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# Microbiological Pattern in Sputum Culture in Patients of Lung Abscess

Authors

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### Introduction

Lung abscess is defined as a circumscribed area of pus or necrotic debris in lung parenchyma, which leads to a cavity. It is a type of liquefactive necrosis of the lung tissue and formation of cavities (more than 2 c.m)<sup>(1)</sup>. It is containing necrotic debris or fluid caused by microbial infection.

Lung abscess is considered primary when it results from existing lung parenchymal disease it is accounts around 60%.<sup>(2)</sup> and it termed secondary when it complicates another process e.g., extra pulmonary abscess rupture or vascular emboli. Cavity of lung abscess may complicates after formation of bronchopulmonary fistula, and air fluid level is seen inside the cavity<sup>(3)</sup>.

In pre antibiotic era, one third of patients with lung abscess would die, the other third of patients Would recover fully, and rest of them would survive with sequeles such as chronic lung abscess, pleural empyema, or bronchiectesis<sup>(4)</sup>. That time surgery was only effective therapy but now day patients fully recovered only with antibiotics therapy.

Predisposing condition for lung abscess are, elderly, dental / peridental infection, alcoholism, drug abuse, D.M., steroids therapy, cytostatics or immunosuppressant therapy, mental retardation therapy, gastro-esophageal reflux disease, bronchial abstraction, inability to cough and sepsis<sup>(5,6,7)</sup>.

Because of the difficulty obtaining material uncontaminated by non pathogenic bacteria colonizing the upper air way, lung abscesses rarely have a microbiological diagnosis. While most significant pathogenes in lung abscess in a study by Bartlett et al. in 1974, 46%% of patients with lung abscess had only anaerobes isolates from sputum cultures, while 43% of patients had mixture of anaerobes and aerobes<sup>(8)</sup>.

In our study, the most common anaerobes are peptostreptococcus spp., peptococcus spp., prevotella buccae, prevotella spp., prerotellafusobacterium Melaninogenica, nucleatum, bacteroidus spp. And arobic organism found are staphylococcus Streptococcus spp., spp., streptococcus pneumonia, streptococcus milleri in gram positive, and

E. coli, klebsiella, psudomonas aeruginossa, proteus spp. In gram negative organism.

### Methodology

40 clinically diagnosed cases of lung abscess of age between 15-75 years were recruited from

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indoor of department of T.B. Chest of Gandhi Medical College and Hamidia Hospital june-dec. 2016, Bhopal the exclusion criteria were patients < 15 years of age, diagnosed tubercular patients and sterile sputum culture.

Aseptically collected sputum samples were transported immediately to microbiology laboratories for further processing by conventional methods.

Appropriate sputum samples was inoculated on 5% sheep blood agar, chocolate agar and Mac Conkeys agar. These inoculated plates were then incubated for a period of 18-24 hours after which they were examined for evidence of bacterial growth. A single well separated colony was identified preliminary tests like grams staining of colony, hanging drop preparation, catalase test and cytochrome oxidase test were done. Biological tests like indole tests, methyl red test, vogesproskamer test, citrate ulilization test, urease test, triple sugar iron agar, nitrate reduction test, oxidation fermentation Hugh-Leifsono test. coagulase production staphylococci), (for optochin sensitivity (for streptococcus pneumonia) were performed. Sugar fermentation test with sugars viz-glucose, lactose, sucrose, maltose, mannitol, xylose, Arabinose and inositols were done performed according to standard methods.

Antibiotics sensitivity test of the isolated were performed by Kirby Bauer Disk diffusion method using Mueller hinton agar and antibiotic discs, as described by clinical laboratory standard institute (CLSI) guidelines, antibiogram was read that is zones of inhibition were measured and sensitivities to various antibiotics were determined using CLSI guidelines, for each antibiotics.

### Results

Individual bacterial isolates and their sensitive pattern to various antibiotics were also recorded in all forty (40) patients. **Table-1** Age wise distribution of lung abscess cases

Age (In years)	Number	Percentage (%)
15-25	1	2.5%
26-35	2	5%
36-45	4	10%
46-55	16	40%
56-65	14	35%
66-75	3	7.5%
Total	40	100%

In this study the prevalence of lung abscess in patients aged between 15 and 25 were 1 (2.5%), between 26 and 35 were 2 (5%), between 36-45 were 4 (5%), between 46-55 were 16 (40%), between 56-65 were 14 (35%) and lastly between 66 and 75 were 3 (7.5%) (table-1).

