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Antibiogram Pattern of Klebsiella Pneumoniae Isolated At a Tertiary Care Centre of Saurashtra

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Abstract **Original Research Article**

Background: Strains of Klebsiella are responsible for a wide variety of diseases in humans; 1) Nosocomial infections [1] which have been well documented in India [2] 2) Respiratory tract infections 3) Acute pyelonephritis in pregnant women with urinary tract abnormalities such as urolithiases, hydronephrosis or congenital deformities 4) Sepsis (especially as mixed infections) 5) Secondary infections with other pathogenic bacteria [3] Multidrug resistant bacteria causes serious nosocomial and community acquired infections that are hard to eradicate by using available antibiotics. ***Methods:*** K. pneumoniae isolates which were confirmed by biochemical reactions during September - October 2014 were included in this study. The isolates were recovered from blood culture, pus, urine and sputum. Isolates were tested for antimicrobial drug sensitivity pattern. All clinical isolates were examined morphologically for Gram's stain & colony characteristics on agar media. ***Result:*** In present study we found that 50% of isolates were multi-drug resistant, which matches with Archana *et al*. [8]. As per our statistical data, all confirmed K.pneumoniae isolates were resistant to Ampicillin, and only 1% & 3% were sensitive to Ampicillin-sulbactam and Cefotaxime respectively. Of 97 isolates, 19(19.58%) were found Extended spectrum beta-lactamase (ESBL) resistant. ***Conclusion:*** On the basis of our analysis we conclude that Tetracycline, Co-trimoxazol, Cefotaxime-clavulanic acid, Gentamicin, Cephalothin, Cefotaxime, Ceftaxidime were significantly resistant; Amikacin, Piperacillin, Aztreonam were relatively resistant; whereas Piperacillin-tazobactum, Meropenem, Levofloxacin, Nitrofurantion and Cefepime were not resistant. Antimicrobial resistance is a global concern not only because it delays cure but it increases health costs and threatens patient care [7]. Moreover, uses of broad spectrum antibiotics, insufficient aseptic precautions and techniques with inadequate control of infections spread had aggravated this problem. To overcome multidrug resistant problem, we would like to suggest that physicians should promote rational use of Antibiotics to avoid drug resistance. There should be a hospital infection control committee and local antibiotic policy to overcome drug resistance. All healthcare professionals should work together with pharmacist and laboratory personnel to overcome this problem.

Keywords: Klebsiella, Antibiogram pattern, Drug resistance, extended spectrum beta-lactamase (ESBL).

INTRODUCTION

In 1883 Friedlander isolated a capsulated bacillus from the lungs of patient who died of pneumonia. This was named after him as Friedlander's bacillus. (Also called as Bacillus mucosus capsulatus). Later on this organism was given the generic name of Klebsiella, which is ubiquitously present and reported worldwide. Strains of Klebsiella are responsible for a wide variety of diseases in humans; 1) Nosocomial infections [1] which have been well documented in India [2] 2) Respiratory tract infections 3) Acute pyelonephritis in pregnant women with urinary tract abnormalities such as urolithiases, hydronephrosis or congenital deformities 4) Sepsis (especially as mixed infections) and 5) Secondary infections with other pathogenic bacteria [3].

Multidrug resistant bacteria causes' serious nosocomial and community acquired infections that are hard to eradicate by using available antibiotics. Moreover, extensive use of broad-spectrum antibiotics in hospitalized patients has led to both increased carriage of Klebsiella and the development of multidrug-resistant strains that produce extended–spectrum beta-lactamase (ESBL). Emergence of Multi-drug resistant bacteria is associated with four resistant strategies that diminish the effects of antibiotics:

- Enzymatic modification and inactivation of antibiotics
- Restriction of drug targets access
- Alteration or complete diminish of drug target
- Phenotypic resistance [4]

Thus the present study was carried out with the following aims and objectives

To analyze the severity of multidrug resistance of K.pneumoniae in India, to know the challenges faced by healthcare personnel during treatment of multi drug resistant K.pneumoniae infected patients, to come up with some suggestions to overcome multidrug resistant problem and to promote rational use of antibiotics to avoid resistance.

MATERIAL AND METHODS

K.pneumoniae isolates which were confirmed by biochemical reactions during September - October 2014 was included in this study. The isolates were recovered from blood culture, pus, urine and sputum. Isolates were tested for antimicrobial drug sensitivity pattern. All clinical isolates were examined morphologically for Gram's stain & colony characteristics on agar media.

Biochemical characterization

Those lactose fermenter exhibiting mucoid colonies on Mac Conkey agar were processed for biochemical testing.

Biochemical test employed were

- Urease production
- Citrate utilization
- Fermentation of sugars

Indole test and H2S production on TSI agar, oxidase and catalase were also carried out. Besides these tests, motility was also checked. For biochemical tests standard procedures were used [5].

