Prevalence of Uropathogens In Various Age Groups & Their Resistance Pattern In A Tertiary Care Hospital In Central India

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Abstracts: Background: The prevalence of multidrug resistance among uropathogens in rapidly increasing. Analysis of the prevalence in various age groups and the common antimicrobial co-resistance pattern of uropathogens isolated from patients in a tertiary care hospital would have important implication for patient care. Methods: A total of 1383 urine samples received during year 2010 were processed. Urine microscopy & culture was done using standard microbiological techniques. Organisms were identified by standard microbiological techniques. Antimicrobial susceptibility testing was done as per CLSI guidelines. Results: A total of 426 uropathogens were isolated. E coli were seen in 65.96 % (most common) followed by Klebsiella spp. 12.44%. Enterococcus was the commonest Gram positive isolate (5.86%). Urinary tract infection (UTI) was seen in 59.86% females as compared to 40.14% males. Average antimicrobial resistance for E.coli 75.74%, Klebsiella spp. 47.45%, Proteus 65.54%, Pseudomonas 75.89%, Enterococci 66.54%, Staphylococcus aureus 39.28%, Staphylococcus saprophyticus 47.79%. [Soni R NJIRM 2011; 2(4) : 7-10]

Key Words: Urinary Tract Infection(UTI), Uropathogens, AST

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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. 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 tertiary care hospital of Central India. There are microbial virulence factors that promote adherence to mucosal surfaces and subsequent infections[3].Host factor such as the epithelial cell receptivity is also important in the infection process. Although fungi and viruses are occasional etiological agents, UTIs are predominantly caused by bacteria. The most common bacteria implicated as causative agents of UTI generally originate in the intestine and include but not limited to *E. coli.* Pseudomonas spp, Proteus spp., Klebsiella spp., Staphylococcus spp., Streptococcus spp, Neisseria gonorrhoea, Chlamydia trachomatis, Candida spp., Mycoplasma are also other causative organisms. Extremes of age, female gender, pregnancy, instrumentation, neurologic dysfunction, renal disease, and expression of A, B and H blood group oligosaccharides on the surface of epithelial cells are predisposing factors for the development of UTIs[3] .UTIs are usually treated with antibiotics and microbiological testing may not always be necessary, because in most cases, urine culture and susceptibility testing cost more than the antibiotic treatment itself.

Studies aimed at gaining knowledge about the type of pathogens responsible for UTIs and their susceptibility patterns may help the clinicians to choose the right empirical treatment. In the last three decades, there have been a lot of reports in the scientific literature on the inappropriate use of antimicrobial agents and the spread of bacterial resistance among microorganisms causing urinary tract infections [3]. The emergence of antibiotic resistance in the management of UTIs is a serious public health issue, particularly in the developing world where apart from high level of poverty, ignorance and poor hygienic practices, there is also high prevalence of fake and spurious drugs of questionable quality in circulation. Knowledge of etiological agents of UTIs and their sensitivities to available drugs is of immense value to the rational selection and use of antimicrobial agents and to the development of appropriate prescribing policies [3] .Results of this data will provide useful information which would be used in the

formulation of policies for the rational and effective use of antimicrobial agents.

Material and Methods: This is a retrospective study of one year (2010) and included patients from the medical and surgical wards of the hospital. A total of 1383 samples were processed. Females and males of all age group included in this 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 on the next day. Plates showing significant growth (>l0^5 CFU/ml) as per the Kass count[4] were further processed. After biochemical identification, antimicrobial sensitivity testing was done and results were interpreted as per the CLSI guidelines[5].

Result: A total of 1383 urine samples received during year 2010 were processed. Out of which 426 (30.8%)samples were positive & 957 (69.2%)sample were negative for bacterial growth

In Positive culture isolation rate of gram negative organisms 378 (88.73%) as compared to gram positive 48 (11.27%). The commonest isolate was E.coli (65.96%) followed by Klebsiella species (12.44%). Among Gram positive isolate Enterococci was common (5.86%). Other organisms, which were isolated, included Pseudomonas aeruginosa (5.63%), Proteus species(1.65 %), Staphylococcus saprophyticus(2.59 %), Staphylococcus aureus(0.94 %), Candida species, etc. The frequency of isolation of these organisms is shown in Table 1.

Table: 1 Shows Percent Prevalence Of Uropathogens In Various Age Groups & Sex

Uro-pathogens	Male (0-5 year)	Female (0-5 year)	Male (6-15 year)	Female (6-15 year)	Male (16-40 year)	Female (16-40 year)	Male (41-60 year)	Female (41-60 year)	Male (>60 year)	Female (>60 year)	Average
E.coli	55.55%	50%	73.68%	100%	69.77%	59%	71.74%	70%	62.22%	76%	65.96%
Klebsiella	27.79%	16.67%	10.53%	-	2.32%	12.30%	10.87%	15.55%	17.77%	4%	12.44%
Enterococci	-	8.33%	10.53%	-	6.98%	4.91%	2.17%	7.77%	6.66%	8%	5.86%
Pseudomonas	-	8.34%	5.26%	-	11.63%	6.56%	8.70%	3.33%	4.45%	-	5.63%
GNNFB	5.55%	8.33%	-	-	4.65%	2.46%	4.35%	1.13%	6.67%	-	3.05%
Staph Sapro	-	-	-	-	-	9%	-	-	-	-	2.59%
Candida	11.11%	-	-	-	-	2.46%	2.17%	1.11%	-	4%	1.88%
Proteus	-	8.33%	-	-	4.65%	1.67%	-	1.11%	-	4%	1.65%
Staph aureus	-	-	-	-	-	1.64%	-	-	2.23%	4%	0.94%

Urinary tract infection (UTI) was seen in 59.86% females as compared to 40.14% males. E.coli is common in both female (65.09%) as well as in male (67.25%).

