IOSR Journal of Pharmacy and Biological Sciences (IOSR-JPBS)
e-ISSN: 2278-3008, p-ISSN:2319-7676. Volume 10, Issue 1 Ver. III (Jan -Feb. 2015), PP 65-69
www.iosrjournals.org

Study on Sensitivity Pattern of Micro-Organisms in Respiratory Tract Infections at a Private Corporate Hospital

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I. Introduction

1.1 Study Background: Wide reports in literatures from different parts of the world revealed that antibiotics are used both widely and indiscriminately. RTIs comprise the most common indication for consulting a general practitioner, and obtaining an antibiotic prescription.

1.2 Objectives:

- To perform prospective antibiotic sensitivity pattern of micro organisms.
- To analyze the antibiotic usage pattern for RTI.
- To know the resistance pattern & prepare antibiogram.

1.3 Study Design: Prospective study

1.4 Study Duration: Six months [March 2014 to August 2014].

1.5 Study Site: 750- bedded multi- specialty private corporate hospital in South India.

1.6 Patient Selection:

Inclusion criteria: All the inpatients with RTI for whom at least one antibiotic was prescribed.
Exclusion criteria: Outpatients and those unwilling to participate in the study.

1.7 Method: The proposed study was designed in three different phases to achieve the objectives:

Phase 1:

- To perform a prospective study on the common organisms isolated during culture and sensitivity testing and their antibiotic sensitivity patterns for a period of six months (from March,2014 to August,2014).

Phase 2:

- To collect relevant demographic information and information on duration of hospitalization of patients with Respiratory Tract Infection admitted to the Pulmonology and General Medicine ward for six month period (from March, 2014 to August, 2014).
- To obtain information on the antibiotic prescribing pattern for RTI.

Phase 3:

- To know the resistance pattern & prepare antibiogram
- To analyse the pattern of antibiotic use for RTI in the Pulmonology department.

II. Results And Discussion

A total of 361 documented records were analysed and 143 cases were analysed during phase2 study. *S.pnemoniae* was the major organism identified in 45.4% of isolated specimens, *S.pyogenes*(27.9%). *K.pneumoniae*(17.45%).Study conducted by Shalini et al (2011) revealed that *E.coli*(64.3%), *Klebsiella*(20.3%), *Pseudomonas*(9.1%)*and S.aureus*(6.3%) were the most common organisms isolated.

Menon RU et al (2013) conducted a similar study and found that *S.pneumonia* was the most common etiological agent followed by *K.pneumoniae, Pseudomonas aeruginosa*. Sputum(236), Throat swab(91), Tracheal(30) were the major samples collected from patients infected with RTI during the study period.

S.pneumoniae (81%) was the most frequently isolated microorganism from sputum specimen whereas *S.pyogenes*(45.5%) from Throat swab culture and *Actinobacter* (77.8) from tracheal fluid culture.

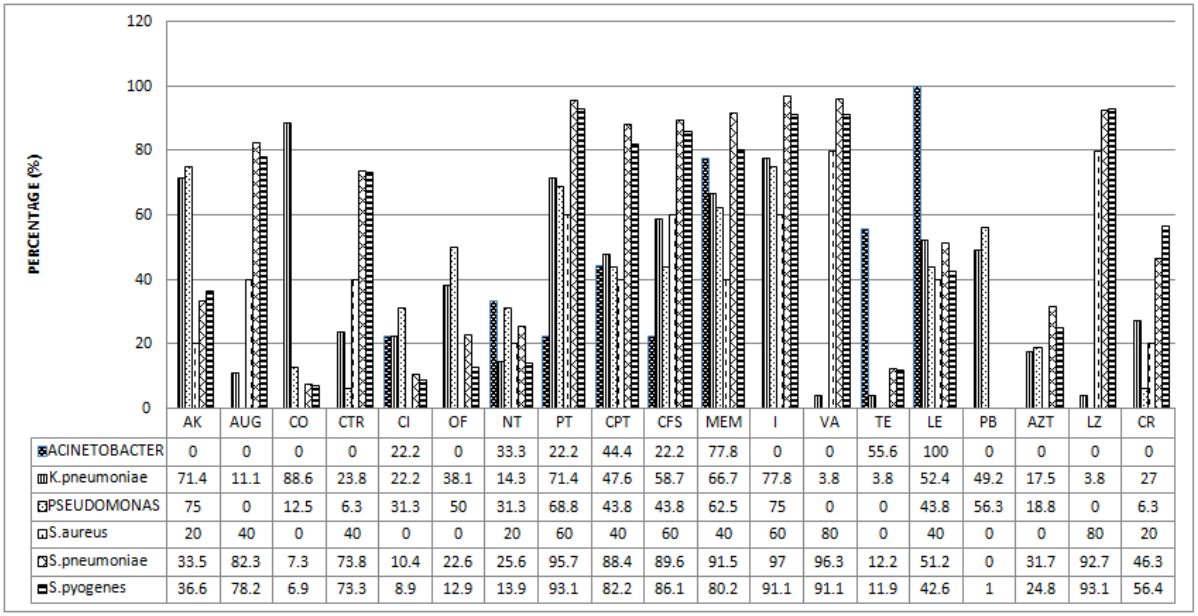
Similar study conducted by Sriram S et al (2013) found that *S.pneumoniae* (76.2%) was the most frequently isolated from sputum specimen. The sensitivity pattern of microorganisms during prospective study indicated that *S.pneumoniae* was highly sensitive to Imipenem (97%) and Actinobacter was sensitive to Levofloxacin (100%).Piperacillin-tazobactum showed good sensitivity against *S.pneumoniae*(95.7%) and *S.pyogenes*(93.1%).

