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Antibiotic Susceptibility Pattern of Lower Respiratory Tract Infection in a Teaching Hospital of Tripura

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Abstract | **Original Research Article**

Infectious diseases remain a major cause of debility and death around the world and are responsible for worsening of living conditions of millions of people. Respiratory tract infection (RTI) is one of the most frequently reported infections worldwide and resulting in more than 50 million deaths every year attributed to both community-acquired and hospital acquired infection. This study has been conducted for duration of two year from January 2017 to December 2018, at Tripura Medical College and Dr. BR Ambedkar Memorial Teaching Hospital, a tertiary care referral centre of the state of Tripura, in North Eastern India. 161 patients participated in the study, of which 135 samples were culture positive and 26 samples showed no growth. Among the culture positive samples 122 (75.8%) samples showed bacterial growth. Female (60.9%) patients were significantly higher than males (39.1%). 95 (77.86%) numbers of the isolates were Gram negative bacilli, which included Klebsiella pneumonia (43.44%), Pseudomonas aeruginosa (24.59%) , E. coli (7.37%) , and Acinetobacter sp (2.45%). Gram negative bacilli shows that most of the isolates were sensitive to Amikacin (65.57%) followed by Imipenem (56.55%) and others. 27 (22.14%) isolates were Gram positive cocci, of which Methicillin Resistant Staphylococcus aureus (13.93%) was the predominant isolate followed by Streptococcus pneumoniae (7.37%) and Enterococcus faecalis (0.81%). Gram positive organisms were sensitive to Linezolid (81.48%), Levofloxacin (51.85%) and Ceftriaxone (48.14%) predominantly. The current scenario states that Klebsiella pneumoniae and Pseudomonas aeruginosa were the major causative agents of Lower Respiratory tract infection in this region of North East India and treatment in our centre need to be based upon the Antibiotic susceptibility test profile of the pathogenic isolate.

Key wards: Sputum, gram negative organism, gram positive organism, antibiotic susceptibility.

INTRODUCTION

Infectious diseases remain a major cause of debility and death around the world and are responsible for worsening of living conditions of millions of people [1]. Respiratory tract infection (RTI) is probably the most frequently reported infection worldwide and resulting in more than 50 million deaths per year attributed to both community-acquired and hospital acquired infection[2,3]. The consistent rise in the antimicrobial resistance among the respiratory organisms could be due to prophylactic administration of antimicrobial agents even before the availability of the culture results [4].

Respiratory tract infections are most commonly encountered infections in our healthcare setting which often presents in life threatening condition of patients. Serious condition of patients and poor outcome could be due to either improper antibiotic use or due to development of resistance to antimicrobials, posing a great threat to the community. Area specific studies are required in monitoring the trend of type of pathogens and their sensitivity pattern for any infectious disease.

This study has been conducted to analyze the spectrum of microbial growth and pattern of Antibiotic Sensitivity of the organisms isolated from sputum samples collected from patients admitted in Medicine ward of Tripura Medical College and Dr BR Ambedkar Memorial teaching Hospital, Agartala.

METHODOLOGY

The study has been conducted at Dr. BR Ambedkar Memorial Teaching Hospital, a tertiary care referral centre of the state of Tripura, in North Eastern India.

Informed consent was taken from all the study participants in prescribed proforma. The relevant clinical history and examination findings were noted in the pre designed proforma. Sputum samples of patients admitted in Medicine ward, suspected to have lower respiratory tract infection were sent to Microbiology dept for Culture and antibiotic susceptibility test.

In Microbiology laboratory, samples were inoculated in appropriate culture media. On finding significant growth of bacteria on incubation, identification of the organism was attempted by gram stain, motility test, biochemical and serological tests as and where applicable. The Antibiotic susceptibility test was performed on identified bacterial pathogen by Kirby Bauer Disc diffusion method conforming to the standard guidelines given by Clinical and Laboratory Standards Institute (CLSI) guidelines [6]. Statistical analysis was done using IBM SPSS, version 21.0 (IBM Corp., Armonk, NY).

RESULTS

A total of 161 patients participated in the study, of which 135 samples were culture positive and 26 samples showed no growth. Among the culture positive samples 122 (75.8%) samples showed bacterial growth whereas 13 (8.0%) samples showed fungal growth.

Female (60.9%) patients were significantly higher than males (39.1%) among the participating patients in our study.

