

Spectrum of Antibiotic Sensitivity in Urinary Tract Infection Caused By Klebsiella Phenomena

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ABSTRACT

Objective: To add valuable data that can assist the scientific community in the development of rational use of antimicrobial agents in treatment of UTIs due to klebsiella pneumonia.

Study Design: Descriptive study

Place and Duration of Study: This study was conducted at the Department of Nephrology, Khyber Teaching Hospital, Peshawar from 01-01-2021 to 31-12-2021.

Materials and Methods: Urine sample of patients received in Outpatient department of Nephrology, with signs and symptoms of UTI were sent for culture and sensitivity in the above-mentioned period. The bacterial species identification was performed by standard biochemical methods.

Results: We isolated 125 patients of klebsiella pneumonia associated UTI. Out of 125 patients studied, 40 (32%) were male and 85 (68%) were female patients. According to age wise distribution of klebsiella pneumonia culture positive UTI 10/125 (8%) were less than 25 yrs of age, 30/125 (24%) were between 25-50 yrs age group and 85/125 (64%) were above 50 yrs of age. The sensitivity pattern of antibiotics against Klebsiella Pneumonia were as follows; Amikacin 110/125 (88%), Meropenem & Imipenem 100/125 (80%) each, Fosfomycin 95/125 (76%), Gentamycin 60/125(48%), Cephperazon sulbactam 55/125 (44%), Piperacillin –Tazobactam and Nitrofurantoin 50/125 (40%) each.

Conclusion: Over all Klebsiella pneumonia is becoming increasingly resistant to different antimicrobial agent and subsequently it may become more difficult to treat such infections. Therefore, continuous surveillance and monitoring of multi drugs resistance organism is needed.

Key Words: Spectrum, Antibiotic Sensitivity, Urinary Tract Infection, Klebsiella Phenomena

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INTRODUCTION

Urinary Tract Infection is among the most common type of bacterial infection worldwide¹. Urinary Tract Infection is an inflammatory process caused by the invasion of pathogenic microorganism in the urinary tract, it has been estimated that in USA alone on average 10 million people visits outdoor departments for treatment of UTI, annually^{2,3}.

The incidence of UTI is more in women then man and it was reported that up to 60% of women will have one

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episode of UTI at some time during their life. The reported UTIs among pregnant ladies are also significant upto 18%^{4,5}. As a common opportunistic pathogen, klebsiella pneumonia causes a wide range of infectious diseases including UTIs and soft tissue infections, bacteremia and pneumonia^{6,7}.

As a result of the abuse and misuse of multiple antibiotics, we are now seeing lot of resistance to different antimicrobial agents and it is making difficult to treat such resistant cases^{8,9,10}.

ESBLs in klebsiella pneumonia often causes resistance to majority of Cephalosporin which are responsible for the therapeutic failure of these agents¹¹. In addition, ESBL associated plasmids often carry genes encoding and co-resistance to other antibiotics resulting in multi drug resistance phenotypes¹² that is why klebsiella pneumonia is mostly resistant to commonly prescribed drugs like, Ampicillin, Amoxicillin, Cephalosporin, Amino glycosides, B. lactam Antibiotics^{13,14}.

Klebsiella pneumonia is the second most frequently isolated species from UTI after E.coli^{15,16,17}. This gram negative organism is one of the most important cause of nosocomial infection in developed countries and one of eight most important cause of infection in developing countries^{18,19,20}.

Unlike most developed countries, we unfortunately do not yet have nationwide surveillance program for monitoring antimicrobial resistance. However surveillance studies of bacterial resistance are very important to control the spread of resistant bacteria species in our population. Therefore the objective of the local study was to add valuable data that can assist the scientific community in the development of rational use of antimicrobial agents in treatment of UTIs due to klebsiella pneumonia.

MATERIALS AND METHODS

This is a descriptive study conducted over a period of one year from 1-1-2021 to 31-12-2021 in the department of Nephrology Khyber Teaching Hospital Peshawar. The study was approved by the Institutional Ethical Committee.

Urine sample of patients received in Outpatient department of Nephrology, with signs and symptoms of UTI were send for culture and sensitivity in the above mentioned period. Urine sample received in the microbiology laboratory from these patients were plated by semi-quantitative culture method on blood agar and macconkey's agar and incubated at 37°C overnight. The isolates obtained from the samples with significant bacteremia with the background of relevant supportive clinical features of UTI were processed further. The bacterial species identification was performed by standard biochemical methods²³. Inclusion criteria used to define patients with UTI caused by klebsiella pneumonia was:-

1. Sign and symptoms of UTI (for example dysuria, urgency, suprapubic tenderness, fever and hematuria or pyuria).
2. Urine culture positive for Klebsiella Pneumonia >10⁵ colony forming units/ml in a clean-catch, midstream.

RESULTS

In the cohort of patient who underwent urine C/S testing for symptomatic UTI in the mentioned one year period, we isolated 125 patients of klebsiella pneumonia associated UTI.

Out of 125 patients studied, 40 (32%) were male and 85 (68%) were female patients, with male to female ration of 1:2 (table-1)

Patient ages were in the range of 14 years to 80 yrs with Mean of 52 years.

According to age wise distribution of klebsiella pneumonia culture positive UTI 10/125 (8%) were less than 25 yrs of age, 30/125 (24%) were between 25-50 yrs age group and 85/125 (64%) were above 50 yrs of age (table-2).

