Original Article

"ANTIMICROBIAL SENSITIVITY PATTERN OF KLEBSIELLA SPECIES FROM DIFFERENT CLINICAL SAMPLES AT A TERTIARY CARE CENTRE AT KANPUR"

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ABSTRACT: Klebsiella species has become one of the most common causes of community as well as hospital acquired infections. This study was conducted to determine the isolation rate of Klebsiella species ,their antibiogram in a tertiary care centre at Kanpur. **Material & Methods:** A total number of 50 Klebsiella species were isolated from different clinical samples during March 2017 to May 2017 and identified by standard microbiological methods. Antibiogram were determined by standard protocol according to CSLI guideline. Carbapenamase and ESBL production were determined by CDDT. **Results:** Out of 50 Klebsiella Species 27 were *K.pneumoniae* and rest 23 were *K.oxytoca*. The most prevalent infection caused by *K.pneumoniae* were respiratory tract infection (48.14%,13 out of 27) followed by urinary tract infection (33.33%,9 out of 27), bacterimia (11.11%, 3 out of 27) and pyogenic infection (7.4%, 2 out of 27).*K.oxytoca* caused urinary tract infection (56.52%, 13 out of 23) followed by respiratory tract infection(34.78%, 8 out of 23) and wound infections(8.6%, 2 out of 23). The male females ratio was 1:1.2 and above 60 years of age was more affected. K. pneumonia was found to be 100% sensitive to polymyxin and tigicyclines. 82% Klebsiella exhibited resistant to carbapenems. 66.66% K.*pneumoniae* and 69.56% K.*oxytoca* were ESBL producers . Among Klebsiella isolates 76%, 80%, and 90% were resistant to amikacin, ciprofloxacin and cefixime respectively. **Conclusion:** The data of this study revealed the resistance to commonly used antibiotics. Because of the high risk for developing resistance during treatment, all severe infections should be carefully monitored during therapy and proper antibiotic policy should be implemented.

Keywords: Klebsiella pneumonia, Klebsiella oxytoca, Antibiogram.

INTRODUCTION

Enterobacteriaceae are referred to as enterobacteria as several members live in the intestine of animal. Enterobacteriaceae may account for 80% of clinically significant isolates gram negative bacilli and 50% of clinically significant bacteria in clinical microbiology. They account for nearly 50% of septicaemia cases, more than 70% of UTI, a significant percentage of intestinal infections,[1] and some important pathogens like *Klebsiella species* are involved in hospital acquired infections[2]. Klebsiella spp. are ubiquitous in nature. In-spite to being the normal commensal of the intestine it also present in respiratory tract of humans and animals [2]. Klebsiella is a Gram negative, non-motile, encapsulated, lactose fermenting, facultative anaerobe. There are five species under this genus, Klebsiella pneumoniae, Klebsiella oxytoca, Klebsiella planticola, Klebsiella terrigena, and Klebsiella ornithinolytica. It is the most common causative agent of nosocomial and community acquired infections. Klebsiella spp have several virulence factors such as capsular polysaccharides, lipopolysaccharide (LPS) and iron-scavenging systems (siderophores)[3].

Drug resistance of Klebsiella species is frequently being reported worldwide. The antimicrobial susceptibility pattern of Klebsiella species shows variation in different geographical settings[4].

In order to implement effective control measures,the present study was conducted to determine the isolation rate of Klebsiella species their antibiogram in a tertiary care centre at Kanpur.

MATERIAL AND METHODS

This cross sectional study was conducted in Rama Medical College Hospital & Research Center, Kanpur in Department of Microbiology. In this study total number of 50 Klebsiella species was isolated from different clinical samples during March 2017 to May 2017.

The clinical samples were inoculated onto Blood and MacConkey agar (CLED in case of Urine sample). After incubation at 37°C for 18-24 hours colony characteristics were observed. On MacConkey agar, Klebsiella produces big, round, convex, mucoid and lactose fermenting colonies.**[Fig 1]** In gram staining, it appears Gram negative, short, stout, blunt rods. For further species identification there were no. of biochemical

reactions which includes Indole test, Voges-Proskauer test, Citrate utilization test, Urease test, Triple sugar iron test, sugar fermentation tests etc.[3]

All 50 Klebsiella species strains were screened for antimicrobial susceptibility testing by Kirby-Bauer disc diffusion method on Mueller-Hinton agar. Antibiogram were determined by standard protocol according to CSLI guideline[5]. Strains, resistant for third generation cephalosporins as well as aztreonem were considered as ESBL producers. These were further confirmed by combined disk diffusion methion. Results were recorded as per CLSI guidelines.

