Original Article

Incidence of Gram Negative Uropathogens in a Tertiary Care Hospital

***Dr. Sanjivani Mundhe*[1], *Dr. Milind Davane*[1]**

[1]*Assistant Professor, Department of Microbiology, MIMSR Medical College& Hospital, Latur-413531, Maharashtra, India*

Abstract:

Background: In wide range, urinary tract infection (UTI) is a substantial and second most popular bacterial infection affecting individuals of overall ages worldwide. The chronicity of divergent bacterial isolates and their propensity to various antibiotics may contradict widely, peculiarly in hospitalized patients, this makes the survey of vulnerability pattern extremely mandatory for correct selection of antibiotics. **Objective:** To appraise antimicrobial susceptibility pattern of the Gram negative organisms identified from urine cultures of hospitalized patients. **Methodology:** Total 500 urine samples from hospitalized patients with significant bacteriuria were surveyed. Using Blood and MacConckey agar, samples were inoculated. Further identification and investigation of organisms was done by standard Microbiological methods. Antimicrobial Susceptibility pattern was interpreted by Modified Kirby-Bauer's disc diffusion method with the group of 15 drugs as per Clinical Laboratories Standard Institute (CLSI) protocols. **Results:** UTIs were frequent in females 290 (58%). Familiar organism found was Escherichia coli 260 (52%) further accompanied by *Klebsiella spp.* 120 (24%), *Pseudomonas spp.* 40 (8%), Proteus spp. 38 (7.6%), *Citrobacter spp.* 25(5%) and *Acinetobacter spp.* 17 (3.4%). Mass of the strains were found sensitive to nitrofurantoin followed by amikacin, piperacillin-tazobactamand cotrimoxazole. Commonly prescribed fluroquinolones were found least effective for treatment of UTI. All the strains were found sensitive to imipenem. Extended spectrum beta lactamase (ESBL) was noted in E.coli and in *Klebsiella spp.*

Conclusion: To break the continuity of non selective use of antibiotics and to intercept further development of bacterial drug resistance, proper knowledge of susceptibility pattern of uropathogens in particular area is very important before prescribing any empirical antibiotic therapy.

Key-words: Antimicrobial sensitivity, Gram negative bacteria, Urinary tract infection (UTI), Hospitalized patients

Introduction:

Basically UTI is the second habitual bacterial infection affecting individuals of different ages worldwide, in which pathogenic micro-organisms are detected in urine, urethra, kidney, prostate and bladder, and are associated with specific clinical signs and symptoms. On an average globally 50% of women have UTIs at least once in their entire lifetime and are particularly more common in those aged between 16–64 years.[1] *Escherichia coli* (upto 85%) are the utmost causing episodes and other covering micro-organismas are *Staphylococcus saprophyticus* (up to 10%), *Klebsiellapneumoniae* and Proteus species.[2]

Management of UTIs is carried out by using antimicrobial therapy. Even though with availability of antibiotics, morbidity and nosocomial infection among hospitalized patients due to UTI are seen regularly.[3]

Corresponding Author: *Dr. Milind Davane*

Email ID: *milinddoctor@rediffmail.com*

Address: *Department of Microbiology, MIMSR Medical College& Hospital, Latur-413531, Maharashtra, India*

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A non-selective use of antimicrobial agents often leads to emergence of resistant microorganisms to one or several of them causing poor treatment outcome.[4] Since the sensitivity pattern is constantly changing and alarming, continuous tracking of antimicrobial susceptibilities has become foremost and mandatory. It imparts actual facts about pathogenic organisms isolated from patients and guides in choosing the most appropriate and effective antimicrobial therapy till the culture reports are evident.[5]

The type of pathogens responsible for UTIs along with resistance patterns are revealed by area specific monitoring studies, thus providing deep knowledge for choosing the correct empirical therapy by clinicians. Therefore, the present study was targeted at Yashwantrao Chavan Rural Hospital, Latur to determine the sensitivity profiles of urinary isolates from the hospitalized patients from which can be proved and opt the most appropriate and effective antibiotic therapy for UTIs.

Methodology:

Study area and population: Following the approval of Institutional Ethics Committee of Yashwantrao Chavan Rural Hospital, Latur, this study was carried out during the period of one year from June 2018 to May 2019 in hospitalized patients.

