



Bronchoscopic Microbial Diagnosis in Non-Responding & Non-Resolving Pneumonia

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ABSTRACT

Introduction: Pneumonia is a common and potentially serious illness associated with considerable morbidity and mortality, especially in the elderly and those with notable comorbidities. More than 100 microbes (bacteria, viruses, fungi, and parasites) can cause pneumonia. In hospitalized community-acquired pneumonia (CAP), 40% are non-responding CAP. The reliability of using bronchoscopic procedures when compared with sputum cultures, routinely processed bronchoscopic specimens demonstrate improved sensitivity. **Aims & Objectives:** Isolation of a responsible microbe causing respiratory infection in non-responding & non-resolving pneumonia. **Place and duration of study:** This Study was conducted at the Department of Pulmonology Shaikh Zayed Medical Complex, Lahore from 01-01-2018 to 31-12-2019. **Material & Methods:** Retrospective analysis of 109 bronchoscopic procedures conducted in patients with Non-Responding & Non-Resolving Pneumonia with a fiberoptic bronchoscope over two years (01-01-2018 to 31-12-2019). **Results:** One hundred nine (109) procedures were done in patients with non-responding and resolving Pneumonia. Bronchial washing microbiology yielded results in 71 (65.1%) patients. Pseudomonas aeruginosa was the most frequent organism and was isolated in 30 (42.3%) patients; Klebsiella pneumoniae was found in 23 (32.4%) patients. Other organisms included Staphylococcus aureus (22.5%), Acinetobacter baumannii (14.1%), Escherichia coli (11.3%), Streptococcus pneumoniae (11.3%), Stenotrophomonas maltophilia (4.2%), Haemophilus influenzae (2.8%), Enterococcus (1.4%) and Mycobacterium tuberculosis (4.2%). **Conclusion:** Pseudomonas aeruginosa and Klebsiella pneumoniae are the most common isolated organisms in patients with non-responding and non-resolving Pneumonia. Bronchoscopy is an extremely useful tool for sample collection among non-responding & non-resolving pneumonia and making the correct microbiological diagnosis.

Key words: Non-responding and resolving Pneumonia, Bronchoscopy, retrospective.

INTRODUCTION

Pneumonia is a universal and potentially critical disease, and it is associated with substantial morbidity and mortality, particularly in the elderly and those with significant comorbidities.¹ The non-resolving or slowly resolving pneumonia is a common clinical term. It has been used reciprocally to mention the persistence of radiographic abnormalities past the expected time limit². More than 100 microbes (bacteria, viruses, fungi, and parasites) can cause pneumonia.³ In hospitalized CAP, 40% are non-responding CAP. Non-resolving or slowly resolving pneumonia accounts for 10% - 15% of nosocomial pneumonias.^{4,5} Delay in diagnosis and treatment may cause fatality by 3-5% in both community-acquired and nosocomial

pneumonia. Incorrect diagnosis, impaired host defense, atypical organisms, inadequate antibiotic therapy, resistant pathogens, tuberculosis, etc. are the common etiologies of non-resolving or slowly resolving pneumonia.⁶ Slow or incomplete pneumonia resolution, despite treatment, requires a more rigorous evaluation. Microbiological, histopathological, and cytological tests of the specimens can be done for diagnosing the underlying cause. The sputum culture has a low diagnostic yield,⁷ but the reliability of using bronchoscopic procedures compared with sputum cultures demonstrate improved sensitivity. The sensitivity of bronchoscopic specimens is around 40% in the context of non-responding CAP and 70% in nosocomial ICU pneumonia.⁶ In this study, we intend to establish the characteristics of microorganisms isolated from

bronchial washing specimens of patients with non-resolving pneumonia or non-responding pneumonia.

MATERIAL AND METHODS

The study was a descriptive case series, conducted at the Department of Pulmonology Shaikh Zayed FGMI, Lahore from 01-01-2018 to 31-12-2019. All cases of non-responding and resolving Pneumonia underwent bronchoscopy during the period were included. The selected cases were 109.

Statistical analysis:

The data were recorded in SPSS 20.0. Data were described by using frequencies and percentages and presented in tables, pi-charts, and bar charts.

