Original Research Article

A study of Multi Drug Resistant UTI caused by Klebsiella Oxytoca

Priyanka Narain[1], Nand Kishor[2*], SN Singh[3]

[1]Assistant Professor, Department of Microbiology, Patna Medical College, Patna, India
[2]Tutor, Department of Microbiology, Patna Medical College, Patna, India
[3]Professor and Head, Department of Microbiology, Patna Medical College, Patna, India

Received: 08-04-2021 / Revised: 22-05-2021 / Accepted: 21-06-2021

Abstract

Background: Klebsiella oxytoca is one among the several Klebsiella species that are opportunistic pathogens that cause a wide spectrum of severe diseases. This bacteria is naturally found in the intestinal tract, mouth and nose. Outside the gut, however these bacteria can cause serious infection. Klebsiella oxytoca is emerging as an important bacterial isolate causing urinary tract infections in adults and having multiple drug resistance to commonly used antibiotics. It is a gram-negative pathogen, cylindrical rod shaped and non-motile in nature.**Aim and objective:** To study multi drug resistant urinary tract infection caused by Klebsiella oxytoca.**Material and methods:** The urinary samples were inoculated on CLED and MacConkey agar. Further identification was done as per routine laboratory protocols. Antibiotic susceptibility testing was done in accordance with Clinical and Laboratory Standard Institute (CLSI) guidelines. Antibiotics disks included in this study by Kirby–Bauer's disk diffusion method. Collected samples were processed at Department of Microbiology, PMCH, Patna.**Results:** We analyzed our data to observe the current pattern of drug resistance among Klebsiella Oxytoca isolated from urinary samples from the period of March 2020 to April 2021 at Patna Medical College Hospital, Patna. A total of 15,200 samples were processed at the hospital laboratory during this period. Klebsiella species were isolated from 510 of these clinical samples Out of these, 480 were Klebsiella pneumoniae and 30 were Klebsiella Oxytoca. These isolates showed 62% of resistance to Imipenem and Meropenem. The resistance to Gentamicin and Amikacin was 62%. Resistance to Ciprofloxacin, Levofloxacin, Moxifloxacin and Aztreonam were 45%. The data from our study showed an increasing burden of infection caused by this bacteria. It is recommended that Hospital Infection Control Committee must keep a close watch on the antibiotic pattern of KlebsiellaOxytoca for better patient care.**Conclusion:** K. Oxytoca species are rapidly developing multi drug resistance in UTI. Earlier it was only Pseudomonas and Acinetobacter that showed high resistance to commonly used antibiotics. UTI caused by multidrug resistant bacteria pose a serious threat to public health and economy. A society without working antibiotics would be like returning to era when a small injury or infection could easily become a threat to life. It is recommended that hospital infection control committee must keep a close watch on the antibiotic pattern of Klebsiellaoxytoca of better patient care and genomic surveillance focus should remain a priority in the hospital environment.

