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STUDY OF RISK FACTORS, CHEST X-RAY FINDINGS, AETIOLOGICAL AGENTS AND THEIR SENSITIVITY PATTERN AMONG PATIENTS WITH LOWER RESPIRATORY TRACT INFECTION

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ABSTRACT

Respiratory tract infections are the most common infectious disease in humans. It is the leading cause of mortality and morbidity in critically ill patients in developing countries.The aim of the present study was to evaluate the risk factors, chest x ray findings, aetiological agents and their antimicrobial susceptibility pattern in hospitalized patients with lower respiratory tract infection. A total of 200 sputum samples collected and processed. Organisms were identified and antimicrobial susceptibility of bacterial isolates was performed using standard procedures. Of the 200 samples 87 yielded growth. *Pseudomonas aeruginosa* was the predominant isolate followed by *Klebsiella pneumoniae, Staphylococcus aureus*. Antibiotic susceptibility pattern showed that carbapenem, aminoglycosides and fluroquinolones are most effective against Gram negative bacteria. Glycopeptide,macrolides and fluroquinolones effective against Gram positive bacteria. Hence regular monitoring of the changing trends of prevalent strains and their antimicrobial susceptibility patterns is required for the good management of patients.

KEY WORDS: Lower respiratory tract infection, sputum, antimicrobial susceptibility, drug resistance

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INTRODUCTION

Lower respiratory tract infection (LRTI) is defined as an acute illness usually for a period of 1-3 weeks, presenting with symptoms of cough, expectoration, dyspnea, wheeze & chest pain/discomfort.[1] LRTIs may present as community acquired pneumonia(CAP), acute bronchitis, acute exacerbation of asthma & chronic obstructive pulmonary disease (COPD).[2] The most common etiological agents are *Streptococcus pneumoniae, Staphylococcus aureus, Klebsiella pneumoniae, Pseudomonas aeruginosa, Moraxella catarrhalis, Haemophilus influenzae* etc.[3] Aetiology of LRTI usually depends on various demographic characteristics like place of study (rural/urban), age of the patient, other predisposing factors including hospitalization.[4]

Respiratory tract infections are the most common infectious disease in humans. This infection is the leading cause of mortality and morbidity in critically ill patients in developing countries.[5] The incidence and associated mortality due to LRTI is influenced by various factors including characteristics of population at risk, health care facilities, immunosuppressive drugs, inappropriate antibiotic therapy, distribution of causative agents and prevalence of antimicrobial resistance.[6] Raise in the antibiotic resistant strains of bacteria, mainly in hospitals and also in community is one of the major problem world wide. These resistant strains spread in the hospital resulting in treatment failure and therapeutic problem. Hence regular monitoring of the changing trends of prevalent strains and their antimicrobial susceptibility patterns is required for the better management of patients.[7] The aim of the present study was to evaluate the risk factors, chest x ray findings, aetiological agents and their antimicrobial susceptibility pattern in hospitalized patients with LRTI in tertiary care hospital in Tumkur.

MATERIALS AND METHODS

The study was carried out over a period of 6 months from jun- dec 2014. A total of 200 sputum samples were collected from the hospitalized patients suspected of lower respiratory tract infection. A detailed history was collected in a pre-designed proforma. The samples were inoculated on Blood agar, Mac conkey's agar and Chocolate agar incubated at 37^0c. The isolates were then identified by standard biochemical tests. Antimicrobial susceptibility was performed by Kirby- Bauer disc diffusion method as recommended by CLSI.[8] Isolates are also tested for production of Methicillin Resistant Staphylococcus aureus (MRSA), Inducible clindamycin resistance in Gram positive cocci and Extended Spectrum Beta lactamase (ESBL), Metallo Beta lactamase (MBL) in Gram negative bacilli.

RESULTS

Out of 200 patients presented with LRTI 135(67.5%) were male, 65 (32.5%) were female (fig 1). Risk factors of patients presenting with LRTIs is shown in table1. Most common risk factor was patient with past history of diabetus mellitus (8.5%), followed by tuberculosis, smoking, patients with family history of tuberculosis and alcohol, asthma, COPD, multiple comorbidities seen in 2.5% of patients, who had more than one risk factor.

Figure 1
Gender distribution in patients with Lower respiratory tract infections

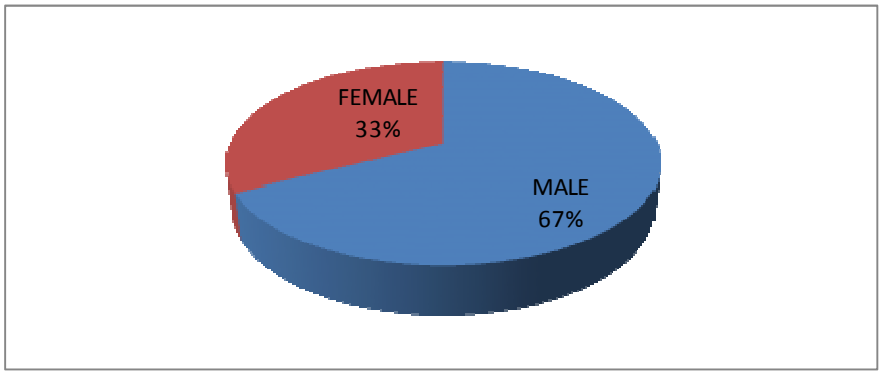

Table 1
Risk factors in patients with Lower respiratory tract infections

Sl No.	Risk Factors	No. of patients
1	Diabetes mellitus	17(8.5%)
2	Hypertension	3
3	Asthma	3(1.5%)
4	COPD	3(1.5%)
5	Smoking	7(3.5%)
6	Alcohol	4(2%)
7	Steroid	0
8	Contact with TB	6(3%)
9	Past h/o TB	8(4%)
10	Multiple comorbidities	5(2.5%)

Radiological findings of patients with LRTI showed that most of them 8% were presented with more than one X ray findings. 6% had consolidation, 2% had cavity and 1% had infiltration and nodular lesions (Table 2).