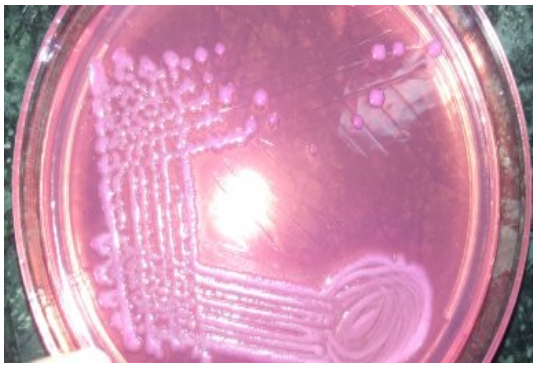

Fig 1: Klebiella species on MacConkey Agar

RESULTS

Out of 50 Klebsiella Species 27 were *K.pneumoniae* and rest 23 were *K.oxytoca*. **[Fig 2]** The most prevalent infection caused by *K.pneumoniae* were respiratory tract infection (48.14%,13 out of 27) followed by urinary tract infection (33.33%,9 out of 27), bacterimia (11.11%, 3 out of 27) and wound infection (7.4%, 2 out of 27). **[Fig 3]** *K.oxytoca* caused urinary tract infection (56.52%, 13 out of 23) followed by respiratory tract infection(34.78%, 8 out of 23) and wound infections(8.6%, 2 out of 23). **[Fig 4]** *K.pneumonia* as well as *K.oxytoca* was found to be 100% sensitive to polymyxin. Klebsiella pneumonia exhibited high resistant to carbapenems. Sensitivity pattern for other antibiotics of *Klebsiella pneumonia* and *Klebsiella oxytoca* has mentioned in [**Fig 5 and Fig 6].** ESBL producer Klebsiella species were mentioned in **fig 7**.