Table-1: Antibiotic susceptibility pattern of Gram negative isolates

Isolate (N=95)	**PM**	**RP**	**IT**	**FS**	**Z**	**XM**	**TR**	**PM**	**K**	**IP**	**EV**	**OT**
E.coli (n=9)												
K.pneumoniae (n=53)	**0**	**1**	**4**			**2**	**4**		**4**	**7**	**8**	**9**
P.aeruginosa (n=30)	**8**		**6**						**6**	**4**	**9**	
Acinetobacter spp (n=3)												
TOTAL (Among all the inoculation / among gm negative organisms)	**69** (56.55 %, 72.63%)	**22** (18.03 %, 23.15%)	**38** (31.14 %, 40.00%)	**7** (5.73 %, 07.36 %)	**2** (1.63 %, 2.10%)	**13** (10.65 %, 13.68%)	**38** (31.14 %, 40.00%)	**13** (10.65 %, 13.68%)	**80** (65.57 %, 84.21%)	**33** (27.04 %, 34.73%)	**51** (41.80 %, 53.68%)	**27** (22.13 %, 28.42%)

IPM – Imipenem; MRP – Meropenem; PIT – Piperacillin Tazobactum; CFS – Cefoperazone Sulbactum ; CZ – Cefazolin; CXM – Cefuroxime; CTR – Ceftriaxone; CPM – Cefipime; Ak – Amikacin; CIP – Ciprofloxacin; LEV – Levofloxacin; COT - Cotrimoxazole.

There were 95 (77.86%) numbers of isolates of Gram negative bacilli, which included Klebsiella pneumoniae (43.44%), Pseudomonas aeruginosa (24.59%), E. coli (7.37%) and Acinetobacter spp. (2.45%).

The sensitivity pattern of antibiotics to Gram negative bacilli shows that majority of the isolates were sensitive to Amikacin (65.57% of all the isolates where as 84.21% of gram negative organisms) followed by Imipenem (56.55% of all the isolates where as of the gram negative organisms it is 72.63%), and Levofloxacin (41.80% of all the isolates where as of the gram negative organisms it is53.68%).The observation has been depicted in Table No. 1.

There were 27 (22.14%) isolates representing Gram positive cocci, of which Methicillin Resistant Staphylococcus aureus (13.93%) was the predominant isolate followed by Streptococcus pneumoniae (7.37%) and Enterococcus faecalis (0.81%) respectively. Among the isolates, 07(5.73%) were Vancomycin Resistant Staphylococcus aureus (VRSA) and the single isolate of Enterococcus faecalis was also Vancomycin resistant (VRE). The observation has been depicted in Table 2.

The antibiotics which were observed to be more sensitive against the isolates were Linezolid (81.48%), Levofloxacin (51.85%) and Ceftriaxone (48.14%). Only 33.33% of the strains were susceptible to Vancomycin. Sensitivity of gram positive organisms to Ampicillin, Ciprofloxacin, Gentamicin, Cefuroxime were considerably low. The observation has been depicted in Table No. 2 below.

Table-2: Antibiotic susceptibility pattern of Gram positive isolates

Isolate (n=27)	LZ	VA	COT	AMC	CIP	LEV	GEN	CZ	CXM
S.aureus (n=17)	12	7	7	4	7	8	6	0	1
Enterococcus Spp.(n=1)	1	1	1	1	1	1	0	0	0
Str.pneumoniae (n=9)	9	1	0	4	0	5	1	0	1
TOTAL	**22 (81.48%)**	**9 (33.33%)**	**8 (29.62%)**	**9 (33.33%)**	**8 (29.62%)**	**14 (51.85%)**	**7 (25.92%)**	**0 (0%)**	**2 (7.4%)**

VA – Vancomycin; LZ – Linezolid; COT – Cotrimoxazole; AMC – Amoxycillin Clavulunic acid ; CIP – Ciprofloxacin; LEV – Levofloxacin; G – Gentamicin; CZ – Cefazolin; CXM – Cefuroxime. PIT – Piperacillin Tazobactum; Ak – Amikacin; CTR – Ceftriaxone;

DISCUSSION

A total of 161 patients participated in the study, of which 135(83%) samples were culture positive and 26 samples showed no growth. In a study reported from Kolkata, out of 188 samples, 102 (54.25%) sample were culture positive [7]. In one study seventy seven percent (77%) of samples were culture positive [8]. In another study at Dhaka, of the 105 sputum samples, 55 (52.38%) yielded growth [9].

In our study, females (60.9%) patients were significantly higher than males (39.1%) though other study male preponderance was obvious like in a study it was male: female ratio of 2.5:1 among the participants [9].