To see the spectrum of antibiotics sensitivity against Klebsiella Pneumonia we found that this pathogen was sensitivity to mostly injectible antibiotics and limited sensitivity to oral medication. The sensitivity pattern of

antibiotics against Klebsiella Pneumonia were as follows; Amikacin 110/125 (88%), Meropenum & Imipenum 100/125 (80%) each, Fosfomycin 95/125 (76%), Gentamycin 60/125(48%), Piperillin – Tazobactum and Nitrofurantoin 50/125 (40%) each, Cephperazon sulbactum 55/125 (44%), Ceftriaxone 50/125 (40%), Trimethoprim – Sulphamethoxazole 35/125(28%), Tobramycin 30/125 (24%), Ciprofloxacin and Levofloxacin 20/125 (16%) each, and Norfloxacin 15/125 (12%) only (table-3).

Table No.1: Distribution of patients on gender basis.

Characteristics	Number	%age of total
All patients Male/	125	100%
Female	40	32%
	85	68%

Table No.2: Distribution of patients according to age wise

No	Age Group	No of patients	% age
1	- Upto 25 yrs	10	8%
2	- 25-50 yrs	30	24%
3	- More than 50 yrs	85	68%

Table No.3: Sensitivity Pattern of Antibiotics against Klebsiella Phenomena

No.	Antibiotics	Number of Patients	% age of sensitivity
1	Amikacin	110	88%
2	Meropenum	100	80%
3	Imipenum	100	80%
4	Fosfomycin	95	76%
5	Gentamycin	60	48%
6	Cephperazon sulbactum	55	44%
7	Piperillin Tazobactum	50	40%
8	Nitrofurantoin	50	40%
9	Ceftriaxone	50	40%
10	Trimethoprim Sulphamethoxazole	35	28%
11	Tobramycin	30	24%
12	Ciprofloxacin	20	16%
13	Levofloxacin	20	16%
14	Norfloxacin	15	12%

DISCUSSION

E coli and Klebsiella pneumonia are two of the most common pathogens associated with high morbidity and mortality among Gram-negative bacilli, especially in UTI²². Klebsiella pneumonia was the second most common pathogen in Pylonephritis in females and upper UTI in males during various studies²³.

This study was done to determine the antibiotics susceptibility pattern of Klebsiella pneumonia isolated

in urine sample. In our cohort of patients UTI in females were 68% as compared to 32% male patients, as shown in table-1. This is consistent with various studies reported earlier^{24, 25, 26}.

It has been documented that 50-60% of women develops UTI in their life time. Some of the common causes might be close proximity of urethra to anus, structurally short length of urethra, adherence of urethral epithelial mucosa with the mucopolysacrides lining, repeated UTIs with sexual intercourses and pregnancy related complications²⁷.

In our study regarding age distribution among these patients, it was shown that Klebsiella pneumonia positive UTI were 68% (85/125) in above 50 years of age group followed by 24% (30/125) in the age group of 25-50 years. Only 8% (10/125) were younger than 25 years of age.

To find out the sensitivity pattern of Klebsiella pneumonia related UTIs to various antimicrobial available, it was shown that up to 88% (110/125) had sensitivity to Amikacin, 80% (100/125) were sensitive to Meropenem & Imipenem each, while 76% (95/125) were sensitive to Fosfomycin only.

While the rest of antibiotics were showing low level of sensitivity to Klebsiella pneumonia associated UTIs. The rest of pattern in our study showed 48% (60/125) to Gentamycin, in 44% (55/125) to Cephperazon sulbactam, 40% (25/125) to Piperacillin Tazobactam, Ceftriaxone & Nitrofurantoin each. Overall resistance to various generations of cephalosporin and Beta Lactam is very high on account of the production of Extended Spectrum Betaactamase (ESBL). Over the past 2 decades, there has been a wide use of extended broad spectrum antibiotics to treat these resistant forms of UTI. Our results were in keeping with a study from Iran by Jamshed Ayatollahi et al²⁸. In this study susceptibility was 100% to Amikacin which was closely followed by Meropenem and imipenem 88% each. It is now well recognized that rates of uropathogen having resistance to multiple drugs have increase exponentially in recent years¹³.

Regarding the more commonly used antibiotic in our community the susceptibility to Trimethoprim Sulphamethoxazole was 28% (35/125), Tobramycin was 24% (30/125) and Ciprofloxacin & Levofloxacin had only 16% (20/125) sensitivity to Klebsiella pneumonia. The lowest susceptibility was shown to Norfloxacin which was 12% (15/125) only.

The fluoroquinolones and Cefixime are usually the two most commonly prescribed empirical antibiotics for UTI in OPDs but there overuse and misuse has led to the emergence of significant resistance to Klebsiella pneumonia against these antimicrobials as shown in our study.

Over all Klebsiella pneumonia are becoming increasingly resistant to different antimicrobial agent and subsequently it may become more difficult to treat

such infections^{29,30}. Therefore continuous surveillance and monitoring of multi drugs resistance organism is needed and highly recommended to reduce the prevalence of such difficult to treat infections.

CONCLUSION

E coli and Klebsiella pneumonia are two of the most common pathogens associated with high morbidity and mortality among Gram-negative bacilli, especially in UTI. Over all Klebsiella pneumonia is becoming increasingly resistant to different antimicrobial agent and subsequently it may become more difficult to treat such infections.

Therefore continuous surveillance and monitoring of multi drugs resistance organism is needed and highly recommended to reduce the prevalence of such difficult to treat infections.

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Conflict of Interest: The study has no conflict of interest to declare by any author.

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