.
4. Vilar J, Domingo ML, Soto C, Cogollos J. Radiology of bacterial pneumonia. European journal of radiology. 2004 Aug 31;51(2):102-13.
5. Macfarlane JT, Miller AC, Roderick Smith WH, et al Comparative radiographic features of community acquired Legionnaires' disease, pneumococcal pneumonia, mycoplasma pneumonia, and psittacosis. Thorax 1984;39:28-33.
6. Fine MJ, Smith MA, Carson CA, Mutha SS, Sankey SS, Weissfeld LA, Kapoor WN. Prognosis and Outcomes of Patients With Community-Acquired PneumoniaA Meta-analysis. JAMA. 1996;275(2):134-141. doi:10.1001/jama.1996.03530260048030
7. Bansal S, Kashyap S, Pal LS, Goel A. Clinical and bacteriological profile of community acquired pneumonia in Shimla, Himachal Pradesh. Indian Journal of Chest Diseases and Allied Sciences. 2004 Mar;46(1):17-22.
8. Koziel H, Koziel MJ. Pulmonary complications of diabetes mellitus. Pneumonia. Infectious disease clinics of North America. 1995 Mar;9(1):65-96.
9. Jong GM, Hsiue TR, Chen CR, Chang HY, Chen CW. Rapidly fatal outcome of bacteremic Klebsiella pneumoniae pneumonia in alcoholics. Chest. 1995 Jan 31;107(1):214-7.
10. Joseph NM, Sistla S, Dutta TK, Badhe AS, Rasitha D, Parija SC. Ventilator-associated pneumonia in a tertiary care hospital in India: role of multi-drug resistant pathogens. The Journal of Infection in Developing Countries. 2010 Jan 18;4(04):218-25.
11. Dey A, Bairy I. Incidence of multidrug-resistant organisms causing ventilator-associated pneumonia in a tertiary care hospital: A nine months' prospective study. Annals of thoracic medicine. 2007 Apr 1;2(2):52.
12. Rajasekhar T, Anuradha K, Suhasini T, Lakshmi V. The role of quantitative cultures of non-bronchoscopic samples in ventilator associated pneumonia. Indian journal of medical microbiology. 2006 Apr 1;24(2):107.
13. Ashbaugh D, Bigelow DB, Petty T, Levine B. Acute respiratory distress in adults. The Lancet. 1967 Aug 12;290(7511):319-23.
14. Chalmers JD, Singanayagam A, Hill AT. Predicting the need for mechanical ventilation and/or inotropic support for young adults admitted to the hospital with community-acquired pneumonia. Clinical infectious diseases. 2008 Dec 15;47(12):1571-4.
15. Kollef MH. Inadequate antimicrobial treatment: an important determinant of outcome for hospitalized patients. Clinical Infectious Diseases. 2000 Sep 1;31(Supplement 4):S131-8.
16. Hindiyeh M, Carroll KC. Laboratory diagnosis of atypical pneumonia. InSeminars in respiratory infections 2000 Jun (Vol. 15, No. 2, pp. 101-113).