



PREVALENCE AND ANTIBIOTIC SENSITIVITY PATTERN OF BACTERIA CAUSING LOWER RESPIRATORY TRACT INFECTION IN THE GERIATRIC GROUP

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ABSTRACT **Introduction:** Lower respiratory tract infections accounts for 3% -5% of mortality in adults, especially in the geriatric age group. **Aim:** To know the prevalence of various microorganisms causing LRTI in geriatric patients, studying their antibiotic sensitivity pattern and to determine the various risk factors in this age group. **Materials & methods:** Sputum samples were collected from 50 geriatric patients. Other Co-morbid conditions were evaluated. Isolated pathogens were tested for antibiotic sensitivity pattern by standard microbiological methods. **Results:** Among 50 patients, 9(18%) Chronic Obstructive Pulmonary Disease (COPD), 7(14%) of them had Pulmonary tuberculosis, 7(14%) Bronchial Asthma, and the remaining 27(54%) with other lower respiratory tract infections. 41(82%) samples were culture positive. Organisms like *Klebsiella pneumoniae* (20), *Pseudomonas aeruginosa* (10), *Candida spp* (3) *E. coli* (2), *Staphylococcus aureus* (4), *Acinetobacter* (1), *Enterococcus* (1), were grown. **Conclusion:** The prevalence of multi drug resistant bacteria causing lower respiratory tract infection is increasing, now-a-days. Changing lifestyle patterns like avoiding of smoking, glycemic control in diabetics, avoiding sedentary lifestyle with adequate physical activity and appropriate diet would improve the immune status of the geriatric patients and thereby reduces all possible infections in this age group. Knowing the sensitivity pattern of isolated pathogens and then treating the patients will reduce the incidence of drug resistant microorganisms as well.

KEYWORDS : Geriatric group, Lower Respiratory Tract Infection, LRTI

INTRODUCTION

Almost 4.4 % patients attending outpatient department, were diagnosed to have lower respiratory tract infection and these infections account for 3 to 5 % of mortality in adults, especially in the geriatric age group [1,2]. In developing countries like India, children are more prone to lower respiratory tract infections, but in developed countries the severity of this infection and the rate of mortality are greater in geriatric age group. This may be due to many factors like diminished mucociliary clearance, decreased cough reflex, colonization of airways with microorganisms and other altered physiological changes due to senility, predispose old people to develop LRTI.[3]

Common microorganisms which are constantly associated with LRTI are Methicillin resistant *Staphylococcus aureus*, *Pseudomonas species*, *Streptococcus pneumoniae*, *Hemophilus influenzae* and other gram-negative bacilli. Especially in the older age group even atypical pathogens like *Chlamydia pneumoniae* (16 – 28%) *Mycoplasma pneumoniae* (0-13%), *Coxiella burnetti* and *Legionella pneumophila* are associated.[4,5] Development of multidrug resistance among these pathogens, has complicated the treatment of LRTI in the geriatric age group.

Hence, determining the prevalence of microorganisms causing LRTI in the geriatric age group along with their antibiotic sensitivity pattern and their associated risk factors, could help us to reduce the mortality and morbidity of the elderly people

MATERIALS AND METHODS

This was a prospective study carried out in Department of Microbiology, in a tertiary care hospital for a period of 2 months, May and June, 2015. Sputum samples collected from 50 geriatric patients (of age 60 yrs. and above), attending various clinical departments either as inpatient or outpatient, presenting with cough as the main symptom and at least one other lower respiratory tract symptom (like sputum production, dyspnoea, wheeze, chest discomfort /pain) were included in this study. Demographic details such as name, age, sex, presenting complaints, personal history including smoking and alcoholic habits were collected from medical records. Various Co-morbid conditions like Diabetes mellitus (DM), Hypertension (HTN). Bronchial asthma (BA), Pulmonary tuberculosis (PTB), COPD, other lung diseases, Human Immunodeficiency Virus (HIV) Infection, Carcinoma's, underlying heart diseases were studied to analyse the risk factors. Ethical clearance was obtained from the Institutional human

ethics committee. Informed written consent was obtained from the patients before sample collection.

Sputum samples were collected before the administration of antibiotics. Early morning, first sputum samples were collected for a better yield of isolates. The acceptability of the sputum was assessed both by macroscopic examination and microscopic examination. Sample, which was watery, thin, with no mucopurulent material was due to salivary contamination and considered unsuitable for further processing and was rejected. Sputum samples containing ≥ 10 pus cells, < 25 epithelial cells per low-power field, were suitable for culture.

