RESISTANCE PATTERNS OF URINARY ISOLATES IN A TERTIARY INDIAN HOSPITAL

Azra S. Hasan, D. Nair, J Kaur, G. Baweja, M Deb, P. Aggarwal,
Department of Microbiology, Safdarjung Hospital & V.M. Medical College, New Delhi

Background: To analyze the pathogenic organisms recovered from patients with urinary tract infection in a tertiary Indian hospital setting along with determination of the occurrence and anti-microbial sensitivity of uropathogens on a retrospective basis during a period of one year. **Methods**: A total of 5073 urine samples were processed. Urine culture was done using conventional microbiological techniques. Biochemical testing was used to identify the organisms and antibiotic sensitivity was done by the Kirby Bauer method. **Results:** A total of 2436 uropathogens were isolated. E coli were seen in 50.7% samples followed by Klebsiella sp (27.6%). Staphylococcus aureus was the commonest Gram- positive isolate (1.5%). Urinary tract infection (UTI) was seen in 70.5% females as compared to 29.5% males. A high recovery of isolates was noted from July to September. Multi drug resistance was commonest with Enterococcus (78.8%) followed by Pseudomonas (65.1%). Drugs, which retained usefulness for Gram-negative isolates, were amikacin, norfloxacin and cefotaxime. For Gram-positive isolates, vancomycin, teicoplanin, lincomycin and Norfloxacin were very effective. **Conclusions**: Our study highlights the changing etiology of UTI and emergence of drug resistance within the Indian subcontinent.

Keywords: Urinary Tract Infections, Pathogens, Antibiotics

INTRODUCTION

UTI is the most common bacterial infection. Due to rising antibiotic resistance among uropathogens, it is important to have local hospital based knowledge of the organisms causing UTI and their antibiotic sensitivity patterns. This information would be relevant not only to the local hospital but would also be a vital regional database. UTI is frequently encountered in patients with diabetes and in those with structural and neurological abnormalities, which interfere with urinary flow. Nosocomial UTI is common following instrumentation namely, catheterization and cystoscopy. Almost all known bacterial pathogens have been incriminated as possible causative agents of this clinical syndrome[1,2]. The current study retrospectively analyses the uropathogens and their anti-microbial susceptibility patterns during one year in patients with UTI from a large tertiary care hospital of India.

MATERIAL AND METHODS

This is a retrospective study of one year and included patients from the medical and surgical wards of our hospital. A total of 5073 samples were processed. There were 3118 females and 1955 ma s in the study.

Fresh midstream urine samples were aseptically collected in sterile containers. Each sample was plated onto 5% sheep blood agar and MacConkey agar plates using a calibrated loop, delivering 0.0lml of the sample. This was incubated at 37°C overnight and the observation was made the next day. All plates showing significant growth (>l0 CFU/ml) as per the Kass count[3] were further processed. Fewer colonies (<l0 CFU/ml) were processed only if relevant history was present in the form of fever, chills, flank pain, pyuria, history of antibiotic intake, structural abnormalities, diabetes mellitus and any immuno-compromised state. For Staphylococcus aureus, even <10 colonies (l0 CFU/ml) were further processed as this was considered significant[4]. After biochemical identification anti-microbial sensitivity testing was done for the isolates using Kirby Bauer methods[5] on Mueller Hinton agar and results were interpreted as per the NCCLS guidelines[6].

RESULTS

Out of the total of 2436 uropathogens, the commonest isolate was E.coli (50.7%) followed by Klebsiella species (27.6%). Among the gram-positive organisms, Staphylococcus aureus (1.5%) was the most prevalent. Other organisms, which were isolated, included Pseudomonas aeruginosa, Proteus species, Coagulase negative Staphylococcus, Candida species, Enterococci etc. The frequency of isolation of these organisms is shown in Figure 1.

UTI was more common in females (70.5%) as compared to males (29.5%). In females Pseudomonas species (84%) followed by E. coli (83%) had an almost equal distribution. In males Enterococci were most prevalent (55%).

