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# Isolation And Antibiotic Sensitivity of Multi Drugs Resistant *Klebsiella Pneumoniae* Among Urinary Tract Infected Patients in Nasarawa State

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## Abstract

Klebsiella pneumoniae complications with limited therapeutic options is considered as one of the major health issues concerning health care professionals worldwide. It is one of the leading nosocomial bacterial pathogens that causes urinary tract infection, and recently the antibiotic resistance of this pathogen has increased dramatically. The cross-sectional study was performed from September 2017 to the end of December 2017. This study aims at the isolation and antibiotic sensitivity of the *Klebsiella pneumoniae* among patients with sign and symptoms of UTI. About120 urine specimens collected were analysed for the presence of *Klebsiella pneumoniae*. The antibiotic sensitivity pattern of the isolates was determined using the disc diffusion method. Of the 120 specimens, only 72 (60%) produced growth. The sensitivity test revealed that all the isolates were sensitive to levofloxacin, 30 isolates (14.2%) were sensitive to ciprofloxacin, 28 isolates (13.2%) were sensitive to gentamycin, 20 isolates (9.4%) were sensitive to travid, while Augmentin has the sensitivity of 17 (8.1%). It revealed that levofloxacin has the lowest resistance of 0 (0%) while travid has the highest resistance of 15(21.7%). The antibiotic sensitivity pattern of the isolate revealed that all the isolates were completely sensitive to levofloxacin and more resistant to Augmentin and travid.

***Keywords:*** *klebsiella pneumonia; urinary tract infection and antibiotic sensitivity test*

## Introduction

*Klebsiella pneumonia* is a Gram-negative opportunistic bacterium that causes infections in hospitalized or otherwise immunocompromised individuals [1]. The established site of predilection of the *K. pneumonia* infection is urinary tract including urethra, bladder, ureters, and kidney. *Klebsiella* UTIs occur using a urinary catheter for a long time in older women

*Klebsiella Pneumoniae* is currently showing high resistance to antibiotics including beta-lactam antibiotics, fluoroquinolones, and aminoglycosides [2]. This resistance is resulting in a growing worldwide problem regarding the choice of effective antibiotic treatment for hospital-acquired infections [2].

B-lactam group are commonly prescribed worldwide and include penicillins, cephalosporins, monobactams, and carbapenems [3]. The production of β-lactamase enzymes by the presence of β-lactam-insensitive cell wall or the active expulsion of β-lactam molecules from Gram-negative bacteria represents the main indications of β-lactam antibiotic resistance [4] β-lactams such as Carbapenems are of choice for the treatment of infections caused by extended-spectrum beta-lactamase (ESBL)-producing bacteria[5], such as *K. pneumoniae*. These antibiotics are also considered as last resort for the management of life-threatening healthcare-

associated infections[6]. Bacterial resistance to carbapenems has been increased and is well documented [7], and has also been further complicated by the production of β-lactamases, efflux, and mutations that alter the expression and/or function of porins and penicillin-binding proteins (PBPs) [8].

The spread of transmissible plasmids and the acquisition of resistance genes that normally occur by horizontal gene transfer, which may also carry virulence, are as the result of antimicrobial resistances [3]. For pathogen survival, the acquisition of resistance and virulent traits are, and some reports suggest that such may have an important role in the pathogenesis of *K. pneumoniae* infections [9]. Capsule, lipopolysaccharide (LPS), fimbriae (types 1 and 3), and siderophores are virulence factors that contribute to the pathogenicity of *K. pneumonia* strains can synthesize capsules of any of the serotypes *K1* to *K78;* however, K1 and K2 can also be associated with increased pathogenicity [7]. This study was conducted to isolate and investigate the antibiotic resistance of *K. pneumoniae* isolates from urine samples.

## Materials and Methods

This study was conducted from September 2017 to the end of December 2017 in Lafia, Nasarawa state capital at Dalhatu Araf Specialist Hospital Lafia among patients suspected of signs and symptoms of UTI. Nasarawa state fondly called 'Home of solid minerals.

### Sample size

A total of one hundred and twenty (120) patients showing signs and symptoms of UTI were sampled as determined using the sample size calculator of Krejcie and Morgan [10].