Antibiotic sensitivity

Antibiotic sensitivity of K.pneumoniae isolates was done by Bauer's and Kirby's disc diffusion method [6]. Organisms were grown in BHI broth and inoculated on Mueller Hinton agar plates by sterile swabs and then antibiotic discs were placed on media and pressed gently followed by overnight incubation.

The antibiotics that were tested included

Ampicillin (20mcg)	Aztreonam(30mcg)
Ampicillin-sulbactum(10+10mcg)	Meropenem(30mcg)
Piperacillin (100mcg)	Gentamycin (10mcg)
Piperacillin-tazobactam(100+10mcg)	Amikacin (30mcg)
Cephalothin(30mcg)	Norfloxacin(10mcg)
Cefotaxime (30mcg)	Levofloxacin(5mcg)
Ceftaxidime(30mcg)	Tetracycline (30mcg)
Cefepime(30mcg)	Cotrimoxazole (25mcg)
Cefotaxime-clavulanic acid(30+10mcg)	Nitrofurantion(300mcg)

RESULTS AND DISCUSSIONS

The clinical isolates of Klebsiella were examined by array of biochemical tests.

K. pneumoniae cultures showed

- Urease production
- Citrate utilization
- Catalase reaction
- Fermentation of sugars (Glucose, lactose, sucrose, mannitol)
- Acid/acid with gas on Triple Sugar Iron agar, no H2S production

In present study we found that 50% of isolates were multi-drug resistant, which matches with Archana *et al*. [8]

As per our statistical data, all confirmed K. pneumoniae isolates were resistant to Ampicillin, and only 1% & 3% were sensitive to Ampicillin-sulbactam and Cefotaxime respectively. Of 97 isolates, 19(19.58%) were found Extended spectrum beta-lactamase (ESBL) resistant.

In our study we found that K.pneumoniae strains were

- Highly susceptible to
  - Piperacillin-tazobactum (91.48%)
  - Carbapenems (100%)
  - Quinolones (83.87%)
  - 4th generation Cephalosporins (75.53%)
  - Nitrofurantion (83.33%) urinary samples

- Less number of strains were sensitive to
  - Amikacin (60.21%)
  - Piperacillin (57.89%)
  - Aztreonam (51.06%)

- Very less number of strains were sensitive to
  - Cefotaxime-clavulanic acid (37.66%)
  - Gentamicin (31.18%)
  - Co-trimoxazol (29.34%)
  - Tetracycline (20.43%)
  - 1st-3rd generation Cephalosporins

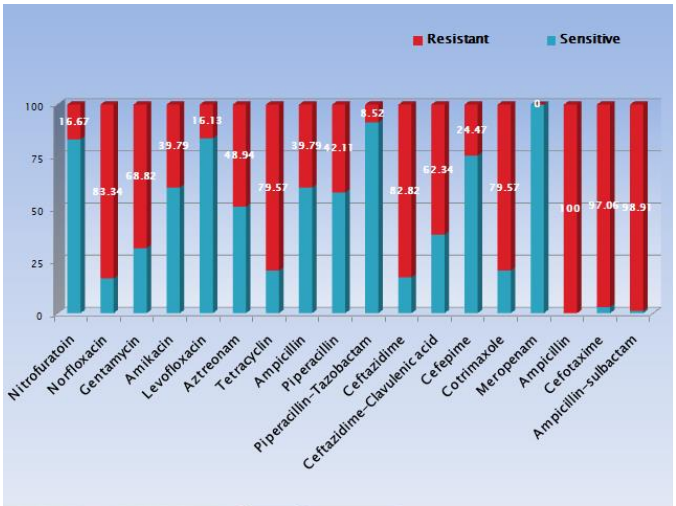

Fig-1: Antibiogram pattern of Klebsiella pneumoniae

Almost five antibiotics: Piperacillin-tazobactum, Carbapenems, Quinolones, Cefepime and in urinary samples to Nitrofurantion showed susceptibility to K.pneumoniae.

Whereas seven antibiotics: Amikacin, Piperacillin, Aztreonam, Cefotaxime-clavulanic acid, Gentamicin, Co-trimoxazol, and Tetracycline and 1st-3rd generation Cephalosporins showed significant resistance.

CONCLUSION

On the basis of our analysis we conclude that Tetracycline, Co-trimoxazol, Cefotaxime-clavulanic acid, Gentamicin, Cephalothin, Cefotaxime, Ceftaxidime were significantly resistant; Amikacin, Piperacillin, Aztreonam were relatively resistant; whereas Piperacillin-tazobactum, Meropenem, Levofloxacin, Nitrofurantion and Cefepime were not resistant. Antimicrobial resistance is a global concern not only because it delays cure but it increases health costs and threatens patient care [7]. Moreover, uses of broad spectrum antibiotics, insufficient aseptic precautions and techniques with inadequate control of infections spread had aggravated this problem. To overcome multidrug resistant problem, we would like to suggest that physicians should promote rational use of Antibiotics to avoid drug resistance. There should be a hospital infection control committee and local antibiotic policy to overcome drug resistance. All healthcare professionals should work together with pharmacist and laboratory personnel to overcome this problem.

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