Ambily Remesh et al (2013), study showed that *E.coli* was sensitive to Piperacillin- tazobactam, Amikacin; and it was resistant to Cefuroxime, Ceftriaxone, Ceftazidine, Ampicillin, Ciprofloxacin, and Cotrimoxazole. *P. aeroginosa* was sensitive to Piperacillin- tazobactam, Ceftazidine, and Cefoperazone. *K. pneumonia* was sensitive to Piperacillin-Tazobactam, and Imipenam. Resistance was found to be more for Ampicillin, Cefazolin, and Cefuroxime, whereas sensitivity was more for Gentamicin, Imipenem, Piperacillin-Tazobactam,and Amikacin. The most important pathogen causing bronchopneumonia is *Streptococcus pneumoniae* and a syndromic antibiotic therapy is being used to control the mortality (Lalitha 2008).

Table 1: Sensitivity Pattern- Prospective Study (March 2014 to August 2014) (n=361)

Organism	No. Of Patients infected	Amikacin	Amoxicillin/ Clavulanic acid	Cotrimoxazole	Ceftriaxone	Ciprofloxacin	Ofloxacin	Netillin	Sparfloxacin	Cloxacillin	Piperacillin /Tazobactam	Cefepime / tazobactum	Cefoperazone/ Sulbactam	Meropenem	Imipenem	Vancomycin	Teicoplanin	Levofloxacin	Polymixin B	Nalidixic acid	Azithromycin	Linezolid	Cefuroxime	Nitrofurantoin	Norfloxacin
E.coli	2	1	0	0	1	0	1	0	0	0	1	0	0	1	1	0	0	1	1	0	0	0	0	0	0
K.pneumoniae	63	45	7	18	15	14	24	9	0	0	45	30	37	42	49	2	2	33	31	0	11	2	17	0	0
S.pneumoniae	164	55	135	12	121	17	37	42	0	0	157	145	147	150	159	158	20	84	0	0	52	152	76	0	0
P.aerogenosa	16	12	0	2	1	5	8	5	0	0	11	7	7	10	12	0	0	7	9	0	3	0	1	0	0
S.aureus	5	1	2	0	0	0	0	1	0	0	3	2	3	2	3	4	0	2	0	0	0	4	1	0	0
S.pyogenes	101	37	79	7	74	9	13	14	0	0	94	83	87	81	92	92	12	43	1	0	25	94	57	0	0
Proteus	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acinetobacter	9	0	0	0	0	0	2	0	0	0	3	2	4	2	7	0	0	5	9	0	0	0	0	0	0

Chart: 1 Prospective Analysis-Sensitivity Pattern Of Micro-Organisms (n=361)



	AK	AUG	CO	CTR	CI	OF	NT	PT	CPT	CFS	MEM	I	VA	TE	LE	PB	AZT	LZ	CR
ACINETOBACTER	0	0	0	0	22.2	0	33.3	22.2	44.4	22.2	77.8	0	0	55.6	100	0	0	0	0
K.pneumoniae	71.4	11.1	88.6	23.8	22.2	38.1	14.3	71.4	47.6	58.7	66.7	77.8	3.8	3.8	52.4	49.2	17.5	3.8	27
PSEUDOMONAS	75	0	12.5	6.3	31.3	50	31.3	68.8	43.8	43.8	62.5	75	0	0	43.8	56.3	18.8	0	6.3
S.aureus	20	40	0	40	0	0	20	60	40	60	40	60	80	0	40	0	0	80	20
S.pneumoniae	33.5	82.3	7.3	73.8	10.4	22.6	25.6	95.7	88.4	89.6	91.5	97	96.3	12.2	51.2	0	31.7	92.7	46.3
S.pyogenes	36.6	78.2	6.9	73.3	8.9	12.9	13.9	93.1	82.2	86.1	80.2	91.1	91.1	11.9	42.6	1	24.8	93.1	56.4