RESULTS

The total number of patients registered in the study was 109, having ages between 15 and 85 years; there were 71 (65.1%) males & 38 (34.9%) females. Ninety-five (87.2%) patients were admitted to the pulmonology ward while 7 (6.4%) patients were admitted to the intensive care unit, and 7 (6.4%) patients were referred from other hospitals (Table-1).

Bronchoscopy yielded result in 65.1% patients, and the most common pathogen isolated was *Pseudomonas aeruginosa* (42.3%) followed by *Klebsiella pneumoniae* (32.4%), *Staphylococcus aureus* (22.5%), *Acinetobacter baumannii* (14.1%), *Escherichia coli* (11.3%), *Streptococcus pneumoniae* (11.3%) and *Haemophilus influenzae* (2.8%). (Figure 1) In 46 (64.8%) patients, only one organism was isolated, while in 20 (28.2%) cases, two organisms were detected in 5 (7%) patients, three organisms were found (Table-1). In 64.8% of patients, single organism was isolated in BAL culture, while 28.2% of patients had two organisms, and 7% revealed three organisms.

Diabetes was the most common comorbidity in this study, observed among 39.4% of all the cases; other comorbidities include hypertension (22.5%), chronic obstructive pulmonary disease (COPD) (11.4%), asthma (5.6%), end-stage renal disease (ESRD) (5.6%), while nine patients had a history of organ transplant (Fig-2).

Thirty-one (28.4%) patients had a history of symptoms for one week, 29 (26.6%) patients for two weeks, 12 (11.4%) for three weeks, 23 (21.1%) patients had the disease for four weeks & 14 patients (12.8%) had a presentation with symptoms more than 4 weeks (Table-1).

	n	%	
Gender	Male	71	65.1
	Female	38	34.8
Age	< 40 years	14	12.8
	40 to 60 years	57	52.2
	> 60 years	38	34.9
Culture Result	Positive	71	65.1
	Negative	38	34.8
Admission Place	Ward	95	87.2
	ICU	7	6.4
	Referred from other hospital	7	6.4
Duration of Symptoms	1 week	31	28.4
	2 Weeks	29	26.6
	3 weeks	12	11.0
	4 Weeks	23	21.1
	>4 Weeks	14	12.8