Keywords: Multidrug resistant UTI, K. Oxytoca, K. Pneumoniae

Introduction

Klebsiella species are becoming an important pathogen of humans and being implicated in increasing morbidity. Normally found in bowel of man,animal,water and soil. Often causes broncho pneumonia,UTI, septicemia etc. It has ability to cause outbreak of nosocomial infection as it often exchanges plasmid borne resistance with other bacteria[1]. Among Klebsiella species, K. Oxytoca is emerging as an important bacterial isolate causing UTI in adults and having multiple drug resistance to commonly used antibiotics[2].It is a gram-negative pathogen,cylindrical rod shaped and non-motile in nature. Symptoms of Klebsiella Oxytoca vary from person to person and depends upon the location of the infection. Klebsiella Oxytoca can cause different type of infections, some of which have serious side effects including pneumonia. It can also cause UTI. Common symptoms of Klebsiella Oxytoca infections include fever,chills, severe body aches, flu like symptoms, difficulty in breathing, mucus filled cough. Less common symptoms are discharge from a wound, painful micturition, severe inflammation around wound, pain in the lower abdomen and vomiting. The causes of developing Klebsiella Oxytoca infection are in healthcare settings such as nursing homes, hospitals, ICU, having diabetes, being alcohol dependent, having an IV catheter, using antibiotics for long period. The people who are in good health can recover from Klebsiella Oxytoca infection without any complications, but those who have serious medical conditions or whose immune system is already compromised, may find It harder to eliminate Klebsiella Oxytoca infection. The symptoms of Klebsiella Oxytoca UTI are: pain and cramping in the lower abdomen, dysuria, hematuria, frequent urge to urinate, fever, chills and back pain. Klebsiella Oxytoca is a clinically relevant pathogen, that has the propensity to acquire multidrug resistance(MDR) and thus limiting the therapeutic options for treatment. K. Oxytoca utilizes variety of virulence factors especially capsule polysaccharides, adhesins and determinants for Iron acquisition, which are used for survival and immune evasion during infection. Typically, K. Oxytoca is an opportunistic pathogen which mostly affects those with weakened immune system. ESBLS (Extended Spectrum Beta Lactamase),Ampe lactamase,KPC (Klebsiella pneumonia Carbapenase) and aminoglycosides modifying enzymes are also responsible for the resistance of antibiotics in cases of klebsiella Oxytoca[3-5]. The most popular virulence factor found in other studies were fimHand mrkD which encode type1 and type 3 fimbrialadhesins respectively which mediate binding to epithelial

**Correspondence*
Dr. Nand Kishor
Tutor, Department of Microbiology, Patna Medical College, Patna, India
E-mail: dr.nandkishordmch@gmail.com

cells of the urinary tract and promote biofilm development. In Klebsiella Oxytoca mainly oxy-2 gene are involved and in K pneumoniae,CTX m2,3,14 are involved in the resistance of the drugs.

Material and methods

Present study was carried out to observe the current pattern of drug resistance among K. Oxytoca isolated from urinary samples. Between March 2020 to March 2021.At Patna Medical College Hospital, Patna. Collected samples were processed at Department of Microbiology, PMCH, Patna. The samples received were directly inoculated on CLED and MacConkey Agar. Further identification was done as per routine laboratory protocols. (Table 1)

Table 1: Microbiological identification of the isolated clinical strains of K. Oxytoca and K. Pneumoniae.

	K. Oxytoca	K. Pneumoniae
Media CLED	Yellow, mucoid	Yellow, mucoid
MacConkey agar	LF, pink, mucoid	LF, pink, mucoid
Indole	Positive	Negative
Urease	Positive	Positive
Citrate	Positive	Positive
Motility	Non-Motile	Non-Motile
MR	Negative	Negative
VP	Negative	Negative
Catalase	Positive	Positive

CLED -> Cysteine lactose electrolyte deficient, MR -> methyl red, VP->Voges-Proskauer,

Antibiotic susceptibility testing was done in accordance with Clinical and Laboratory Standard Institute (CLSI) guidelines. Antibiotics disks included in this study, by Kirby–Bauer's disk diffusion method [6].Ceftriaxone (30 mg), Ceftazidime (30 mg), Cefotaxime (30 mg), Aztreonam (30 mg), Gentamicin (10 mg), Amikacin (30 mg), Ciprofloxacin (5 mg), Imipenem (10 mg), Meropenem (10 mg), Tigecycline (15 mg) and Colistin (10 mg).

Isolates showing inhibition zone of ≤22 mm for Ceftazidime (30 mg) (MIC ≥16 mg/ml), ≤27 mm for Cefotaxime (30 mg) (MIC ≥4 mg/ml) and ≤27 mm for Aztreonam (30 mg) (MIC ≥16 mg/ml)Ertapenem (10 mg) is being considered the best carbapenem for detection of KPC resistance. Isolates showing inhibition zone of ≤18 mm and MIC ≥4 mg/ml were being considered positive for KPC.

