Original Research Article

Prospective Study on Microbiology of Respiratory Tract Infections with Interest in Multidrug Resistant Bacteria

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A B S T R A C T

Respiratory tract infections (RTI) are the commonest health problem demanding frequent consultation and hospitalisation. It causes morbidity & mortality in young children & elderly people. Moreover, in recent years, there has been dramatic rise in antibiotic resistance among respiratory pathogens. This study aims to identify the prevalence of community acquired respiratory tract infections, among patient visiting to respiratory clinic. To find out the prevalence of bacterial and fungal etiology, with interest to multidrug resistance (MDR) in respiratory infections. This study also focuses the respiratory health of people in Wayanad district of Kerala where the climate throughout the year is wet and cold. The study was carried out in 185 respiratory samples of patient presenting with symptoms of respiratory tract infections. Samples were collected and processed in the Microbiology Laboratory of DM WIMS Hospital, Meppady, Wayanad within a period of 2 months (October 2015– December 2015). The samples were collected & processed by standard microbiological technique. Antimicrobial susceptibility testing was performed by modified Kirby Bauer method as per the CLSI guidelines. Out of the 185 samples cases, only 100(54.05%) showed significant growth, 72(38.91%) samples were showing normal pharyngeal flora & 13(7.02) sputum samples were without showing any growth and was reported as no growth. Infection rate in males (72%) was higher than in female (28%) and was reported more in age group of 66-75 years. Out of the 100 samples showing significant growth 78 were bacteria and 22 were fungi. Out of the 78 cases with bacterial etiology, 18(23.07%) of them were *Streptococcus pyogens*, 4(5.15) *streptococcus pneumonia*, 17(21.79%) *Enterococcus* species, 16 (20.51%) *Klebsiella*, 9 (11.53%) *Pseudomonas*. Out of the 22 isolates of fungi 15(68.18%) were *Candida albicans*, 5(22.72%) were *Candida tropicalis* & 2(9.10%) were *Aspergillus flavus*. Prevalance of ESBL's were identified in 6 out of 78 cases, 2 MRSA , 1 MBL & also 3 MDR were Identified Conclusion. This study reveals that most of the respiratory infections are due to bacteria and the commonest infective agent was S*treptococcus pyogene*. RTI remains an important cause of morbidity & mortality in worldwide. Therefore correct identification of the causative pathogens & their antibiotic susceptibility pattern in turn helps to select best antibiotic therapy which ultimately helps for diagnosis & treatment of the patients.

Introduction

Respiratory tract infections (RTI) are among the most common infectious diseases of human's worldwide (Carroll, 2002). Infections of the respiratory tract are responsible for 4.4% of all hospital admission & 6% of all general practitioner consultations (Anderson *et al*., 1993). Infections occur by air borne route through inhalation. Coughing & sneezing spread the infection, close contact in school, at work & visit to the hospital also may lead to the transfer of causative agents. The infections are common during winter season (Elliot *et al*., 1996). Respiratory Tract Infections are persistent health problems & being a common reason for consultation & hospitalization, impose an enormous burden on society (Woskey *et al*., 2001). They also account for 3% - 5% of deaths in adults, especially over the age of 60 years. However, increasing antibiotic resistance in frequently isolated respiratory tract pathogens has complicated the selection process of antimicrobial agents (Guthrie, 2001). The dramatic rise in the antimicrobial resistance among the respiratory pathogens is a matter of potential concern worldwide (Mukhopadhyay *et al*., 2003). This study was conducted to find out the prevalence of respiratory tract infections among the people of Wayanad District.

Materials and Methods

The present study was carried out in the Department of Microbiology, DM WIMS Medical College, Meppadi, Wayanad, Kerala, India. This was carried out during a period of 3 months, from October 2015 – January 2016. A total of 185 respiratory samples were collected. Respiratory specimens like sputum, Bronchial wash, Throat swab, Endo tracheal secretion & Nasal swabs were collected from patients attending to pulmonology department. The samples were processed according to standard conventional methods and isolates were identified by biochemical tests. Antibiotic susceptibility testing was done by Kirby-Bauer disk diffusion method on Muller- Hinton agar and interpreted as per CSLI guidelines (CLSI, 2012). The isolates showing reduced susceptibility to carbapenems (imipenem and meropenem) were selected for detection of Metallo-beta lactamases (MBLs) enzyme by imipenem-EDTA disk method.

Results and Discussion

Out of 185 respiratory specimens studied, bacterial growth was noted in 100 samples, 72 samples showed the growth of normal flora & remaining 13 samples were without any growth. Out of the 100 cases with significant respiratory tract infections, 39(39%) were in the age group of 66-75 and 33(33%) cases were in the age group of 56-65 years.