The number of samples was significantly higher from July to September and a corresponding high recovery of isolates was also observed in this season.

Table 1: Anti-microbial resistance profile of Gram positive isolates (Figures represent resistance percentage).

Org	Nt	Ak	G	No	Am	P	Ox	E	Te	Va	Lin	Av Re
S.aur	45.4	-	-	45.4	54.5	65.6	34.2	45.4	0	0	9	33.3
CNS	72.1	-	-	51.3	88.6	96.4	48.9	80.8	0	0	18.8	50.8
Ent.	76.4	76.3	84.2	80.2	92.2	98.8	-	-	0	0	-	63.5

Org: Organism, Nt: Netilmycin, Ak: Amikacin, G: Gentamycin, No: Norfloxacin, Am; Ampicillin, P: Penicillin, Ox: Oxacillin, E: Erythromycin, Te: Teicoplanin, Va: Vancomycin, Lin: Lincomycin, Av Re: Average Resistance

Table 2: Anti-microbial resistance profile of Gram-negative isolates
(Figures represent resistance percentages).

Org	Nt	G	Ak	Cefo	Cefu	Cftz	Pip	Nor/cip	Av Re
Pseu.	75.3	89.7	54.6	68.7	92.7	72.2	90.7	70.1	80.3
E.coli	80.9	90.4	33.3	71.4	95.2	-	95.2	68.5	76.3
Kleb.	73.8	57.1	45.2	59.5	88.1	-	38.1	62.8	60.7
Prot.	100	88.9	77.8	33.3	100	-	44.4	66.7	83.4

Org: Organism, Nt: Netilmycin, G: Gentamycin, Ak: Amikacin, Cefo: Cefotaxime, Cefu; Cefuroxime, Cftz: Ceftazidime, Pip: Piperacillin, Nor: Norfloxacin, Cip: Ciprofloxacin, Av Re: Average Resistance

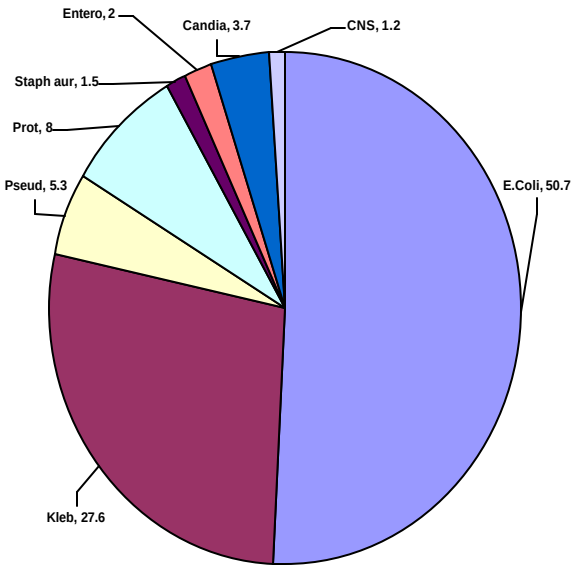

Figure 1. Pattern of organisms

Bacterial resistance to multiple antibiotics characterizes the present decade. Among the total isolates multi drug resistance (MDR = resistance in ≥3 drugs) was most commonly associated with Enterococci (77.8%) followed by Pseudomonas aeruginosa (65.1%), E. coli (52.9%) and Klebsiella species (48%). Multi drug resistance among Gram-positive organism was also seen in Coagulase negative Staphylococcus (50%) and Staphylococcus aureus (38.8%). Oxacillin resistance was observed in Staphylococcus species with methicillin resistant Staphylococcus aureus being 34.2% and methicillin resistant Coagulase negative Staphylococcus 48,9%. Drugs, which retained their usefulness for the Gram-negative isolates, were amikacin (47.3%), norfloxacin (33%) and cefotaxime (42%). In Gram-positive isolates vancomycin (100%), teicoplanin (100%), lincomycin (86.1%), netilmycin (35.4%) and norfloxacin (41%) were very effective. Pseudomonas aeruginosa was susceptible to amikacin (45.4%), cefotaxime (31.3%) and ciprofloxacin (30%). Among the Gram-negative isolates maximum resistance was seen to cefuroxime (94%) followed by netilmycin (82.5%) and gentamycin (81.5%). Amongst Gram-positive organisms high resistance was again observed with penicillin (86.9%), gentamycin (84.2%) and amikacin (78.4%). (Table 1 and 2).