Table-1: Various characteristics of study cases

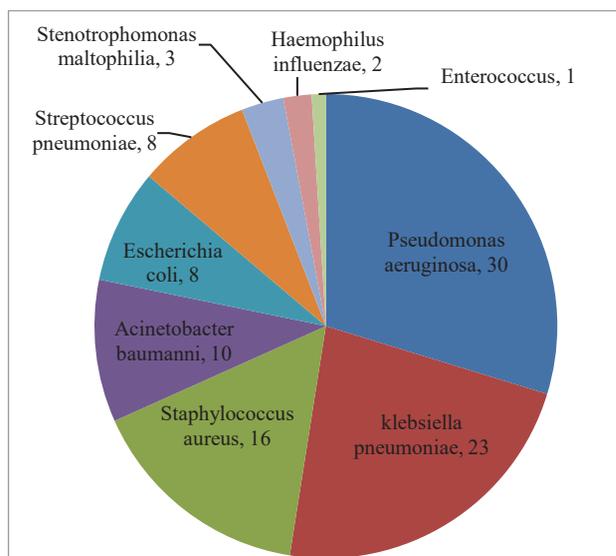


Fig-1: Organisms Isolated

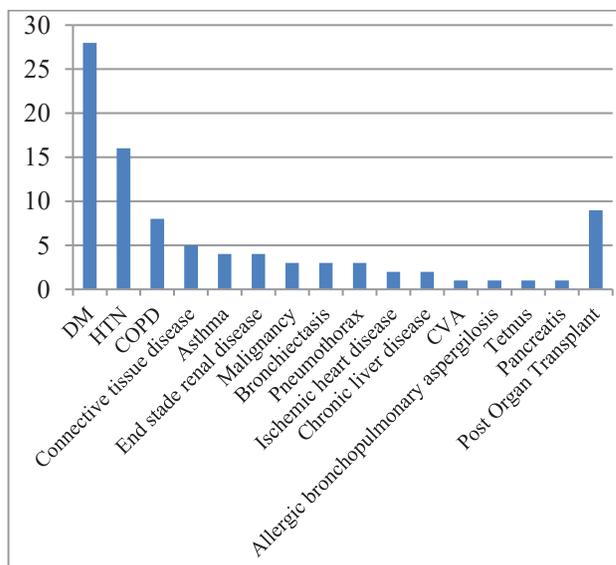


Fig-2: Co-morbidities

		n	%
Number of Organisms	Single	46	64.8
	Two	20	28.2
	Three	5	7.0

Table-2: Number of organisms isolated on Broncho-alveolar lavage (BAL) culture

DISCUSSION

Non-resolving or non-responding pneumonia is not a rare clinical entity to pulmonologists, and simultaneously, it can be a cause of concern in everyday clinical practice. Amberson first described the term "unresolved organizing or protracted pneumonia" in 1943.⁸ Most patients with CAP show clinical improvement within 72 hours of initial antibiotic treatment. It has been determined that 6 to 15 percent of hospitalized patients with CAP do not respond within this time, and the failure rate for those admitted to ICU may be as high as 40 percent. Causes of non-responding & non-resolving pneumonia may include atypical organisms, inadequate antibiotic therapy, resistant pathogens, tuberculosis, etc.⁶

The radiographic and clinical improvement in pneumonia varies with age, comorbidities & with the particular infectious agent causing pneumonia. In general, the resolution is more rapid with non-bacteremic *Streptococcus pneumoniae*, *Mycoplasma pneumoniae*, *Chlamydomydia* species, and *Moraxella catarrhalis* than with other organisms.⁹

In this study, 85% of patients were above the age of 40, and 34.9% were over the age of 60. In a prospective cohort study, it was found that age alone has the most remarkable impact on the resolution of pneumonia.¹⁰

Broncho-alveolar lavage (BAL) fluid was collected from all patients who underwent bronchoscopy during this study, and it remained diagnostic in 65.1% cases, whereas during a study conducted in India, BAL culture-confirmed diagnostic yield was 71.4%.⁶ In a study conducted by Silver et al., bronchoscopy was diagnostic in 86% of cases.¹¹ Balamugesh et al. have also observed bronchoscopy a very useful tool in evaluating non-resolving pneumonia.¹²

A study conducted in Barcelona, Spain revealed that 13% of patients with pneumonia had mixed infection.¹³ In our research, the mixed infection was seen in 35.2% of cases. We also observed that all five patients where three organisms were isolated on

BAL culture were admitted to ICU and had multiple comorbidities.

Gram-negative bacteria were seen to be the predominant pathogens in our study, and among them, *Pseudomonas* (42.3 %), *Klebsiella* (32.4%), and *Acinetobacter* (14.1%) were the common pathogens. Chaudhuri et al. & Fein also shared similar observations of an increased occurrence of gram-negative etiology of pneumonia in patients with non-resolving pneumonia or non-responding pneumonia.^{6,14}

Diabetes mellitus was the most frequent comorbidity in our study and was seen in 39.4% of cases and while the most common organisms in the diabetic patients were *Klebsiella* (39.3%) & *Pseudomonas* (35.7%). Avijgan has also reported that diabetes mellitus was significantly associated with the delayed resolution of pneumonia.¹⁵ *Klebsiella pneumoniae* and *Mycobacterium tuberculosis* were the most common etiologies in diabetics and were detected in 33.3% and 25% cases, respectively. Begamy has also published an increased appearance of *Klebsiella pneumoniae* in thoracic infections in diabetic patients.¹⁶

In our study, we had nine patients with post organ transplant history, and among these, the most common organisms were also *Klebsiella* (44.4%) & *Pseudomonas* (44.4%) reflecting their ability to cause non-responding & non-resolving pneumonia.

CONCLUSION

Non-responding & non-resolving pneumonia is usually an area of clinical dilemma. The microbiological profile varies from that of commonly known organism for community-acquired respiratory tract infection as most common pathogens isolated in our study were *Pseudomonas aeruginosa* & *Klebsiella pneumoniae*. Bronchoscopy is an extremely useful tool for sample collection among non-responding & non-resolving pneumonia and making the correct microbiological diagnosis, this can help in timely modification of antimicrobial therapy.

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