### Collection of urine specimens

The urine specimens were collected from 120 patients (37 males and 83 females) with clinical symptoms of UTI and sent to the microbiology laboratory. The patients with positive samples were detected; some information related to these patients, such as sex and age was obtained.

### Consent and Ethical Approval

Ethical clearance was obtained from Dalhatu Araf Specialist Hospital Lafia before the commencement of the study. Informed consent was also obtained from each participant.

### Isolation, identification, and antibiotic sensitivity test

Urine specimens were directly inoculated aseptically on MacConkey and Brain heart infusion agar (BHI) plates and incubated for overnight at 37°C. In the next step, the isolated bacteria were identified by Gram staining of bacterial colonies, colony character and biochemical tests, based on standard procedures and international Guidelines [11]. Susceptibility to a range of antibiotics that were available and routinely used in hospital was evaluated utilizing the method of disk diffusion according to the guidelines of Clinical and Laboratory Standards Institute.

## Result

The highest percentage of *K. pneumoniae* isolates were from the individuals in the age range 46 years and above (27.7%) followed by age range 36-40 years (20.8%), 26-30 years (16.6%) and then between 31-35 years and 15-35 years had (9.7%), while the least prevalence age group of UTIs were in the 41-45years (5.5%).

***Table 1:*** Distribution of uropathogenic K. *pneumoniae* according to age and sex groups

| Patients Age | patients' gender with the number of samples collected from each | | Number of samples collected from both sex (%) | Number of samples with growth (%) | Number of samples without growth (%) | *Klebsiella pneuminiae* morphology (%) |
|---|---|---|---|---|---|---|
| | MALE (%) | FEMALE (%) | | | | |
| 15-20 | 4 (10.8) | 6 (7.2) | 10 (8.3) | 7 (9.7) | 3 (6.25) | 3 (8.5) |
| 21-25 | 5 (13.5) | 7 (8.4) | 12 (10) | 5 (6.9) | (14.5) | 1 (2.8) |
| 26-3 | 12(32.4) | 8 (9.6) | 20 (16.6) | 12 (16.6) | 8 (16.6) | 7 (20) |
| 31-35 | 1 (2.7) | 14 (16.8) | 15 (12.5) | 7 (9.7) | 8 (16.6) | 5 (14.2) |
| 36-40 | 7 (18.9) | 18 (21.6) | 25 (20.8) | 15 (20.8) | 10 (20.8) | 9 (25.7) |
| 41-45 | 0 (0) | 8 (9.6) | 8 (6.6) | 4 (5.5) | 4 (8.3) | 0 (0) |
| 46 & above | 8 (21.6) | 22 (26.6) | 30 (25) | 20 (27.7) | 8 (16.6) | 10 (28.5) |
| Total | 37(30.8) | 83(69.2) | 120 | 72 | 48 | 35 |

The total number of 35 *K. pneumoniae* were isolated from the sexes. High isolate was observed among female aged 46 and above had (42.1%), followed by Male aged 36-40 had (37.5%), followed by Male aged 26-30 had (18.7%), Female aged 21-25 and 36-40 with (15.7%) each and the least isolated from both sexes aged 41-45 had (0%). The overall percentage of isolation of *K. pneumonia* from urine was (29.2%).

***Table 2:*** *K. pneumoniae* isolated according to the age group and gender.

| Age of patients | No of *klebsiella pneumoniae* isolated from the gender | | No of *klebsiella pneumonia* isolated from both |
|---|---|---|---|
| | Male | Female | |
| 15-20 | 1 (6.5%) | 2 (10.5%) | 3 (8.5%) |
| 21-25 | 0 (0%) | 1(15.7%) | 1 (2.8%) |
| 26-30 | 3 (18.7%) | 4 (21.1%) | 7 (20%) |
| 31-35 | 4 (25%) | 1 (5.3%) | 5 (14.2%) |
| 36-40 | 6 (37.5%) | 3 (15.7%) | 9 (25.7%) |
| 41-45 | 0 (0%) | 0 (0%) | 0 (0%) |
| 46 and above | 2 (12.5%) | 8 (42.1%) | 10 (28.5%) |
| Total | 16(13.3) | 19(15.8) | 35(29.2) |

The total number of 35 *K. pneumoniae* were isolated and screened for their antimicrobial resistance and sensitivity towards different classes of antibiotics. The highest sensitivity of *K. pneumoni*ae is 16.5% towards levofloxacin, followed by 15.1% to imipenem. While the other tested antibiotics showed less than 15%. On the other hand, the k. *pneumoniae* isolates showed high resistance against Augmentin 26.1%, while levofloxacin showed no resistance. The overall 29.2% of isolation of *K. pneumonia* from urine was recorded.