Results

A total of 15,200 samples were processed at the hospital laboratory during the study period. Klebsiella was isolated from 510 of these clinical samples[fig1]. Out of these Klebsiella species, 480 were K. pneumoniae and 30 were K. Oxytoca. [fig2] E. coli isolated :14790 and others: 620. In case of K.Oxytoca, isolates showed 62% of resistance to Imipenem and Meropenem. Resistance to Gentamicin, Amikacin was observed in 62% samples.Resistance to Ciprofloxacin, Levofloxacin, Moxifloxacin and Aztreonam was better (45%). [fig3 and fig4] Minimum two samples were processed to confirm the bacterial isolates. Antibiotic sensitivity pattern was studied and it was found that all the K. Oxytoca isolates were sensitive to colistin and tigecycline. Bacteria isolated in urinary sample

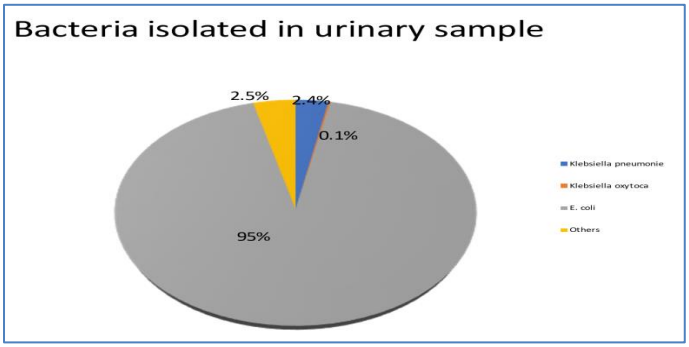

Fig 1:Bacteria isolated in urinary sample

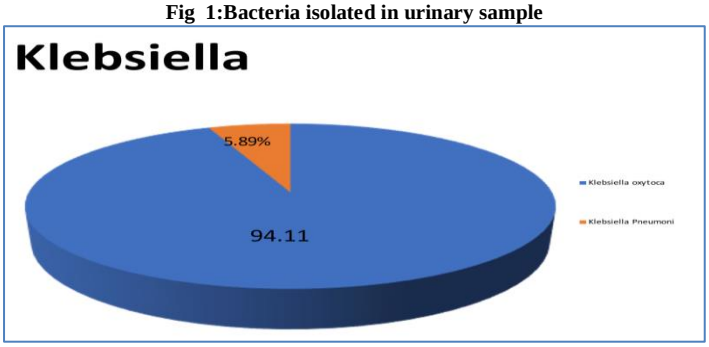

Fig 2:Klebsiella

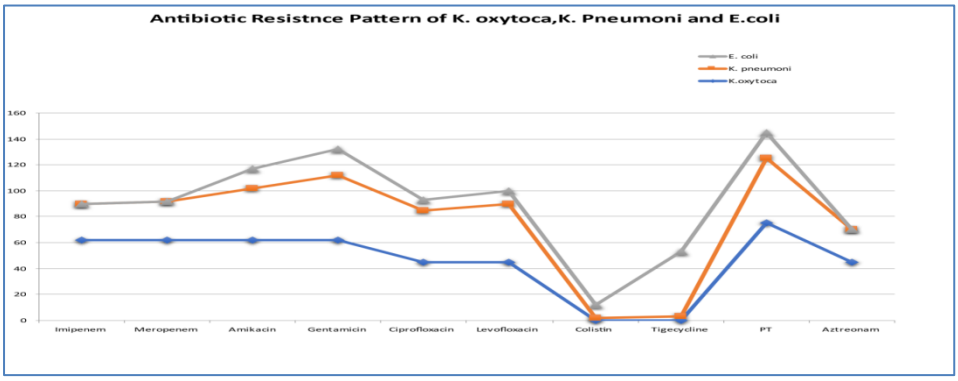

Fig 3:Antibiotic resistance pattern of K.oxytoca,K.Pneumonia and *E.coli*

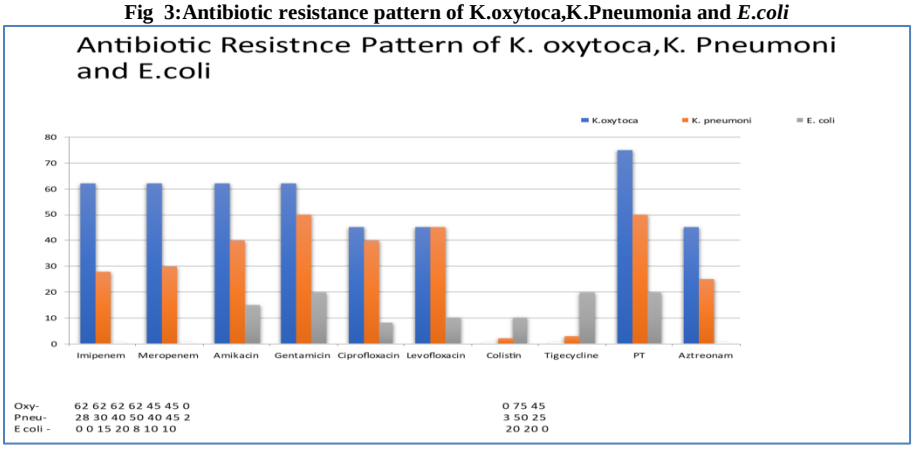

Fig 4:Antibiotic resistance pattern of K.oxytoca,K.Pneumonia and *E.coli*

Discussion and Conclusion

K. Oxytoca species are rapidly developing multi drug resistance in UTI. Earlier it was only Pseudomonas and Acinetobacter that showed high resistance to commonly used antibiotics. In our study UTI that was caused by Klebsiella, K. pneumonia was isolated in 94% and K. Oxytoca in about 6% , another study showed similar results in which prevalence of k. Oxytoca was 11% isolated in Iraqi UTI patients; some studies detected K. Oxytoca in urine sample in 8% of all the patients with UTI[7].K. Oxytoca is capable of producing enzyme such as carbapenemase[8].UTI caused by multidrug resistant bacteria pose a serious threat to public health and economy. The rise of drug resistant UTI is worrisome. In many of these resistant UTIs, it may simply be impossible to identify which patients are at risk. Addressing the causes of antibiotic resistance, and developing novel drugs, is imperative. A society without working antibiotics would be like returning to era when a small injury or infection could easily become