Likewise in another study 66% were male and 34% were female [8]. One Meta analysis has stated that more women were enrolled and/or hospitalised more frequently in studies that were performed on patients with milder cases of community acquired pneumonia [10]. This finding does match with our finding.

Anatomic, lifestyle, behavioral, and socioeconomic differences between males and females and the role of sex hormones in the regulation of the immune system may also contribute to the reported sex differences in the incidence and severity of the various types of RTIs [11].

There were 95 (77.86%) numbers of isolates of Gram negative bacilli, which included Klebsiella pneumoniae (43.44%), Pseudomonas aeruginosa (24.59%), E. coli (7.37%) and Acinetobacter spp. (2.45%). One study reported by Akter *et al.* showed 58.18% to be gram negative organism, which included Klebsiella pneumoniae (43.75), Pseudomonas aeruginosa (18.75%), H. influenzae (28.12%), E. coli (6.25%) and Acinetobacter sp (3.12%) [9]. These findings are similar to our observation of gram negative organism distribution except isolation of H. influenzae. In a study conducted in Central India, 79.23% isolates were gram negative organisms with Klebsiella spp. (32.08%), Pseudomonas spp. (28.34%), E.coli (13.36%) and Acinetobacter spp. (3.74%) [12]. An European analysis shows, Streptococcus was the most common causative organism in patients of Community Acquired Pneumonia [13]. Variation of prevalence does occur with different geographical areas. In another study from Egypt, gram negative organisms were predominant [14]. In one Indian study showed *Klebsiella pneumoniae* was the most prevalent pathogen (71/193), followed by Coagulase positive Staphylococci (43/193) [8].

In the present study, the sensitivity pattern of antibiotics to Gram negative bacilli shows that majority of the isolates were sensitive to Amikacin (65.57%) followed by Imipenem (56.55%) and Levofloxacin (41.80%). Our findings were different from the findings of one study showing 100% sensitivity of the isolates to Meropenem, 92% to Ceftriaxone, 83.34% to Amikacin where as Acinetobacter spp. was resistant to Ceftriaxone [9]. In another study, Penicillin group of antibiotics were highly sensitive, beside that Imipenem, Amikacin and Pipercillin Tazobactum were also found considerably sensitive against gram negative organisms [12]. In one study *Pseudomonas aeruginosa* was the most resistant organism found based on the antibiotic susceptibility pattern while *Proteus mirabilis* was the most sensitive organism [8].

We observed that, there were 27(22.13%) isolates representing Gram positive cocci, of which Staphylococcus aureus (13.93%) was the predominant isolate followed by Streptococcus pneumoniae (7.37%) and Enterococcus faecalis (0.81%) respectively. Observations reported in a study from Dhaka shows 41.81% to be gram positive organisms, including Streptococcus pneumoniae (36.36%), Staphylococcus aureus (5.45%) [9], which is different in respect of our finding. In one study, gram positive organisms were isolated in 20.77% cases, commonest being Staphylococcus (11.76%), followed by Streptococcus (5.34%) [12].

Our observation of antibiotic sensitivity to the gram positive isolates i.e. Linezolid (81.48%), Levofloxacin (51.85%), Ceftriaxone (48.14%) were different from a study showing sensitivity pattern Amoxycillin Clavulanic acid (95%), Ampicillin (85%), Ceftriaxone (80%) and Levofloxacin (70%) [9]. In one central Indian study, Linezolid was found highly sensitive where as Fluoroquinolones, Cotrimoxazole, Cephalosporins were not effective but Amikacin was moderately sensitive [12]. In a study, gram positive

organisms were resistant when tested with penicillin (100%), amoxicillin (100%), cefixime (100%), cephalothin (100%), cefotaxime (94.74%), Amoxycillin Clavulanic acid (80%), cefaclor (69.23%), ceftriaxone (66.67%) [14]. It was found that gentamycin was the most consistently active antibiotic against S. aureus in Asia and Sub Saharan area with relatively high degree of resistance to amoxicillin and ampicillin [15]. It was general finding in Indian studies that Staphylococcus aureus has developed considerable resistance to newer antibiotics over the years. Prevalence of MRSA is increasing at time exceeding 50% in different tertiary care centers, though Vancomycin resistance has been very low, but irrational use of the antibiotic may alter the scenario as institutional strict guide line for antibiotics are not available due to scarcity of reproducible data [16]. We observed that only 33.33% Gram Positive isolates were sensitive to Vancomycin, which should be an alarming situation in our setting, mandating for strictly abiding by antibiotic policy and surveillance at frequent intervals.