Table 2 Specimen Vs. Organism – Prospective Study (March 2014 to Aug 2014) (n= 361)

Organism	Patients infected	Tracheal	Throat swab	Sputum	Endotracheal	Ear swab
E.coli	2	2	0	0	0	0
Klebsiella	63	14	8	40	0	1
S.pneumoniae	164	0	31	133	0	0
Pseudomonas	16	4	4	6	0	2
S.aureus	5	1	1	2	1	0
S.pyogenes	101	1	46	54	0	0
Proteus	1	1	0	0	0	0
Acinetobacter	9	7	1	1	0	0

Chart: 2 Organism v/s Specimen- Prospective (n=361)

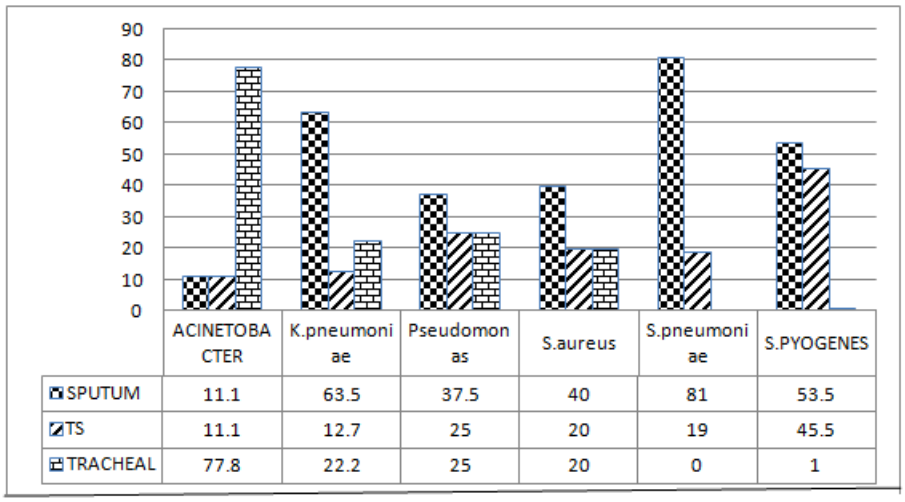


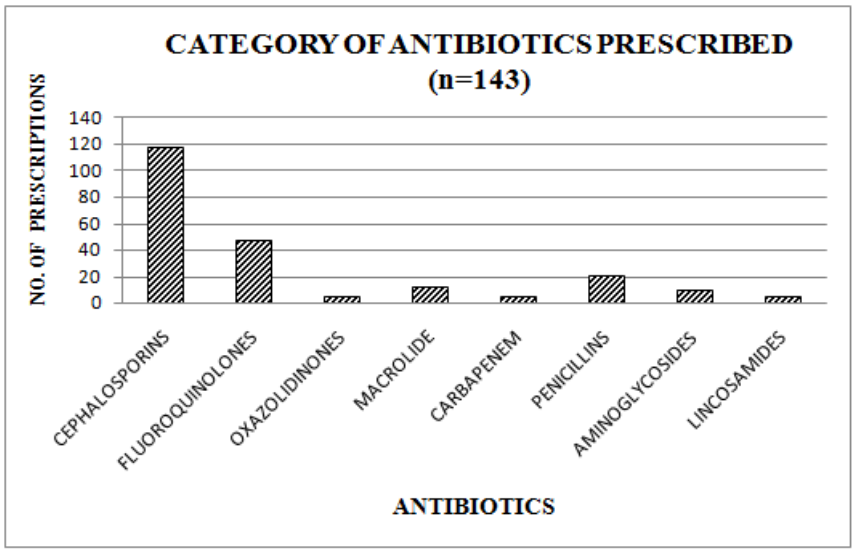
Table:3 Multiple Organisms – Prospective (n=361)

ORGANISMS	NO. ISOLATED
Pseudomonas + Klebsiella	5
S.pneumoniae + S.pyogenes	2
Klebsiella + S. aureus	1
Klebsiella + Acinetobacter	1
Klebsiella +Proteus	1