***Table 3:*** Susceptibility of *K. pneumonia* isolated against different antibiotics

| Antibiotic agents (discontent) | Total isolate (n= 35) (%) | |
|---|---|---|
| | Resistant | sensitive |
| Levofloxacin | 0 (0) | 35 (16.5) |
| Ciprofloxacin | 5 (7.5) | 30 (14.2) |
| Gentamycin | 7 (10.1) | 28 (13.2) |
| Augmentin | 18 (26.1) | 17(8.1) |
| Travid | 15 (21.7) | 20 (9.4) |
| Reflacin | 12 (17.3) | 23 (10.9) |
| Nitrofurantoin | 9 (13.0) | 26 (12.3) |
| Imipenem | 3 (4.3) | 32 (15.1) |

## Discussion

*Klebsiella pneumonia* is one of the most common causes of Urinary tract infections in human beings. In this study, 120 urine specimens were collected for investigation. Females showed a significant rate (15.8%) of UTIs compared to males (13.3%). The result of this study showed that Female are more prone to UTI (urinary tract infection) compared to the Male, this may be due to their anatomy and reproductive physiology that quick bacterial access to the bladder [12,13]. One potential reason that could enable the auto transmission and increase the rate of UTIs in women could be related to the closeness of the genital tract and the urethra and anus [14,15].

The prevalence of *K. pneunonia* (29.2%) in this study is almost high as the percentages reported in Ethiopia (19-21%) [16] and Cameroon (18.5%) [17]. In Morocco, urinary *K. pneumoniae* was isolated in 10% and 28% of the urine samples in the Meknes [18]and Rabat [19] regions, respectively.

Over the past two decades there has been wide use of extended broad-spectrum antimicrobial agents to meet the emerging challenge of treating UTIs due to gram-negative bacilli. However, these microbes have developed multiple antimicrobial resistance mechanisms, including enhanced drug efflux,

alterations of the drug target and the production of plasmid-mediated -lactamases [20]. The typical characteristic of antimicrobial resistance is that there are often great differences temporally and regionally [21,22]

Antibiotic sensitivity screening was determined by the zones of inhibition using the disc diffusion method for sensitivity test. For sensitivity to antibiotics, the isolates gave the following results, levofloxacin16.5%, ciprofloxacin 14.2%, gentamycin 13.2%, Augmentin 8.15, travid 9.4%, reflacin 10.9%, nitrofurantoin 12.3%, imipenem 15.1%. The pathogen was resistance to the antibiotics as follows levofloxacin 0%, ciprofloxacin 7.3%, gentamycin 10.1%, Augmentin 26. 1%, travid 21.7%, reflacin 17.3%, nitrofurantoin 13.0%, imipenem 4.3%.

The resistance rate in *K. pneumonia* was 14.2% to ciprofloxacin which is lower than other studies conducted in India [23] and United State of American [24]

Multi- drug resistance (MDR) is a major concern in the management of uropathogens [25]. This MDR may be due to the plasmids harboring several resistance genes which are transferred from one bacterium to another· Multidrug Resistance (MDR) in *K. pneunomiae* is of high increase throughout the world [26]

The pathogen has the highest sensitivity to levofloxacin probably because levofloxacin is not commonly used in treating *K. pneumoniae* infections, so strains resistant to it has not emerged.

The highest resistance found against Augmentin followed by travid can probably be as a result of development of multidrug resistance due to prolonged use of these drugs against the pathogen within or outside the hospitals. Travid and reflacin produced a limited amount of sensitivity respectively probably due to multi-drug resistance that may be acquired from drug resistance plasmids and the frequent use of these antibiotics.

## Conclusion

Indiscriminate use of antibiotics has resulted in the emergence and survival of resistance strains of bacteria isolates, thus antibiotic sensitivity is crucial for determining the choice of antibiotics. Levofloxacin as revealed by this work was effective against most of the bacterial isolates and would do well if used in therapy.

## Competing interest

The Authors have declared that no competing interests exist.

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