CONCLUSION

The current scenario states that Klebsiella pneumoniae and Pseudomonas aeruginosa were the major causative agents of Lower Respiratory tract infection in this region of North East India. The present data represents that Amikacin and Imipenem were effective antibiotics against Gram negative bacterial pathogens whereas Linezolid and Levofloxacin were effective against Gram positive organisms causing Lower Respiratory tract infection. Significant resistance to Vancomycin and Meropenem in our healthcare setting indicates an alarming situation, thereby requiring further intervention and adherence to antibiotic policy. Since none of the strains except Linezolid attained a significant level of susceptibility against the tested antibiotics, treatment in our centre need to be based upon the Antibiotic susceptibility test profile of the pathogenic isolate. This study has several limitations, namely, those associated with single-center studies and the sample size is also very large.

REFERENCES

1. Hossein AH, Ali AR, Akram H, Farhad M. Infectious Diseases in hospitalized Children of Central Iran. Pak J Med Sci. 2010 ;26(4):901-904.
2. Carroll KC. Laboratory diagnosis of lower respiratory tract infections: controversy and conundrums. Journal of clinical microbiology. 2002 ;40(9):3115-20.
3. Manikandan C, Amsath A. Antibiotic susceptibility of bacterial strains isolated from patients with respiratory tract infections. International Journal of Pure and Applied Zoology. 2013;1(1): 61-69.
4. Ahmed SM, Jakribettu RP, Meletath SK. Lower respiratory tract infections (LTRIs): An insight into the prevalence and the antibiogram of the gram negative, respiratory, bacterial agents. Journal of clinical and diagnostic research: JCDR. 2013 ;7(2):253.
5. Choudhury S, Bhaumik DP, Debnath J.Antibiotic Susceptibility Pattern of Pyogenic Infectious Diseases in a Teaching Hospital of Tripura. Sch. J. App. Med. Sci., Aug 2018; 6(8): 2955-2959.
6. Clinical and Laboratory Standards Institute (CLSI); Performance standards for antimicrobial susceptibility testing: Sixteenth informational supplement. Wayne PA: CLSI, 2016.p.M100 – S16.
7. Paul R, Ray J, Sinha S, Mondal;J. Antibiotic resistance pattern of bacteria isolated from various clinical specimens: an eastern Indian study. Int J Community Med Public Health 2017;4:1367-71.
8. Sunil Vijay, GauravDalela : Prevalence of Lrtiin Patients Presenting with Productive Cough and Their Antibiotic Resistance Pattern, Journal of Clinical and Diagnostic Research. 2016 Jan, Vol-10(1): DC09-DC12
9. Akter S, Shamsuzzaman SM, Jahan F: Community acquired bacterial pneumonia: aetiology, laboratory detection and antibiotic susceptibility pattern, Malaysian J Pathol 2014; 36(2) : 97 – 103.
10. Matthew E. Falagasa,b, Eleni G. Mourtzoukoua, Konstantinos Z. Vardakasa: Sex differences in the incidence and severity of respiratory tract infections, Respiratory Medicine (2007) 101, 1845–1863.
11. Falagas ME, Mourtzoukou EG, Vardakas KZ. Sex differences in the incidence and severity of respiratory tract infections. Respiratory Medicine 2007; 101: 1845–1863.
12. Dhakre S, Reddy P, Kulmi M, Goyal C. Antibiotic susceptibility pattern of bacteria isolated from patients of respiratory tract infection in a tertiary care hospital of Central India. Int J Basic Clin Pharmacol 2017;6:1740-6.
13. M. Woodhead: Community-acquired pneumonia in Europe: causative pathogens and resistance patterns. Eur Respir J 2002; 20: Suppl. 36, 20s–27s
14. Mansour MM, Al Hadidi KM, Hamed MS. Epidemiology and antimicrobial resistance of community-acquired pneumonia in children. J Health Res Rev 2017;4:122-9.
15. Ashley EA, Lubell Y, White NJ, Turner P. Antimicrobial susceptibility of bacterial isolates from community acquired infections in Sub-Saharan Africa and Asian low and middle income countries. Tropical Medicine & International Health. 2011 Sep;16(9):1167-79.
16. Raghunath D. Emerging antibiotic resistance in bacteria with special reference to India; J. Biosci.2008.33 593–603.