

Antibiotic susceptibility pattern of urinary isolates from a tertiary care hospital with special reference to Gram negative bacteria

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Abstract: Urinary tract infections are amongst the most common infections encountered in clinical practice. Antimicrobial resistance is very high among the urinary pathogens. Hence we aimed at evaluating the pathogens causing UTI in the study area and study the antibiogram. **Materials and methods:** Ninety eight urine specimens from symptomatic patients were processed for isolation of pathogen and antibiotic sensitivity. The antibiogram to different antibiotics were studied. Inpatient and outpatient groups were compared for antibiotic resistance and results compared. **Results:** Of 98 specimens 50 specimens didn't yield any pathogen. Of the 48 which grew, 40 were gram negative bacteria and 9 were Gram positive bacteria. *Escherichia coli* was predominant pathogen (65%). High drug resistance was noted to ampicillin (93%), Nalidixic acid (75%), Cotrimoxazole (73%), Norfloxacin (68%) and even third generation cephalosporins. Nitrofurantoin showed least resistance (15%). Drug resistance was high in inpatients than outpatients. **Conclusion:** *E.coli* were the predominant pathogens causing UTI followed by *Klebsiella* species. Antibiotic resistance was very high in the study hospital. Nitrofurantoin still holds good for the treatment of UTIs. Drug resistance was high in inpatients compared to outpatients. The situation warrants judicious use of antibiotics to curb the menace of antibiotic resistance.

Keywords: Antibiogram, antibiotic resistance, inpatients, nitrofurantoin, urinary tract infection

I. Introduction

Urinary tract infections (UTI) are one of the major causes of illness affecting all age groups. It is more common in females. A large majority of the UTI are caused by Enterobacteriaceae, which are known to acquire drug resistance easily. There has been an increasing trend in the drug resistance of urinary pathogens. [1],[2],[3],[4]. The scenario is worse in hospitalized patients [5]. Although there are a large group of antimicrobial agents available for the treatment of UTIs, none of them can treat all UTIs. In this study, we attempted to study the antimicrobial susceptibility pattern of the isolates from patients attending to our tertiary care hospital.

II. Materials And Methods

The study was conducted in a teaching hospital in northern Karnataka. Patients with clinical features suggestive of urinary tract infection formed the subject of the study. A total of 98 urine specimens collected by clean catch midstream method were processed. The urine specimens were immediately inoculated on to culture media and incubated. After overnight incubation at 37 °C, plates were read and colony count noted. Only the specimens which had colony count of > 10⁵ were included in the study. Identification and Antibiotic susceptibility testing (AST) was done according to standard procedures [6]. AST was done by Kirby Bauer disc diffusion test and results interpreted according to Clinical laboratory Standards Institute (CLSI) guidelines. Antibiogram of Gram negative bacilli were tabulated and resistance profile for various antibiotics was compared. Difference between inpatient and outpatient sensitivity percent was noted.

III. Results

Majority of the patients were in the age group of 21-40 years age group. Males were the most common gender (57%) compared to females. Inpatients (63.2%) constituted bigger chunk than outpatients. Of the 98 specimens, 50 specimens did not yield any growth. *E. coli* were the most common agents (65%) grown followed by *Klebsiella spp.* and *Coagulase negative staphylococci* (Table 1). Gram negative bacilli accounted for a total of 40 isolates and Gram positive bacteria were grown in nine specimens. *Candida* and enterococci were not isolated in the study. Antimicrobial pattern of the Gram negative bacilli is presented in the table 2. Difference between resistance between inpatients and outpatients is presented in Table 3.

Table1. Distribution of organisms isolated from cases of UTI

Organism	Number of organisms isolated	Percentage
<i>E. coli</i>	26	53.1
<i>K. oxytoca</i>	7	14.3
Coagulase negative staphylococci	6	12.2
<i>Staphylococcus aureus</i>	3	6.1
<i>K. pneumoniae</i>	2	4.1
<i>Pseudomonas spp.</i>	2	4.1
<i>P. mirabilis</i>	1	2.0
<i>P. vulgaris</i>	1	2.0
<i>C. freundii</i>	1	2.0
Total	49	100.0

Table2. Antibigram of Gram negative pathogens

Antibiotics	Sensitive	Moderately Sensitive	Resistant	Percentage Resistance
Ampicillin	3	0	37	93
Cotrimoxazole	11	0	29	73
Gentamicin	19	3	18	45
Norfloxacin	13	0	27	68
Nalidixic acid	10	0	30	75
Nitrofurantoin	34	0	6	15
Cefotaxime	20	1	19	48
Ceftazidime	25	0	15	38
Ceftriaxone	18	0	22	55
Cefoperazone	21	0	19	48
Cefuroxime	17	0	23	58
Cefadroxyl	19	0	21	53