Table 2
Chest X ray findings

Sl No.	Chest x ray finings	No. of patients
1	Cavity	4(2%)
2	Infiltrates	2(1%)
3	Fibrosis	0
4	Nodular	2(1%)
5	Consolidation	12(6%)
6	Multiple x ray finding	16(8%)

Of the 200 sputum samples processed, 87(43.5%) yielded growth, 113(56.5%) were no growth. Out of cultue positives 76(87.36%) showed bacterial growth, while 11(12.64%) showed growth of *Candida species*. Of the 76 bacterial isolates 62(81.58%) were Gram negative bacilli and 14(18.42%) were Gram positive cocci. Among all the samples processed most predominant Gram negative pathogen isolated was *Pseudomonas aeruginosa* 22 (11%) followed by *Klebsiella pneumoniae* (10.5%), *Acinetobacter baumanii* (4.5%). While the most prevalent Gram positive pathogen was *Staphylococcus aureus* (5%), followed by *Streptococcus pyogenes* (1.5%).

Table 3
Microbial profile of Lower respiratory tract infections

Sl No.	Microorganism isolated	Number	Percentage
1	Pseudomonas aeruginosa	22	11%
2	Klebsiella pneumoniae	21	10.5%
3	Staphylococcus aureus	10	5%
4	Acinetobacter baumanii	9	4.5%
5	Escherichia coli	6	3%
6	Streptococcus pyogenes	3	1.5%
7	Enterbacter aerogens	2	1%
8	Moraxella catarrhalis	2	1%
9	Coagulase Negative Staphylococcus aureus	1	0.5%
10	Candida species	11	5.5%
11	No growth	113	56.5%

Antimicrobial susceptibility pattern indicated that ESBL production in 12 isolates of *Pseudomonas aeruginosa*, 10 *Klebsiella pneumonia*e and no MBL production. MRSA production was seen in 3 isolates of *Staphylococcus aureus* and no inducible clindamycin resistance. Gram negative isolates showed 100% sensitive to imipenem, and 92% sensitive to amikacin, 88% to ciprofloxacin and levofloxacin. Gram positive isolate showed 100% sensitivity to vancomycin, linezolid and 90% to tetracycline, 86% to ciprofloxacin and levofloxacin.

DISCUSSION

LRTI is the most common infection World wide. Recently, due to the emergence of multidrug resistant bacteria management of these cases become complicated. In our study out of 200 samples processed, 87 (43.5%) yielded growth and 113(56.5%) of the samples remained sterile on culture probably due to prior antibiotic therapy or being non representative samples. Of the 200 patients 67.5% were male and 32.5% females, male preponderance in our study may be due to prevalence of associated risk factors like smoking and alcoholism etc. Radiological findings of patients with LRTI showed that there was no correlation between reports of radiographs and isolation of organisms from sputum samples.[9,10] *Pseudomonas aeruginosa* was the most common isolate followed by *Klebsiella pneumoniae, Acinetobacter baumanii*. This is comparable to Goel N etal, Veena Kumari HB et al and Srivathsava P et al.[11, 12, 13] The risk factors for LRTI due to *Pseudomonas aeruginosa* are previous hospitalization, prior antimicrobial therapy and presence of pulmonary comorbidities. In our study there was predominance of Gram negative bacteria similar to other studies by Ramana KV etal, Bhatiani A and Mishra SK etal.[3,14, 15] Antibiotic susceptibility pattern showed that carbapenem, aminoglycosides and fluroquinolones are most effective against Gram negative bacteria. glycopeptide, macrolides and fluroquinolones effective against Gram positive bacteria. Similar obsevations were made by other investigators Veena Kumari et al, Srivathsava et al and Okesola et al.[12,13,16] Multiple drug resistance to the tested antimicrobials was noted more in gram negative bacteria. High rate of resistance to cephalosporins was noted in our study, this might be due to extensive use of third generation cephalosporins in hospitalized patients. Viral patel et al from Baroda also reports similar observation.[17] Carbapenems showed 100% sensitivity in our study. Kucukates and Kocazeybek also showed 100% sensitivity to carbapenem in their study and suggested that carbapenem should be judiciously used to prevent any further increase in resistance.[18]

CONCLUSION

Aetiology and antimicrobial susceptibility of LRTI's varies with different geographical regions. Hence need to regularly update the aetiology, predisposing factors and improve the

laboratory diagnostic facilities to identify the infectious causes of LRTI. Judicious use of antimicrobial agents will enable better management of patient and reduce the burden of multidrug resistance.

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