Table: 4 No Of Antibiotics Prescribed

Sl.no	ANTIBIOTICS	NO OF PRESCRIPTIONS
1	CEPHALOSPORINS	117
2	FLUOROQUINOLONES	47
3	OXAZOLIDINONES	5
4	MACROLIDES	12
5	CARBAPENEM	5
6	PENICILLINS	21
7	AMINOGLYCOSIDES	9
8	LINCOSAMIDE	5

Chart: 3



The category of antibiotics which are highly prescribed included Cephalosporins (n=117), Fluoroquinolones (n=47) and penicillins (n=2)

Table : 5 Antibiotic Combinations Used (n=143)

SL.NO	ANTIBIOTIC COMBINATIONS	NO OF PRESCRIPTIONS
1	Cephalosporins+Fluoroquinolones	28
2	Cephalosporins+Lincosamide	3
3	Carbapenems+Macrolides	2
4	Cephphalasporins+Oxazolidinones	2
5	Cephalosporins+Penicillins	6
6	Cephalosporins+Macrolides	7
7	Cephalosporins+Aminoglycosides	4
8	Penicillins+Fluoroquinolones	2
9	Fluoroquinolones+Oxazolidinones	1
10	Penicillins+Macrolides	1
11	Cephalosporins+Carbapenems	3
12	Penicillins+Aminoglycosides	1
13	Cephalosporins+Aminoglycosides+Macrolides	2
14	Cephalosporins+Macrolides+Oxazolidinones	1
15	Cephalosporins+Aminoglycosides+Fluoroquinolones	2
16	Cephalosporins+Fluoroquinolones+Carbarbapenams	1
17	Cephalosporins+Fluoroquinolones+Oxazolidinones	1
18	Cephalosporins+Macrolides+Fluoroquinolones	1
19	Cephalosporins+Penenicillins+Fluoroquinolones	1

Antibiotic combinations that are most commonly prescribed in the study hospital include Cephalosporins + Fluoroquinolones (19.5%), followed by Cephalosporins+ Macrolides (0.04%).

Antibiogram of different isolates at the study Site.

SL.NO	MICRO-ORGANISM	SENSITIVE TO	RESISTANT TO
1	*S.pneumoniae*	Imipenem Vancomycin Piperacillin/TazobactumCefeperazone-Sulbactum	Ciprofloxacin
2	*S.pyogenes*	Piperacillin/ Tazobactum Linezolid Vancomycin Imipenem	Ciprofloxacin Azithromycin
3	*K.pneumoniae*	Imipenem Piperacillin/TazobactumMeropenem Cefoperazone-Sulbactum	Vancomycin Linezolid
4	*Pseudomonas sps.*	Imipenem Piperacillin/Tazobactum Amikacin	Amoxicillin/Clavulanate Vancomycin Linezolid
5	*S.aureus*	Vancomycin Linezolid Imepenem Cefeperazone/Sulbactum Piperacillin/Tazobactum	Amikacin Ciprofloxacin Azithromycin

III. Summary and Conclusion

It was found that S. pneumonia was the major organism identified in 45.4% In the prospective study a total of 361 documented records were analyzed and of the isolated specimens, followed by S.pyogenes (27.9%), Klebsiella (17.45%). The sensitivity pattern data of the prospective study revealed that S.pneumoniae was highly sensitive to Imipenem(97%)and also to Piperacillin/Tazobactum(95.7%), Actinobacter to Levofloxacin (100%), and Piperacillin/Tazobactum (93.1%) showed good sensitivity against S.pyogenes.

In the prescribing pattern study, it was found that the most common RTI was found to be Lower Respiratory Tract Infection in 134 patients constituting 93.7%.

Cephalosporins (81.8%), in particular Cefepime/Tazobactum (70.1%) was highly prescribed for RTI, and is followed by Fluroquinolones(32.8%).

This study gives reliable statistics on antibiotic resistance that is mandatory to control spread of resistant pathogens and should be made available. Hospital antibiogram can be useful means for initiation the empiric treatment and also tracking the emergence of resistance among the bacterial strains.

The antibiotic susceptibility data generated based on the consistent, reproducible and comparable data among different laboratories will help in producing a better outcome and prevention of cross infection is also a very important task as well ensuring the continued antibiotic adherence.

Efforts to prevent such threats build on the foundation of proven public health strategies include immunization, infection control, antibiotic stewardship, and reducing person-to-person spread through screening, treatment and education.

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