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ANTIBIOTIC SENSITIVITY PATTERN OF *KLEBSIELLA SPECIES* ISOLATED FROM VARIOUS CLINICAL SAMPLES

Microbiology

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ABSTRACT

Gram-negative bacilli form the frequent cause different types of infections. *Klebsiella species* are widely distributed in nature. They can cause pulmonary and extrapulmonary infections, including enteritis, meningitis, urinary tract infections, bacteremia, septicaemia, etc. Present study aimed at evaluating the antimicrobial resistance pattern among the *Klebsiella species* from different clinical specimens. A total of 628 clinical isolates of *Klebsiella species* were obtained during the period of 3 years, most commonly from pus, sputum and urine samples. Most of the *Klebsiella species* were found sensitive to Imipenem and Cefepime while a high degree of resistance was observed towards most of the commonly used antibiotics like the third generation cephalosporins, aminoglycosides, ciprofloxacin, etc. The increasing clinical incidence of antibiotic-resistant bacteria is becoming a major global health care issue. For this reason, correct choice and use of antibiotics is the necessity of time.

KEYWORDS

Klebsiella species, antibiotic resistance

Introduction

Gram-negative bacilli form the inevitable cause for four most frequent types of infections, including pneumonia, surgical site infections (SSI), urinary tract infection (UTI) and blood stream infections (BSI).[1] The genus Klebsiella consists of non-motile, non-sporing, non-acid fast, and capsulated gram negative rods. They are widely distributed in nature, occurring both as commensals in intestines and as saprophytes in soil and water.[2] These are gram-negative, rod-shaped, facultative aerobic and anaerobic, fermentative, catalase positive, lactose negative, nitrate reducing organisms showing mucoid growth and have a large polysaccharide capsule.[1]

Klebsiella pneumoniae is most frequently recovered from clinical specimens and can cause a classic form of primary pneumonia. They can also cause a variety of extrapulmonary infections, including enteritis and meningitis in infants, urinary tract infections in children and adults, nosocomial pneumonia, bacteremia in immunocompromised humans and septicaemia.[3,4] Epidemic and endemic nosocomial infections caused by *Klebsiella* species are leading causes of morbidity and mortality all over the world.[5]

Antibiotics provide the main basis for the therapy of microbial infections.[6] Extensive use of broad-spectrum antibiotics in hospitalized patients has led to both increased carriage of *Klebsiella spp* and the development of multidrug resistant strains.[7]

The present study aimed at giving an insight into the antimicrobial resistance pattern among the *Klebsiella species* from different clinical specimens obtained from a tertiary care hospital.

Material and Methods:

Retrospective study was conducted for duration of three years, from January 2015 to December 2017. All samples obtained during this period were screened by staining as well as culture. Amongst the various bacteria isolated, strains of *Klebsiella spp* were identified using standard biochemical tests and further subjected to antibiotic susceptibility testing by Kirby Bauer disk diffusion method. Based on CLSI guidelines, various antibiotics were tested which included Ciprofloxacin (5µg), Cefuroxime (30µg), Cotrimoxazole (1.25/23.75 µg), Gentamicin (10µg), Amikacin (30µg), Cefotaxime (30µg), Ceftriaxone (30µg), Cefepime (30µg), Ampicillin-Sulbactam (10/10 µg), Imipenem (10µg).

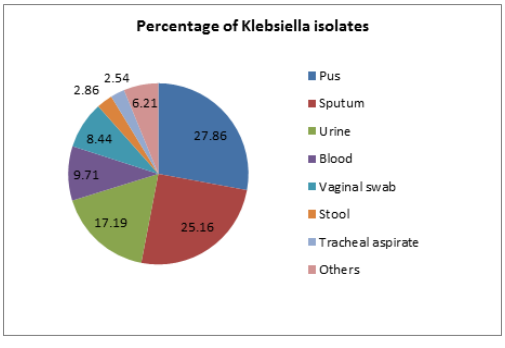
Results:

A total of 628 clinical isolates of *Klebsiella species* were obtained during the period of 3 years. These were most commonly isolated from pus, sputum and urine samples.

