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A Prospective study on Antibiotic Susceptibility in *Klebsiella pneumonia* isolates in Urinary tract infections

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ABSTRACT
*Urinary tract infections (UTIs) are common bacterial infections among the female. Klebsiella drug resistance (DR) is important threat in UTI. The aim of the study isto finds the drug resistance in Klebsiella pneumoniae isolates in UTI. It was a **prospective study, conducted in the** department of Microbiology, Vishnu dental college, Bhimawaram.The individuals aged ≥ 18with the symptoms of UTI were included. Those on steroid treatment, malignancy and transplant recipients were excluded. Midstream urine samples were collected and inoculated on blood agar, MacConkey agar and CLED media incubated at 37^0C for 48 hrs. Plates were observed for growth. For the identification of the isolates, Gram stain (GS), hanging drop examination, biochemical reactions were conducted and antimicrobial susceptibility test was also performed to find the drug susceptibility. Total 223 MSU were collected, UTI was detected in 118 (100) MSU samples.Highest incidence in 29 – 37, 38 – 47 years.The female male ratio was 1.8 and the mean age was 39.3 years.Klebsiella pneumoniae (25%; 29) was the second common pathogen. All the female male ratio was 1.8 and the mean age was 39.3 years. Strains were sensitive to Piperacillintazobactum, Colistin, Imepenem, Amikacin. Least sensitivity was reported to Cefotaxime, Ceftazidime and Amoxyclov. Improper usage of antibiotics is the major cause for the drug resistance.*
Keywords: *Urinary tract infections (UTIs), Klebsiella drug resistance (DR), Gram stain (GS), Cefotaxime, Ceftazidime*

INTRODUCTION

Urinary tract infections (UTIs) are one of commonest bacterial infections [1]. Due to the anatomical difference, UTI is common among the female [2]. Single bacterium is the causative pathogen in 80 – 90% of UTIs [3]. *Klebsiella pneumoniae* (KP) was reported to be the second common causative agent of UTI [4]. Adhesion of the pathogen to the urinary system is the key feature for the pathogenesis of UTIs. Contamination of the uropathogens which reside in the gut followed by colonization to the urethral orifice as well as urethra is the pathogenesis of UTI. This is the 2nd most common diagnostics for which usually empirical antimicrobials can be prescribed for the treatment [5].

Each year, nearly 150 million people are getting effecting because of UTIs [6]. This high burden as well as prolonged antibiotics usage results not only huge loss of working days but also more huge financial burden. Because of the usage of broad-spectrum antibiotics for a long time, the chances of developing antibiotic drug resistance (DR) is another threat to the world. A study was conducted with an aim to find the DR in KP isolates in UTI.

MATERIAL AND METHODS

It was a **prospective study, conducted in the** department of Microbiology, Vishnu dental college, Bhimawaram. Study was conducted between March 2021 to May 2022. Study protocol was approved by the institutional ethics committee. The individuals aged ≥ 18with the symptoms of UTI were included. Those on steroid treatment, malignancy and transplant recipients were excluded.

After recruiting the patients in the study, detailed clinical history was collected and the clinical findings were noted in the study proforma. The study was clearly explained in the local language. The participants were allowed to ask doubts. After clarifying all the doubts, midstream urine (MSU) sample collection was

explained in the local language. Once the participant was comfortable, MSU was collected and labelled properly [7] and transported immediately to the laboratory [8] in self-sealing polythene covers with two compartments; the laboratory requisition form is placed in one and the sample in the other compartment. Then the samples will be transported to the laboratory immediately. Samples were refrigerated if there is any delay for > 1 – 2 hrs.

Immediately after receiving the sample, urine wet mount was carried to find pyuria [9]; $\geq$ 8 pus cells were considered to be significant. Simultaneously, samples were inoculated on Cysteine lactose electrolyte deficient (CLED) agar, MacConkey agar (MA) and blood agar (BA), plates were incubated at 37^0C for 48 hrs. Growth was identified using gram stain (GS), hanging drop examination, biochemical reactions; antimicrobial susceptibility test was performed Kirby-Bauer disc diffusion method on Mueller-Hinton agar medium [10]. Commercially available HIMEDIA antibiotic discs were used.