As shown in Table 4 average antimicrobial resistance for E.coli 75.74%, Klebsiella spp. 47.45%, Proteus 65.54%, Pseudomonas 75.89%, Enterococci 66.54%, Staphylococcus aureus 39.28% and Staphylococcus saprophyticus 47.79%. Antibiotics, sensitive for Gram negative isolates, were Nitrofurantoin, Piperacillin-Tazobactum, Amikacin, Gentamicin. For Gram-positive isolates, Cotrimoxazole, Amoxicillin - Clavulanate, Gatifloxacin, Amikacin were very sensitive.

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 (65.95 %) and Klebsiella spp. (12.41 %) being the most common in our study. Hasan et al [6](2007) have reported a high incidence of for E coli (50.7%) followed by Klebsiella spp. (27.6%) in 2436 uropathogens from patients with UTI. Multi drug resistance was commonest with Enterococcus (78.8%) followed by Pseudomonas (65.1%) [6.] 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 et al [7] and Gupta et al [8] have found E. coli followed by Staphylococcus

saprophyticus as the most common isolates in females. But in our study E.coli & Klebsiella were the common isolates in females.

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[9]. 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.

Table: 4: shows antibiotic resistance for uropathogens in %

Uropathogens	NF	AK	PT	PC	CA	G	CN	CF	CO	CTR	CPZ	NX	CTX	CFX	AC	NA	C	GF	Resistance (%)
E.coli	22.42	35.24	25.27	86.84	82.92	70.82	86.6	86.48	81.85	84.34	89.32	85.77	84.55	90.04	90.75	94.31	90.15	-	75.74
Klebsiella	28.3	45.28	26.42	52.45	48.68	37.36	56.23	46.79	44.91	52.45	54.34	48.68	54.34	54.34	54.34	54.34	-	-	47.45
Proteus	57.14	42.86	42.86	57.14	71.43	85.72	71.43	42.86	85.72	57.14	71.43	57.14	71.43	71.43	57.14	85.72	85.72	-	65.54
GNNFB	69.23	53.85	15.39	38.47	39.23	53.85	92.31	44.62	61.54	39.23	52.31	39.23	31.54	52.31	36.92	39.23	-	-	47.43
Enterococci	60.00	72.00	64.00		-	44.00	-	78.00	52.00	-	88.00	92.00	-	-	40.00	96.0	-	46.00	66.54
Pseudomonas	91.67	50.00	25.00	54.17	75.00	87.5	-	75.00	95.83	75.00	83.33	83.33	79.17	91.67		95.83	-	-	75.89
Staph sapro	-	36.37	-	-	-	18.19	-	54.55	90.91	-	63.64	-	-	-	27.28	-	-	43.64	47.79
Staph aureus	-	50.00	-	-	-	0	-	75.00	75.00	-	50.00	-	-	-	25.00	-	-	0	39.28

(GNNFB =Gram negative non-fermenter bacilli, staph sapro = Staphylococcus saprophyticus, NF = Nitrofurantoin, AK = Amikacin, PT = Piperacillin-Tazobactum, PC = Piperacillin, CA = Ceftazidime, G = Gentamicin, CN = Cefoxitin, GF = Gatifloxacin, CF = Ciprofloxacin, CO = Cotrimoxazole CTR = Ceftriaxone, CPZ = Cefoperazone, NX = Norfloxacin, CTX = Cefotaxime, CFX = Cefixime, AC = Amoxicillin-clavulanate, NA = Nalidixic acid, C = Chloramphenicol))

Resistance to several antimicrobial agents was prevalent among the isolates recovered in the hospital. In the 1970s, MDR was practically nonexistent and the cause was restricted to mutation of chromosomal genes. However, during the last two decades bacterial resistance mediated by plasmids, which carry resistant gene to a large number of antibiotics, which are rapidly transferred, has worsened the scenario[10]. 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, Cotrimaxazole, Trimethoprim, Nalidixic acid, Chloramphenicol, Tetracycline and Gentamicin are common in isolates with integrons[11].

In our study multi drug resistance was commonest with Pseudomonas(75.89%) followed by E.coli(75.74%) and Proteus(65.54%). Antibiotics, sensitive for Gram negative isolates, were Nitrofurantoin, Piperacillin-Tazobactum, Amikacin, Gentamicin. For Gram positive isolates, Cotrimoxazole,Amoxicillin-Clavulanate, Gatifloxacin Amikacin were sensitive. Farrell et al found that E. coli was most sensitive to Amoxycillin (78.8%). The sensitivity to Cefuroxime (80%) was maximum in Gram negative isolates[12]. In our study overall

resistance to all antibiotics for E. coli, which was the commonest Gram negative bacteria found, was 75.74%. Amongst Gram positive isolates, 66.54% average resistance for Enterococci were noted. 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 emergence of resistant bacteria and the second is to improve hygienic measures to prevent the spread of resistant bacteria[13].

Conclusion: E.coli is the most common cause of UTI in all age group & both sex and increasing resistance to the available antibiotics has made the management of these patients more difficult. So, in future more work is needed to study this issue to overcome the problem of emergence of multidrug resistant uropathogens especially in tertiary care centres. Antibiotic protocol is necessary to limit this problem

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