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Original Research Article

A Study on Antibiotic Pattern of Urinary Tract Infections Causing Gram Negative Bacteria

Chittineni Krishna Prasad[1], Srinivas N[2]

[1]Assistant Professor, Department of Pharmacology, Dr. Pinnamaneni Siddhartha Institute of Medical Sciences and Research Foundation, Chinna Avutupalli.
[2]Associate Professor, Department of Microbiology, Govt. Medical College, Sangareddy.

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Corresponding author: Dr. Srinivas N
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Abstract

Introduction: Urinary tract infections (UTIs) is one of the oldest infections, reported in 1550 BC. Development of antibiotic drug resistance (DR) is important threat due to the prolonged usage of antibiotics. With this, a study was conducted with an aim to find the DR in UTI causing gram negative bacteria (GNB).

Methods: It was a prospective study, conducted in Pinnamaneni Siddhartha Institute of Medical Sciences, Vijayawada. Study protocol was approved by the institutional ethics committee. The individuals aged ≥ 18 with the symptoms of UTI were included. Detailed clinical history was collected and study was clearly explained in the local language. After clarifying all the doubts, midstream urine (MSU) sample was collected and labelled properly and transported immediately to the laboratory in self-sealing polythene covers with two compartments; the laboratory requisition form is placed in one and the sample in the other compartment. Samples were inoculated on Cysteine lactose electrolyte deficient agar, MacConkey agar and blood agar, plates were incubated at 37^0C for 48 hrs. Growth was identified as per the protocol. Antimicrobial susceptibility test was performed Kirby-Bauer disc diffusion method on Mueller-Hinton agar medium.

Results: UTI was detected in 101 (100%) cases. Highest UTI incidence was detected in 38 – 47 group. The female male ratio was 1.6, 37.1 was the mean age. Esch.coli was the most prevalent (30.7%; 31) bacterial isolate followed by other GNB (22.7%; 23). All the GNB were sensitive to Piperacillin tazobactum, Colistin, Imepenem, Amikacin.

Conclusion: GNB are common UTI causing agent with high prevalence among the women. Sexually active and older age groups are commonly prone for UTI. Cephalosporins are less effective.

Keywords: Age, Pathogen, High, Infection.

Introduction

Urinary tract infections (UTIs) is one of the oldest infections, reported in 1550 BC. Still, UTI is the common bacterial infection throughout the globe. [1] The annual incidence is 150 million, with a high prevalence among the women. [2, 3] Short urethra is the important cause for the high UTI prevalence among the women. It is reported that around 20% of women suffer from UTIs. [4]

UTI can be asymptomatic also; fever, dysuria, lower abdominal pain are some of

the common symptoms of UTI. Gastrointestinal bacteria are reported to be common causative agents of UTI. [5] Bacterial attachment to the urethral epithelium is the important aspect in the pathogenesis.

The annual incidence is nearly 150 million. [6] This high burden as well as long-time antibiotic usage causes not only significant loss of work days but also more high financial burden. Development of antibiotic drug resistance (DR) is another threat due to the prolonged usage of antibiotics. With this, a study was conducted with an aim to find the DR in UTI causing gram negative bacteria (GNB).

Methods

It was a prospective study, conducted in Pinnamaneni Siddhartha Institute of Medical Sciences, Vijayawada. Study was conducted between May 2022 to July 2022. Study protocol was approved by the institutional ethics committee. The individuals aged $\geq$ 18 with the symptoms of UTI were included. Those on steroid treatment, malignancy and transplant recipients were not considered.

Detailed clinical history was collected from all the study patients and the clinical findings were recorded 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 and transported immediately to the laboratory in self-sealing polythene covers with two compartments; the laboratory requisition form is placed in one and the sample in the other compartment.

Immediately after receiving the sample, urine wet mount was carried to find pyuria. 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. [7] 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 211 MSU were collected in this study, bacterial UTI was detected in 101 (100%). Highest UTI incidence was detected in 38 – 47 (24.7%; 25) years followed by 29 – 37 (23; 22.7%) years group. Less UTI cases were detected in 18 – 27 (11; 10.9%) years group (Table 1).

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

Age	Number	%
18 – 27	11	10.9
29 – 37	23	22.7
38 – 47	25	24.7
48 – 57	12	11.9
58 – 67	15	14.9
>68	15	14.9
Total	101	100

The female male ratio was 1.6 and the mean age was 37.1 years.
Esch.coli was the most prevalent (30.7%; 31) bacterial isolate followed by other GNB (22.7%; 23), *Klebsiella pneumoniae* (20.8%; 21). One candida strain was also isolated in this study (Table 2).

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

Isolate	Number	%
Staph.aureus	08	7.9
Enterococcus species	17	16.8
Esch.coli	31	30.7
Klbsiella pneumoniae	21	20.8
Other GNB	23	22.7
Candida species	01	1
Total	101	100

All the GNB were sensitive to Piperacillin tazobactum, Colistin, Imepenem, Amikacin. Least sensitivity was reported to Cefotaxime, Ceftazidime and Amoxyclov (Table 3).

Table 3: Antibiotic susceptibility pattern of Klebsiella pneumoniae isolates

Antibiotic	Number	%
Piperacillin tazobactum	92	100
Imepenem	92	100
Colistin	92	100
Amikacin	90	98
Nitrofurantoin	78	85
Ciprofloxacin	78	85
Gentamicin	75	82
Cotrimoxazole	46	50
Norfloxacin	37	40
Cefotaxime	25	27
Ceftazidime	25	27
Amoxiclav	25	27
Cefoxitin	0	0
Ampicillin	0	0

Discussion

UTI is the leading bacterial infection with high incidence among the female. [8] In this research also high female prevalence was reported. Due to the structural difference in the urethra and the close proximity to the anal region are the main causes for high UTI prevalence among the women. In this study the female male ratio was 1.6. Whereas it was reported to be 1.8 in the literature. [9]

Sexually active age group is highly prone for the UTIs. [10] In this research the mean age of UTI patients was 37.1 years. The age was ranged between 18 to 71 years. In older age group also we diagnosed UTI. Here the exact cause is not known but this could be passage of abdominal pathogens to urethral are could be the reason. Because of the old age, it may be difficult to maintain proper hygiene especially after toilet. Hence the pathogens may spread and cause the infection.

In this research, Esch.coli was the most prevalent (30.7%; 31) bacterial isolate followed by other GNB (22.7%; 23), *Klebsiella pneumoniae* (20.8%; 21). One candida strain was also isolated in this

study (Table 2). In the available research also, Esch.coli was diagnosed to be the leading UTI causing agent. 11, 12] Esch.coli is the flora of the abdomen and also genitourinary area. Hence, this is the leading causative agent of UTI.

In this research, all the GNB were sensitive to Piperacillin tazobactum, Colistin, Imepenem, Amikacin. Least sensitivity was reported to Cefotaxime, Ceftazidime and Amoxyclov. However, the improper and long term usage of high antibiotics are identified to the main reasons for DR. In case of the DR, it is very difficult to treat UTI. [13, 14] India is the diabetes capital [15]; this is important cause for DR in UTI patients. But in this research diabetes was not considered. This is the major limitation of this research. [16]

Conclusion

GNB are common UTI causing agent with high prevalence among the women. Sexually active and older age groups are commonly prone for UTI. Cephalosporins are less effective and high sensitivity was detected to sensitive to Piperacillin tazobactum, Colistin, Imepenem.

Author's contribution: Chittineni Krishna Prasad: Literature review, article writing, bench work Srinivas N: Statistical analysis, article writing.

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