Sputum samples were immediately inoculated on Blood agar, MacConkey agar, Chocolate agar and were incubated at 37° C for 24-48 hours. They were also inoculated in Sabouraud's Dextrose agar and were incubated in BOD incubator at 28°C. Smears were made for Gram staining and acid-fast staining. For the sputum culture, the pathogenic isolate was considered significant only, if they grow as the predominant organism. Pathogens isolated were processed and identified using appropriate biochemical tests. Antibiotic sensitivity of the organisms isolated was performed by "Kirby Bauer disc diffusion method", according to CLSI guidelines. Isolated microorganisms and their antibiotic sensitivity pattern were noted and were analysed for prevalence of various microorganisms causing lower respiratory tract infection in geriatric population.

RESULTS

Among 50 patients, 26 (52 %) were of age group between 61 – 70 years, 23 (46%) were of age group between 71 – 80 years, 1 (2%) patient was > 80 years. Out of 50 patients, 42 were males and 8 were females.

The common presenting symptoms of all the patients were analysed. Almost all patients (100%) complained of productive cough. 6 (12%) had chest discomfort, 19 (38%) had breathlessness and 38 (76%) had fever. Most common presented symptom in this study was productive cough.

While scrutinising the clinical diagnosis of these 50 patients, 9 had Chronic Obstructive Pulmonary Disease (COPD), 7 of them were diagnosed to have Pulmonary tuberculosis, 7 had Bronchial Asthma, and the remaining 27 were diagnosed to have other lower respiratory

tract infections like Acute or Chronic Bronchitis, Pneumonia and Bronchiectasis.

Various Co morbid conditions of these geriatric patients were studied. 5 of them were previously diagnosed to have Pulmonary tuberculosis and were on Anti tuberculous drugs. 2 patients were newly diagnosed to have tuberculosis infection. 14 (28%) of them were suffering from underlying lung pathology like COPD and Bronchial asthma. 14 patients were Diabetic, 16 were Hypertensive and 8 of them had Coronary artery disease. By exploring the co morbid conditions, it is evident that lower respiratory tract infections are predisposed by

various risk factors like, underlying lung pathology, Diabetes, senility, etc, in this age group of patients. It is also crystal clear that smoking is the commonest predisposing factor for LRTI.

When the culture reports were scrutinized, it was noted that 41 (82 %) were culture positive. Organisms like *Klebsiella pneumoniae* (20), *Pseudomonas aeruginosa* (10), *Candida sp.*(3), *Escherichia coli* (2), *Staphylococcus aureus* (4), *Acinetobacter* (1), *Enterococcus* (1), were grown (Figure 1). Sputum culture from 9 patients had only growth of lower respiratory tract commensals. The antibiotic sensitivity patterns of the isolated organisms were studied (Table 1 & 2).

Table 1: Antibiotic sensitivity pattern - Gram Negative bacilli (n=33)

	<i>Pseudomonas aeruginosa</i> (10)				<i>Klebsiella pneumoniae</i> (20)				<i>E. coli</i> (2)				<i>Acinetobacter</i> (1)			
	Resistant		Sensitive		Resistant		Sensitive		Resistant		Sensitive		Resistant		Sensitive	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Tetracycline	5	50	5	50	11	55	9	45	1	50	1	50	0	0	1	100
Gentamicin	8	80	2	20	8	40	12	60	1	50	1	50	0	0	1	100
Amoxyclav	10	100	0	0	20	100	0	0	1	50	1	50	1	100	0	0
Ciprofloxacin	5	50	5	50	3	15	17	85	0	0	2	100	0	0	1	100
Co-trimoxazole	10	100	0	0	11	55	9	45	1	50	1	50	1	100	0	0
Amikacin	3	30	7	70	7	35	13	65	1	50	1	50	1	100	0	0
Ceftazidime + Clavulonic acid	0	0	10	100	4	20	16	80	0	0	2	100	0	0	1	100
Ceftazidime	2	20	8	80	6	30	14	70	0	0	2	100	1	100	0	0
Imipenem	1	10	9	90	8	40	12	60	0	0	2	100	0	0	1	100
Piperacillin + Tazobactam	0	0	10	100	3	15	17	85	0	0	2	100	0	0	1	100
Colistin	9	90	1	10	0	0	20	100	0	0	2	100	1	100	0	0
Aztreonam	2	20	8	80	19	95	1	5	0	0	2	100	1	100	0	0

Table 2: Antibiotic sensitivity pattern - Gram positive cocci (n=5)