Sex	Number	Percentage (%)
Male	28	70%
Female	12	30%
Total	40	100

It is evident from that out of 40 patients admitted, 28 (70%) were males and 12 (30%) were female. The ratio between male and female is 2.33 : 1 (Table-2).

### **Bacteriological Profile**

Out of 40 sputum culture, monomicrobial isolates were in 34 (85%) polymicrobial isolates were in 6 (15%) cases.

Table-3A	Bacterial	strains	in	sputum	culture	in
lung abscess cases (Monomicrobial)						

S. No.	Organism	Number	Percentage (%)
Anaerobic organism		25	62.5%
1	Peptostrepto Coccus	8	20%
	Spp.		
2	Peptococcus Spp.	2	5%
3	Prevotella Spp.	3	7.5%
4	Prevotella Buccae	3	7.5%
5	Prevotella	3	7.5%
	Melaninogenica		
6	Fusobacterium	5	12.5%
	Nucleatum		
7	Bacteroidum Spp.	1	2.5%

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S. No.	Organism	Number	Percentage (%)
Gt	am positive organism	5	12.5%
1	Staphylococcus Spp.	1	2.5%
2	Streptococcus Spp.	1	2.5%
3	Streptococcus	2	5%
	Pneumonia		
4	Streptococcus Milleri	1	2.5%

#### Table-3C

Table-3B

S. No.	Organism	Number	Percentage (%)
Gram Negative organism		4	10%
1	E.coli	1	2.5%
2	Klebsiella Spp.	1	2.5%
3	Pseudomonas	1	2.5%
	Aeruginosa		
4	Proteus Spp.	1	2.5%
Total(3A+3B+3C)		34	85%

Out of 34 sputum sample, Anaerobic organism found in 25 cases (62.5%) out of which most common organism found peptostreptococcus Spp., 8 (20%) and Fusobacterium, 5 (12.5%). in 5 cases (12.5%) gram positive organism found were most common streptococcus pneumonia 2 (5%) and in 4 cases (10%) gram negative organism found were E.coli 1 (2.5%), Klebisella 1 (2.5%), Psudomonas Aeruginosa 1 (2.5%), Proteus Spp. 1 (2.5%) isolates.

**Table-4** Bacterial strain in sputum culture in lungabscess cases (Polymicrobial)

S.	Organism	Number	Percentage
No.			(%)
1	Peptostrepto Coccus Spp.	2	5%
	+ Strepto Coccus Spp.		
2	Prevotella Spp. +	2	5%
	Klebsiella Spp.		
3	Staphylococcus Spp. +	2	5%
	Proteus Spp.		

Out of 40 positive sputum cultures, six (6) cases showed more than one isolates (Table-4).

Table -5 Antimicrobial	suscentibility nattern	of isolated	anaerohic	organisms
Table -3 Anumicioula	susceptionity pattern	01 ISOIaleu	anaciouic	organishis

	-	-	<b>.</b>						-
Antibiotics	Peptostreptococcu	Peptococcu	Prevotell	Prevotell	Prevotella	Fusobacteriu	Bacteroidu	Tota	Percentag
	s Spp.	s Spp.	a Spp.	a Buccae	Melaninogenic	m Nucleatum	m	1	e (%)
	n=8	n=2	n=3	n=3	а	n=5	Spp.	25	(n/25)x10
					n=3		n=1		0
Metronidazol	7	2	3	3	2	5	1	23	92%
e									
Clindamycin	8	2	3	3	3	5	1	25	100%
Chloram-	4	1	0	1	0	2	0	8	32%
Phenicol									
Penicillin	3	0	1	1	0	0	0	5	20%
Carbapenems	5	1	2	2	1	2	1	14	56%
(Meropenam)									

The clindamycin (100%) and metronidazole (92%) are more sensitive against the anaerobic organism, and after this carbapaenem is (56%) sensitive less than clindamycin and

metronidazole. Sensitivity for penicillin (20%) and chloramphenical (20%) is comparatively very less.