Table3. Difference in the resistance profile of Gram negative bacteria to various antibiotics between inpatients and outpatients (In Percentage)

Name of antibiotic	Inpatients (total 34)	Outpatients (Total 14)
Ampicillin	100.0	78.6
Cotrimoxazole	82.4	50.0
Gentamicin	52.9	35.7
Norfloxacin	70.6	50.0
Nalidixic acid	82.4	57.1
Nitrofurantoin	20.6	0.0
Cefotaxime	64.7	42.9
Ceftazidime	64.7	7.1
Ceftriaxone	73.5	35.7
Cefoperazone	64.7	35.7
Cefuroxime	73.5	50.0
Cefadroxyl	67.6	50.0

IV. Discussion

Urinary tract infections are amongst the most common infections encountered in clinical practice. Many of the infections are caused by Enterobacteriaceae. Empiric antibiotic therapy is the mainstay of treatment for UTIs. However, many previous studies indicate increasing trend of drug resistance among UTI pathogens. [1],[2], [4]. Hence it is imperative to perform antibiotic susceptibility testing (AST) in order to choose an effective antibiotic.

In our study, 53% of the infections were caused by *Escherichia coli*, followed by *Klebsiella oxytoca* and Coagulase negative staphylococci (14% and 12% respectively). Enterobacteriaceae accounted for a total of 78% of infections (38 out of 49). The findings are similar to studies done by [3],[7]. The present study revealed a slight male predominance among the subjects. This is in contrast with earlier reported data where females formed major part of the study. Various studies have reported female preponderance [8],[9],[10]. This

discrepancy is probably because study group included both inpatients and outpatients who had been hospitalized with different complaints and later acquired UTI during the stay in hospital, thus indicating that it was of nosocomial origin. This is supported by the finding that Inpatients constituted 63.2% of the study group.

In the present study resistance to ampicillin was noted in 92.4% isolates, cotrimoxazole in 61.6% and nitrofurantoin in 15% respectively. Sahm DF et al. reported similar findings (97.8%, 92.8% to and 7.7% respectively) [11]. Many previous studies have reported similar findings in their study [7],[9],[12]. Further, Karlowsky J A et al. detected lowest rates of resistance to nitrofurantoin among *E. coli* (0.4%) stating that nitrofurantoin has retained its potent activity against *E. coli* despite 50 years of use [13]. The probable reasons for this could be its narrow spectrum and hence limited indication (treatment of acute cystitis) and narrow tissue distribution (low or undetectable serum distribution) and limited contact with bacteria outside urinary tract.

In our study, high drug resistance was noted to ampicillin (93%), Nalidixic acid (75%), Cotrimoxazole (73%), Norfloxacin (68%). Even third generation cephalosporins tested resistant. Many authors have reported a high degree of drug resistance in their studies [2],[3],[4],[12]. Among the antibiotics tested, Nitrofurantoin and ceftazidime were reported resistant only in 15%, 38% respectively, hence proving as suitable alternatives. The above studies together with our study highlight the importance of performing AST in order to choose an effective antibiotic. However, AST report is immediately not available to the clinicians and the clinician has to depend on the empirical choice of antibiotics. A rational empirical therapy is designed by gathering all the data of the AST reports in particular geographic area and choosing the best alternative. The local health institutions and government should take interest in publishing the local antibiotic patterns observed in their respective geographical areas so as to enable formation of an effective empirical therapy.

In our study, we noted there was a significant difference between antibiotic resistance percentages between inpatients and outpatients. Isolates from inpatients had higher resistance compared to outpatients for all antibiotics. Joseph Gangoué Piéboji et al have also reported similar findings in their study on Gram negative bacilli [5]. This difference demonstrates the unrestrained use of antibiotics in the hospital and the need to use them judiciously. The constant and uninhibited use of antibiotics throughout the year leads to selection of resistant mutants and emergence of drug resistance. A possible solution for such problem would be rotation of antibiotics which is guided by a good hospital antibiotic policy.

V. Conclusion

Escherichia coli were the predominant pathogens causing UTI followed by Klebsiella species. Antibiotic resistance was very high in the study hospital and needs to be guided by a good antibiotic policy. Nitrofurantoin still holds good for the treatment of UTIs. Antibiotic sensitivity testing is a must for a treatment of UTIs and prevention of drug resistance. Drug resistance was high in inpatients compared to outpatients. If the situation continues, very few options will be left for treatment and warrants immediate action to curb the menace of antibiotic resistance.

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