a threat to life. It is recommended that hospital infection control committee must keep a close watch on the antibiotic pattern of Klebsiella Oxytoca for better patient care and genomic surveillance focus should remain a priority in the hospital environment. People should be instructed to complete the full course of antibiotics even if the symptoms go beforehand. By doing this, we reduce the risk of re-infection.Washing hands regularly and thoroughly prevents the spread of infection.

References

1. Paterson DL,Siu KL, Chang FY. Klebsiella species (K. pneumoniae, K Oxytoca, K. ozaenae and K. rhinoscleromatis). Antimicrobe, 2014:1
2. Litleitner E, Zarfel G, Luxner J, Herzog K, Pekard-Amenitsch S et al. Contaminated hand washing sinks as the source of a clonal outbreak of KPC-2 producing K. Oxytoca on a hematological ward. Antimicrobe agents chemother. 2015; 59: 714-4.
3. Pitout JD,Thomson KS, Hanson ND, Moland ES, Sanders CC. Beta-lactamase responsible for resistance to expanded spectrum cephalosporins in K. pneumoniae, E coli and Proteus mirabilis isolates recovered in South Africa Antimicrobe agents chemother. 1998;42:1350-4
4. Lomestro BM, Tobin EH, Shang W, Gootz T. The spread of K. pneumoniecarbapenase producing K. pneumonie to upstate New York. Clin Infect Dis.2006;43:26-8
5. Rodrigue Bano J, Rptmar P, Pascual A. The extended spectrum beta-lactamase red espariola-de investigacion en patologia infecciosa/grupo de studio de infetcion hospitalaria group. Risk factors and prognosis of nosocomial bloodstream infections caused by extended spectrum beta-lactamase-producing Escherichia coli. J Clin Microbiol. 2010;48:1726-31.
6. Clinical and Laboratory Standards Institute (CLSI). Performance Standards for Antimicrobial Susceptibility Testing Wayne, PA: 20-Thi. Clinical and Laboratory Standards;2013
7. Mbanga J,Munyanduki H.Prevalance and drug resistance in bacteria in Bulawayo province, Zimbabwe, East Afr J Public Health. 2010;7:229-32.
8. Hoenigl M, Zarfel G, W Leitner E, Saizer HJ et al. Nosocomial outbreak of K.pneumonia carbapenemase producing K.Oxytoca in Austria.Antimicrobe agents chemother. 2012; 56: 2158-61.

Conflict of Interest: Nil Source of support:Nil