Table 1: showing the percentage of isolation of Klebsiella species from different clinical samples

Clinical specimen	No. of isolates	Percentage
Pus	175	27.86
Sputum	158	25.16
Urine	108	17.19
Blood	61	9.71
Vaginal swab	53	8.44
Stool	18	2.86
Tracheal aspirate	16	2.54
Others	39	6.21

Chart 1: showing distribution of Klebsiella isolates according to clinical specimens

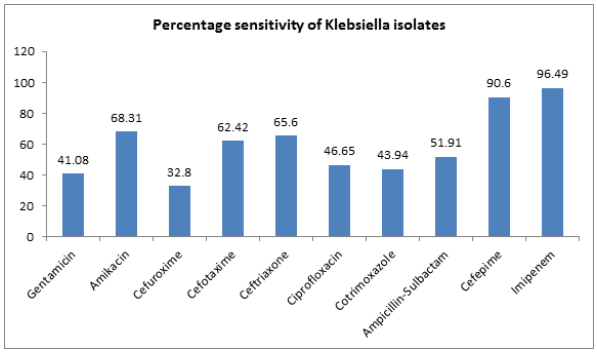


On antibiotic susceptibility testing, most of the *Klebsiella species* were found sensitive to Imipenem and Cefepime while a high degree of resistance was observed towards most of the commonly used antibiotics like the third generation cephalosporins, aminoglycosides, ciprofloxacin, etc.

Table 2: showing antibiotic sensitivity pattern of Klebsiella isolates

Antibiotic	No. of sensitive isolates	Percentage of sensitive isolates
Gentamicin	258	41.08
Amikacin	429	68.31
Cefuroxime	206	32.80
Cefotaxime	392	62.42
Ceftriaxone	412	65.60
Ciprofloxacin	293	46.65
Cotrimoxazole	276	43.94
Ampicillin-Sulbactam	326	51.91
Cefepime	569	90.60
Imipenem	606	96.49

Chart 2: showing percentage sensitivity of Klebsiella isolates to different antibiotics



Discussion

The control of infections due to *Klebsiella spp.* is seriously threatened by the steady rise in the number of these microorganisms that show resistance to antimicrobial agents. Resistant infections, like these, adversely affect mortality, treatment costs, disease spread and duration of illness.[2]

In present study, *Klebsiella spp.* were most commonly isolated from pus samples. Similar results were obtained in a study by Shah K *et al*.[6] Pus, sputum and urine formed the most common sources of these isolates. Similar findings were noted by Shah K *et al* and Babakhani S *et al.*[1,6]

Sensitivity to Gentamicin was 41.08% in present study, which was similar to studies conducted by Sarathbabu *et al*, Kumar AR and Akujobi CN.[7,8,9] Sensitivity to Amikacin was 68.31% in present study. Similar pattern was seen in studies by Sarathbabu *et al,* Varghese A, Ullah F *et al* and Babakhani S *et al*.[1,8,10,11]
Sensitivity to Cefuroxime was 32.80%, which was similar to study by Kumar AR.[7]

While sensitivity of *Klebsiella spp* to Ceftriaxone and Cefotaxime was 65.60% and 62.42% respectively. Similar sensitivity pattern to cephalosporins was observed by Manikandan C and Amsath A.[12]

Sensitivity to Cotrimoxazole was 43.94% in present study, which was similar to study conducted by Kumar AR.[7] Whereas sensitivity to Ampicillin-Sulbactam was 51.91%, which was similar to the findings in the studies by Sarathbabu *et al* and Kumar AR.[8,13]

Highest sensitivity was observed towards Cefepime and Imipenem in present study amounting to 90.6% and 96.49% respectively. Similar sensitivity results for Imipenem were obtained by Taitt CR *et al* and Ravichitra KN *et al*.[14,15]

The increasing clinical incidence of antibiotic-resistant bacteria is becoming a major global health care issue. Among MDR pathogens, *Klebsiella pneumoniae* forms one of the world's most dangerous superbugs and is becoming resistant to virtually every antibiotic available today.[16]

Conclusion

Extensive use of broad-spectrum antibiotics for treatment in hospitalized patients has led to development of multidrug resistant strains. For this reason, correct choice and use of antibiotics is important, which in turn demands the antibiotic susceptibility testing of all the isolates. The magnitude of the existing problem of antimicrobial resistance should be taken into utmost consideration and rational prescription of antibiotics needs to be strictly followed.

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