DISCUSSION

Urine is the commonest sample to be received in a microbiology laboratory. A large spectrum of organisms has been reported from patients of UTI with E coli and Klebsiella sp being the most common. Among 217 uropathogens isolates from patients with UTI, Tankhiwale et a! have reported a high incidence of 49.8% for E coli followed by 37.8% for Klebsiella species[7]. On the contrary, Chan et a! found Klebsiella (25%) to be more prevalent than E coil (17.7%)[8].

It is stated that UTI is predominantly a disease of the females due to a short urethra and proximity to the anal opening. In our study too there was a female preponderance for this infection. Olafsson M et al[9] and Gupta et al[10] have found E coil followed by Staphylococcus saprophyticus as the most common isolates in females. But in our study

Pseudomonas species and E.coli were the common isolates in females. The higher incidence of Pseudomonas may be seen because of influence by microbial flora prevalent in hospital environment.

Reports worldwide suggest a significant peak in the incidence of UTI for a few months each year. This rise is generally in the post summer season. Anderson et at reported a rise in the incidence of UTI in August[11]. They attribute this to hot and humid conditions during these months. We have observed that the samples were maximum in monsoon i.e. July to September with a corresponding high recovery of isolates during this period.

Resistance to several antimicrobial agents was prevalent among the isolates recovered in the hospital. In the seventies MDR was practically non-existent and the cause was restricted to mutation of chromosomal genes. However, during the last two decades bacterial resistance mediated by plasmids, which carry resistance genes to a large number of antibiotics, which are rapidly transferred, has worsened the scenario[12]. Mathai et al have further suggested that MDR may be linked to integrons, which are genetic elements capable of recombination.

In their study from South India, they report anti-microbial resistance genes clustered in integrons. According to them resistance to ampicillin, co-trimaxazole, trimethoprim, nalidixic acid, chloramphenicol, tetracycline and gentamycin are common in isolates with integrons[13]. Multi drug resistance was commonest with Enterococci followed by Pseudomonas and E coil. Useful antibiotics for gram-negative bacteria were amikacin, norfloxacin and cefotaxime. For the Gram-positive organisms, vancomycin, teicoplanin and lincomycin were very useful. Ciprofloxacin was most useful for Pseudomonas. Farrell et al found that E coli were most sensitive to amoxycillin (78.8%). The sensitivity to cefuroxime (80%) was maximum in Gram-negative isolates[14]. In accordance with our data ciprofloxacin (97.7%) was most useful for Pseudomonas. Iqbal et al concluded that ciprofloxacin (80%) has maximum sensitivity for Gram negatives and erythromycin (72%) for Gram positive organism[15]. Overall resistance to all antibiotics for E coli, which was the commonest Gram-negative bacteria found, was 76.3%. Proteus species had maximum overall resistance (83.4%). Amongst Gram-positive isolates, 33.3% for Staphylococcus aureus and 63.5% average resistance for Enterococci were noted in our study. This is quite high and unacceptable. There could be a possible skew in our data as the cohort of patients who were admitted in the hospital, in whom there is an increased intake of antibiotics and increased urological manipulation.

On a phenotypic level there are two ways of fighting development and spread of drug resistant bacteria. The first is to reduce the use of antimicrobial agents to decrease the selection of resistant bacteria and the second is to improve hygienic measures to prevent the spread of resistant bacteria[16].

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Address for Correspondence: Dr. Azra S Hasan, Flat 704, FTA, Ayurvigyan Nagar, Khel Gaon Marg, Near Ansal Plaza, New Delhi-110 049, INDIA.