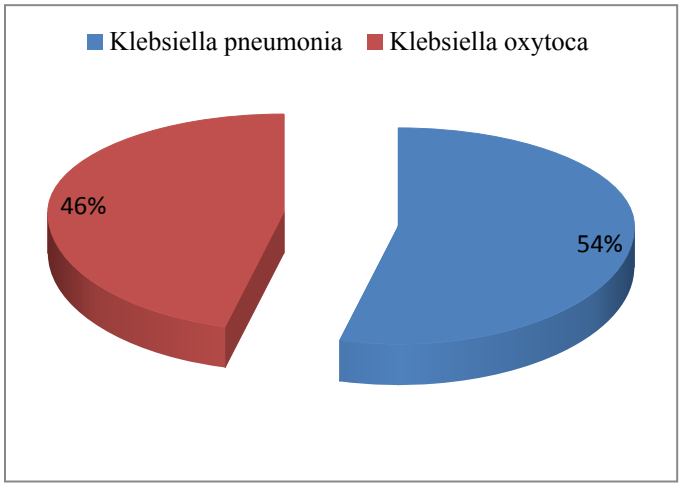

Fig 2: Distribution of Different Klebsiella species

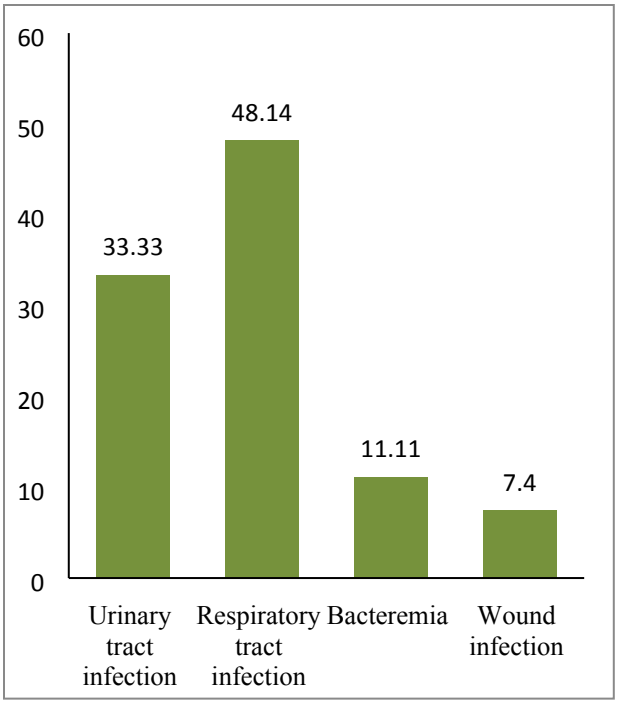

Fig 3: Distribution of *Klebsiella pneumonia* among different infections

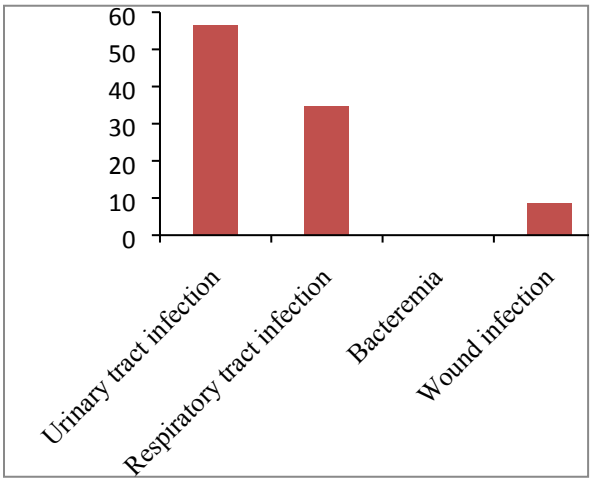

Fig 4: Distribution of *Klebsiella oxytoca* among different infections

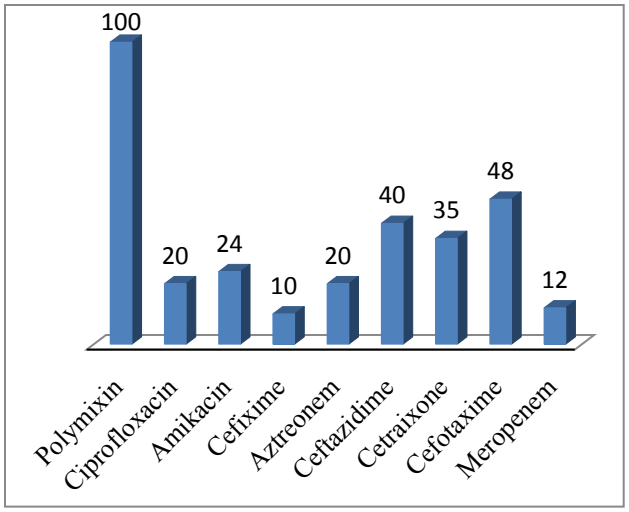

Fig 5: Antibiotic sensitivity pattern of *Klebsiella pneumonia* isolates recovered from patients

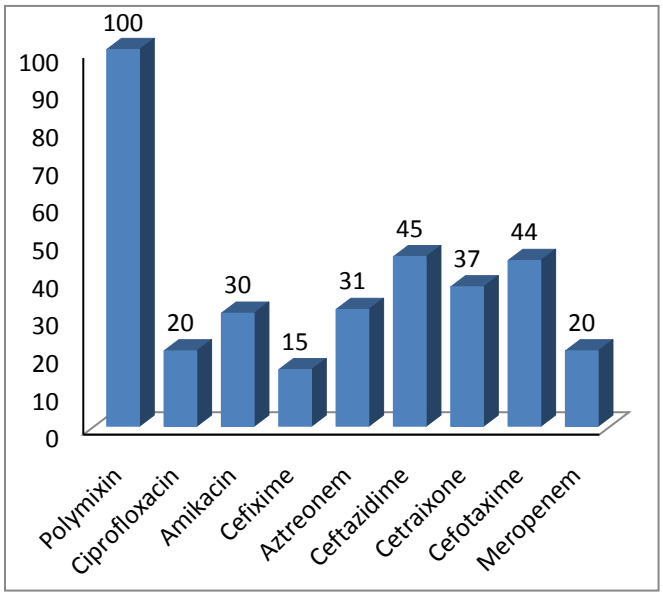

Fig 6: Antibiotic sensitivity pattern of *Klebsiella oxytoca* isolates recovered from patients