Antibiotics		Ampicillin	Amoxyclav	Ciprofloxacin	Clindamycin	Cotrimoxazole	Erythromycin	Cefoxitin	Amikacin	Vancomycin	Gentamicin	High level gentamicin	Linezolid
		Resistant	No	3	5	3	3	1	1	3	1	1	2
	%	60	100	60	60	20	20	60	20	20	40	80	80
Sensitive	No	2	0	2	2	4	4	2	4	4	3	1	1
	%	40	0	40	40	80	80	40	80	80	60	20	20

DISCUSSION

Patient can be affected by respiratory tract infections at any age, but the incidence of lower respiratory tract infections rises substantially with increasing age, so that LRTI is a most important leading cause of mortality and morbidity in the geriatric people. Inflammation, Changing lung physiology and compromised immune system increase the susceptibility to respiratory infections.[17] Most studies[3] states that beyond the age of 60 years a normal lung loses approximately 1 litre of FEV 1, which is approximately 20 ml/year. This age incidence with restricted pulmonary function correlates reasonably with certain other studies.[4]

In this present study of 50 geriatric patients the number of male patients is 42 (84 %) and female patients 8 (16 %). Some studies showed higher male preponderance than females. [5,7] Male predominance over female in this study could be supported by the fact that males are frequently exposed to external environmental conditions as they're moving around when females are being housewives in most of the cases Moreover, smoking habit is more often seen in males, which is one of the major predisposing factors for lung pathology[19]. Recent studies [6] have reported higher female morbidity and mortality, which could not be supported by this study.

Smokers with COPD had sputum positivity rate of 88.9% in this present study is supported by certain studies [3,Error! Reference source not found.] who have evaluated that diminished mucociliary clearance is the reason for the increased rate of lower respiratory infections in smokers with COPD. Heart disease was known as one of the most common predisposing factors for pulmonary infections and pneumonia.[8] Similarly, all the 8 patients who had Heart Disease were turned to be culture positive cases in this study.

In the present study growth of pathogenic organisms was obtained in

41(82 %) samples. Remaining 9(18 %) samples had only upper respiratory tract normal flora. Culture positivity depends on use of antibiotics before sample collection, organism load present in the sample (Early morning sample have an excellent load due to overnight accumulation and growth), mucopurulent nature of the sample and time delay in the transportation of the sample. Few studies [7] have obtained growth in 72% cases, as that of this study. But most of the Indian studies showed sputum culture positivity between 10-33% of patients. [10,10,12]

Though various microorganisms have been associated with lower respiratory tract infections, most studies have shown the most common organism to be *Haemophilus influenzae*. [13-15] But, results of our differ from these studies as *Haemophilus influenzae* could not be isolated from any of the patients. This finding can be correlated with other studies.[5,7] *Klebsiella pneumoniae* (40%) was responsible for causing most of the infections followed by *Pseudomonas aeruginosa* (20%), *Candida species* (6%), *Staphylococcus aureus* (8 %), *Escherichia coli*(4%) and *Acinetobacter*(2%).

Candida species were isolated from 3 (6 %) samples. It was found *Candida species* were frequently isolated in geriatric age group.[15,17] *Candida species* (10.99%) were the third most common organisms obtained from sputum specimens in this study. The predisposing factors found were smoking, corticosteroid therapy, malnutrition, diabetes mellitus and prolonged use of antibiotics. Only isolation of *Candida species* in sputum does not necessarily mean that patient has pulmonary candidiasis. Therefore, a clinical correlation is mandatory to confirm the clinical significance of the isolate.

Alarming concern in this study is, we have noted resistance to first line of drugs, which were effective and cheaper in earlier decades. These drugs are no longer sensitive in the treatment of most infections as per study. Similar observation was seen in certain other studies.[19-22]

Indiscriminate use of various antibodies in the empirical treatment of infectious diseases lead to the emergence of multi drug resistant pathogens. This is because of using antibiotics for treating even trivial viral infections. Hence it is mandatory to establish the cause of lower respiratory tract infection by doing routine culture and sensitivity.

CONCLUSION

Now a days, Prevalence of drug resistant bacteria causing lower respiratory tract infection is increasing. Changing lifestyle practices like avoiding of smoking, glycaemic control in diabetics, avoiding sedentary lifestyle with appropriate physical activity and diet would improve the immune status of the geriatric patients and reduce the occurrence of all possible infections in this age group. Multidrug resistant organisms are also on the rise, so antibiotic sensitivity pattern must be done for the causative organism before treating a patient. This would reduce the incidence of drug resistant microorganisms.

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