Out of the 78 bacterial isolates, 18(23.07%) were *streptococcus pyogenes,* 4(5.12%) *Streptococcus pneumonia,* 17(21.79%) *Enterococcus species,* 3(3.84%) were *Staphylococcus aureus*, 7(8.97%) were *E.coli,* 16 (20.51%) were *Klebsiella species*, 9(11.53%) were *Pseudomonas*, and 3(3.84%) identified as *Acinetobacter.* Out of the 22 fungal isolates, 15 (68.18%) were *Candida albicans*, 5 (22.72%) were *Candida tropicalis* & 2 (9.09%) were *Aspergillus flavus*. The study also reveals that respiratory tract infections are more prevalent in male patients than females. Emergence of serious infections due to multidrug resistant organisms poses a therapeutic challenge. Antibiotic resistance analysis revealed the multiple drug resistance of the isolates to the commonly used antibiotics. (Table: 1 & 2)

Out of 78 bacterial isolates the different degree of drug resistance strains are to be

collected. In here 6(8%) ESBL, 3(4%) MDR, 1(1.2%) MBL, 2(2.5%) MRSA are identified (table 3 & figure 3). The prevalence of MDR in this study, *Klebsiella* species (67%), followed by *Acinetobacter* species (33.3%).The prevalence of ESBL was the *E.coli* followed by *Klebsiella* spp, *Pseudomonas* spp & *Enterobacter* spp.

The present study revealed high antibiotic resistance of Streptococcus species was noted on Tigecyclin (90.90%), Linezilod (59.09%), Pristinomicin (54.54%). Antibiotic resistance of *Klebsiella* species was noted on Co-Trimoxazol (87.50%), Amoxyclv (81.25%), Netilmicin (75%).

Table.1 Antibiotic resistant pattern of Gram positive isolates (% resistance)

Antibiotics	*Streptococcus pyogens* n =18	*Enterococcus* species n =17
Ampicillin (AMP)	11(61.11%)	6(35.29%)
Amoxyclav (AMC)	6(33.33%)	4(23.52%)
Amikacin (AK)	4(22.22%)	2(11.76%)
Clindamycin (CD)	7(38.88%)	10(58.82%)
Co-Trimaxazole (COT)	10(55.55%)	
Erithromycin (E)	11(61.11%)	5(29.41)
Linezolid (LZ)	13(72.22%)	3(17.64%)
Pristinomycin (RP)	12(66.66%)	6(35.29%)
Tigecyclin (TGC)	16(88.88%)	1(5.88%)
Vancomycin (VA)	3(16.66%)	2(11.76%)

Table.2 Antibiotic resistant pattern of the Gram negative isolates (% resistance)

Antibiotic	*Klebsiella* species (n:16)	*Pseudomonas* species (n:9)
Amikacin (AK)	2(12.5%)	4(44.44%)
Amoxyclav (AMC)	13(81.25%)	4(44.44%)
Aztreonam (AT)	10(62.5%)	3(33.33%)
Ceftazidime (CAZ)	8(50%)	4(44.44%)
Cefuroxime (CXM)	11(68.75%)	
Ciprofloxacin (CIP)	2(12.5%)	1(11.11%)
Co-Trimoxazole (COT)	14(87.5%)	7(77.77%)
Gentamicin (GEN)	10(62.5%)	6(66.66%)
Imipenem (IPM)	9(56.25%)	3(33.33%)
Meropenem (MRP)	8(50%)	3(33.33%)
Netilmicin (NET)	12(75%)	3(33.33%)

In conclusion, the present study, report shows that more than half of the total cases were having significant RTI, with the majority coming from adult male patients. Out of the 100 bacterial isolates 9(50%) *Streptococcus* species, 16(20.51%) *Klebsiella* species & 9 (11.53%) *Pseudomonas* species were isolated. A significant prevalence of Streptococcal respiratory infections predominates.

Out of the 100 isolates studied, 22 were fungal isolates. Among these 20 were Candida species & 2 were *Aspergillus* species, which needed antifungal therapy for better responses.

The multiple drug resistance (MDR) among the isolates observed against the regularly used antibiotics is very high. The present study revealed that 8% ESBL, 4% MDR, 1.2% MBL, 2.5% MRSA. Extended spectrum beta lactamases (ESBL) continue to be a major problem in clinical setups. Research in rapid molecular diagnosis should be encouraged to aid in rapid & improved management of severe infections with resistant organisms. Isolation policies have to be adopted while handling colonized or infected patients with drug resistant organisms. Inappropriate & irrational drug usage should be avoided. However, a combined approach of antibiotics restriction, effective surveillance & good infection control practices is essential to overcome antibiotic resistance. The causative agents show the variety of drug resistance, so the possibility of reducing resistance by controlling the use of antibiotics is a logical approach.

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