Table-6 Antimicrobial	susceptibility p	attern of isolated	gram positive	organism
			Brann poortrie	or Bernorn

Antibiotics	Staphylococcus	Streptococcus	Streptococcus	Streptococcus	Total	Percentage
	Spp.	Spp.	Pneumonia	Milleri	5	(%)
	n=1	n=1	n=2	n=1		(n5/) x 100
Penicillin	0	0	0	0	0	0%
Cefoxitin	1	1	2	0	4	80%
Erythromycin	1	1	2	0	4	80%
Linezolid	1	1	2	1	5	100%
Vancomycin	0	1	2	1	4	80%
Ciprofloxacin	0	0	0	1	1	20%
Ceftroline	1	1	2	1	5	100%
Levofloxacin	1	1	0	0	2	40%
Co-Trimoxazole	0	0	2	0	2	40%
Gentamycin	0	0	0	0	0	0%
Amikacin	0	0	0	0	0	0%
Chloram- Phinicol	0	1	0	0	1	20%

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Streptococcus pneumonia is commonest isolated organism among the gram positive, was sensitive to cefoxitin, Erythromycin, Linezolid, Vancomycin Ceftrolin and resistant to Penicilin, Gentamycin, Amikacin.

Table-7	Antimicrobial	susceptibility	pattern of	f isolated	gram	negative	organism
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Antibiotics	E.Coli	Klebsiella	Pseudomonas	Proteus	Total	Percentage
	n=1	n=1	Aeruginoasa	n=1	4	(%)
			n=1			(n/4) x 100
Ampicillin+ Susbactum	1	1	1	0	3	75%
Aztreonam	1	1	0	1	3	75%
gentamycin	1	1	1	1	4	100%
Amikacin	1	1	1	1	4	100%
Imipenem	1	1	1	0	3	75%
Tobramycin	1	1	0	0	2	50%
Ticar Cillin	1	0	1	0	2	50%
Colistin	1	1	0	0	2	50%
Levofloxacin	0	1	0	0	1	50%
Polymyxin B.	0	1	0	0	1	50%
Piperacillin + Tazobactum	1	1	1	0	3	75%
Cefepime	0	1	1	0	2	50%
Ceftriaxone	0	0	0	1	1	25%

E.coli, Klebsiella, Pseudomonas Aeruginosa, Proteus is commonly isolated organism among the gram negative, was sensitive to Apmicilin + sulbactum, Aztreonam, Gentamycin, Amikacin & Piperacillin + Tazobactum.

## Discussion

In present study bacteriological spectrum was analysed in 40 cases of lung abscess. It was observed that lung abscess was prevalent in 15-75 years age group. We have concluded here that lung abscess is higher in males 28 (70%) than females 12 (30%) with the ratio of 2.33 : 1 and the peak was in the range of 46-55 years (40%).

In 34 cases monomicrovial organism found, were anaerobic organism found in 25 cases (62.5%) in which most common organism peptostreptococcus spp. 8 (20%), followed by fusobacterium nucleatum 5 (12.5%) and in gram positive organism 5 cases was found (12.5%) in which most common organism streptococcus pneumonia 2 (5%) and in gram negative organism 4 cases was found in which E.coli 1 (2.5%), Klebsiella 1 (2.5%), pseudomonas aeruginosa 1 (2.5%), proteus 1 (2.5%) observed.

In 6 (15%) sputum samples were found polymicrobial organism.

In present study anaerobic organism were most common isolated, and most sensitive for clindamycin (100%) followed by, metronidazole (92%) and carbapenem (56%).

# Conclusion

- Lung abscess is a common complication of upper respiratory tract infection in elderly or immunocompromise patients, have a major impact on the quality of life of patients with the conditions.
- Bacterial infection in lung abscess was seen more in age group of 46-55 years (40% in our study).
- it was more common in males than female(ratio 2.33:1 in our study).
- Anaerobic organism are most common in lung abscess (62.5%) followed by gram positive organism (12.5%) and gram negative organism (10%). more than one strain found in 15% cases. in a study by Bartlett et al in 1974,46 % of patients with lung abscess had only anaerobic isolates from sputum and 43% had mixture of anaerobic and aerobic organism<sup>(8)</sup>our study shows similar pattern of aetiology.

• Sputum culture is an excellent diagnostic tool to study the aetiology due to bacterial lung abscess antibiogram helps in correct treatment protocol for management of lung abscess.

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