Statistical analysis

Statistical analysis was conducted using SPSS version 21. Data were analyzed by mean ± SD for continuous variables and percentage for categorical data. The association between two variables was done by Chi-Square test; $P \leq 0.05$ was considered to be statistically significant.

RESULTS

Total 223 MSU were collected in this study, bacterial UTI was detected in 118 (100%).Highest UTI incidence was detected in 29 – 37, 38 – 47 years age, 22% (26) each, respectively. This is followed by >68 years (16%; 19), 58 – 67 (15%; 18), 18 – 27 (13%; 15) and 48 – 57 (12%; 14) groups (Table 1). The female male ratio was 1.8 and the mean age was 39.3 years.

Esch.coli was the most prevalent (29%; 34) bacterial isolate followed by KP (25%; 29), other gram negative rods (22%; 26), Enterococcus (16%; 19) and *Stap.aureus* (7%; 8). Total 2 candida strains were also isolated in this study (Table 2).

All the KP strains were sensitive to Piperacillintazobactum, Colistin, Imepenem, Amikacin. Least sensitivity was reported to Cefotaxime, Ceftazidime and Amoxyclov (Table 3).

DISCUSSION

Worldwide, UTI is the commonest bacterial infections [11]. The reported incidence was higher among the female [12, 13]. The incidence was reported to be highest in 29 – 37 and 38 – 47 years groups; 22% each, respectively (Table 1). This is the child bearing and sexually active age group in this locality. Sexual exposure might be the cause for the high UTI prevalence. Whereas there was a decline in the incidence in 48 – 57 years from that the incidence is raised. Similar findings were reported in the literature also [14]. In another research, the prevalence was reported to be highest in 20 – 29 (32%) years group [15]. The incidence of UTI is increased with age. Usually there is defect in immunity usually in the older age groups. With this the infections are also increased.

In this research, *Esch.coli* was reported to be the leading pathogen (29%; 34) followed by KP (25%; 29). Fungal species were identified just in 1.7% samples. In the literature also, Esch.coli was reported to be the leading UTI causing pathogen [16, 17]. *Esch.coli* is the flora in the genitourinary system. Hence, this is the leading causative agent of UTI. In this study, the prevalence of KP was 25% (29); this was reported to be 21% [18].

In this research, among the infected participants, the female male ratio was 1.8. The human anatomy is the main cause for high UTI prevalent in female. The close proximity of anal region to the urethra is the major cause for the UTI among the female. High prevalent of UTI among the female was reported in the literature also [19, 20]. Esch.coli was reported to be the commonest UTI causing agent among the female. Whereas, gender wise, the pathogens were not categorised in this study.

In this research, all the KP strains were sensitive to Piperacillintazobactum, Colistin, Imepenem, Amikacin. Least sensitivity was reported to Cefotaxime, Ceftazidime and Amoxyclov. However, the improper and long term usage of antibiotics is the major cause for the drug resistance. Due to the antibiotic resistance mechanism, it is usually difficult to treat UTI caused by DR strains [21-24].

Table 1: Age wise incidence of UTI among the study participants

Age	Number	%
18 – 27	15	13
29 – 37	26	22
38 – 47	26	22
48 – 57	14	12
58 – 67	18	15
>68	19	16
Total	118	100

Table 2: Various bacterial pathogens responsible for UTI among the study members

Isolate	Number	%
Staph.aureus	8	7
Enterococcus species	19	16
Esch.coli	34	29
KP	29	25
Other GNR	26	22
Candida species	2	1.7
Total	118	100

Table 3: Antibiotic susceptibility pattern of *Klebsiella pneumoniae* isolates

Antibiotic	Number	%
Piperacillintazobactum	29	100
Imepenem	29	100
Colistin	29	100
Amikacin	29	100
Nitrofurantoin	23	80
Ciprofloxacin	23	80
Gentamicin	23	80
Cotrimoxazole	15	52
Norfloxacin	14	48
Cefotaxime	11	36
Ceftazidime	11	36
Amoxiclav	11	36
Cefoxitin	0	0
Ampicillin	0	0

CONCLUSION

KP was the 2nd commonest UTI causing agent in this research, sexually active and older age groups are commonly prone for UTI. Cephalosporins such as Cefotaxime, Ceftazidime were less effective.

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