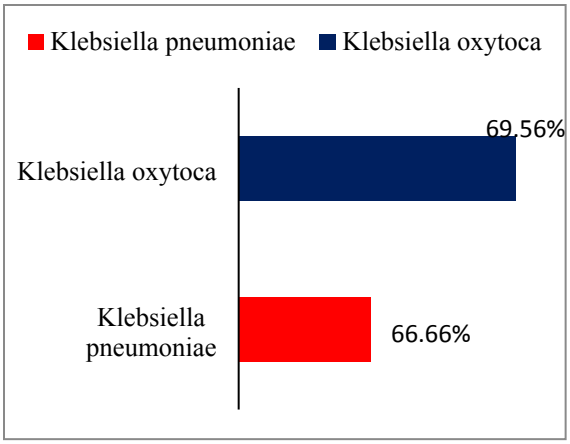

Fig 8: ESBL producer Klebsiella species

DISCUSSION

Klebsiella is an important nosocomial human pathogen that has the potential to cause severe morbidity and mortality. In the present study total 50 non repeated Klebsiella isolates were collected from March 2017 to May 2017. In Kanpur, only two species of Klebsiella were isolated. Out of 50 Klebsiella Species 27 (54%) were *K.pneumoniae* and rest 23(46%) were *K.oxytoca*.

Similar to our study, Namratha et al[4] found isolation rate of K. pneumoniae was more compared to K. oxytoca. Asmaa et al. [6] who isolated 65.5% of K. pneumoniae and 34.5% of K. oxytoca from clinical samples. Kaur et al. and Rao et al. reported isolation rate of K. pneumoniae and K. oxytoca (14.8% & 4.2%), and (13.52% & 0.9%) respectively [7,8]. K. pneumoniae was the predominant species isolated in all previous reports including the present study.

The most prevalent infection caused by *K.pneumoniae* were respiratory tract infection (48.14%,13 out of 27) followed by urinary tract infection (33.33%,9 out of 27), bacterimia (11.11%, 3 out of 27) and wound infection (7.4%, 2 out of 27). Similar to our study, other authors also reported Klebsiella pneumonia as a causative agent of respiratory tract infection,UTI, Blood stream infection and wound infection[9,10,11,12].

Unlike *Klebsiella pneumonia, Klebsiella oxytoca* predominantly caused urinary tract infection followed by respiratory tract infectionand wound infections. Here no case of bacteremia was found doe to *Klebsiella oxytoca*. Biradar S et al reported highest percentage of Klebsiella spp from pus followed by urine, sputum[13].

In the present study, only 20% and 12% of the isolates of *Klebsiella pneumonia and Klebsiella oxytoca* showed sensitivity to meropenem respectively.

Ciprofloxacin (20%) was the also not effective antibiotic against Klebsiella pneumoniae. While Shilpa K et al. found >65% of strains were sensitive for

ciprofloxacin and found to most effective agent[14].

Amikacin and cephalosporins were also not effective antibiotic agents against Klebsiella pneumonia. In contrast to our study, Shilpa K et al.[14] reported as effective drugs. While other studies in the favor of our results [15,16].

Similar to Klebsiella pneumonia, Klebsiella oxytoca showed high resistance towards beta lactam antibiotics including carbapenem and amikacin. Only polymyxin was most effective antibiotic but due to nephrotoxicity its consumption is low.

In the present study, approx 70% of Klebsiella oxytoca were positive for combined disk diffusion test for ESBL producer. And 66% of Klebsiella pneumonia was ESBL producer.

Asha A et al. and Chakraborty et al. reported ESBL producing Klebsiella pneumoniae was 50.88% and 50% respectively. While ESBL producing Klebsiella oxytoca were only 2.94% and 25% by Asha A et al. and Chakraborthy et al. respectively. A study conducted by Asmaa et al., (2012), ESBL producers among Klebsiella pneumoniae (11.2%) were more than for Klebsiella oxytoca (5.2%). The prevalence of ESBL producers vary from one region to the other due to the differences in the infection control practices, extensive, inappropriate use of new extended spectrum antibiotics, antibiotic policy, carriage rate among hospital staff.

CONCLUSION

The data of this study revealed that Klebsiella pneumoniae most common isolate than Klebsiella oxytoca. Klebsiella pneumoniae mainly cause respiratory tract infection while Klebsiella oxytoca are the causative agent of UTI. Both the isolates were resistance to commonly used antibiotics. Because of the high risk for developing resistance during treatment, all severe infections should be carefully monitored during therapy and proper antibiotic policy should be implicated.

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