Sample collection: For analysis a total of 500 urine samples evident with bacteriuria were considered. Patients with symptoms of UTIs was selected and a 'mid-stream' clean catch urine or a catheter specimen of urine sample was collected along with age and sex records.[6]

Isolation and identification of uropathogens: Using Blood and MacConkey's agar inoculation of samples was done. Standard microbiological methods were used for identification of colonies.[7]

Antimicrobial susceptibility test: Antimicrobial susceptibility pattern was surveyed by Modified Kirby-Bauer disc diffusion method with a group of 15 drugs as per the Clinical Laboratory Standard Institute (CLSI) guidelines and sensitivity pattern was noted. The 15 drugs used were norfloxacin(10µg), amikacin (30µg), ciprofloxacin (5µg), gentamicin (10µg), ofloxacin (5µg), gatifloxacin (5µg), levofloxacin (5µg), nitrofurantoin (300µg), cotrimoxazole (1.25 µg /23.75µg), ceftriaxone (30µg), piperacillin-tazobactam (100µg+10µg), ceftazidime (30µg), netilmicin(30µg), imipenem (10µg), and ceftazidime (30µg) (Hi-Media, India).The caliber of section of inhibition of growth was documented and interpreted by the standards of *CLSI. E. coli, Klebsiellaand proteus spp*. Screening for extended spectrum beta lactamase (ESBL) by using ceftazidime, cefotaxime and ceftriaxone as screening agents as proposed by CLSI.[8]

Escherichia coli ATCC 25922, *Staphyloccusaureus* ATCC 25923 and *Pseudomonasaeruginosa* ATCC 27853 were used as control strains.

Results:

Table 1: Sex Distribution (total positive samples=500)

Sex	Number	Percentage
Male	210	42%
Female	290	58%
Total	500	100%

Among 500 culture positive urine samples from hospitalized patients, 210 (42%) were male and 290 (58%) were females **(Table 1).**

Table 2: Gram Negative Bacilli Isolated

Name of Bacteria	No. of Isolates	Percentage
E. *coli*	260	52
Klebsiella Pneumonia	120	24
Pseudomonas aeruginosa	40	8
Proteus spp.	38	7.6
Citrobacter freundii	25	5
Acinetobacter baumanii	17	3.4

Conventional Gram negative isolates grown on culture were *E.coli* 260 (52%), *Klebsiella spp.* 120 (24%), *Pseudomonas aeruginosa* 40 (8%), *Proteus spp.* 38 (7.6%), *Citrobacter freundii* 25 (5%) and *Acinetobacter baumanii* 17 (3.4%). **(Table 2)**

Table 3: Antibiotic Susceptibility pattern of uropathogens

Isolates	Ak	G	Cf	Of	Gf	Le	Nx	Nf	CO	Nt	PT	I	Ca	Ci	Ce
***E. coli* (n=260) %**	190 (73.07)	127 (48.84)	68 (26.15)	65 (25)	59 (26.69)	67 (25.76)	61 (23.46)	212 (81.53)	126 (48.46)	151 (58.07)	163 (62.69)	246 (94.61)	102 (39.23)	92 (35.38)	97 (37.30)
***Klebsiella* (n=120) %**	86 (71)	52 (43.3)	33 (27.5)	26 (21.6)	29 (24.1)	33 (27.5)	28 (23.3)	98 (81.6)	59 (49)	70 (58.3)	75 (62.5)	119 (99.1)	36 (30)	39 (32.5)	41 (34.1)
***Pseudomonas* (n=40) %**	31 (77.5)	19 (47.5)	15 (37.5)	10 (25)	9 (22.5)	1.5 (37.5)	14 (35)	NA	NA	23 (57.5)	29 (72.5)	39 (97.5)	25 (62.5)	19 (47.5)	18 (45)
***Proteus* (n=38) %**	28 (73.68)	15 (39.47)	9 (23.68)	8 (21.05)	7 (18.42)	11 (28.94)	10 (26.31)	31 (81.57)	15 (39.47)	17 (49.73)	23 (60.58)	38 (100)	17 (44.73)	19 (50)	14 (36.8)
***Citrobacter* (n=25) %**	18 (72)	10 (40)	07 (28)	06 (24)	07 (28)	07 (28)	08 (32)	19 (76)	11 (44)	12 (48)	16 (64)	25 (100)	9 (36)	8 (32)	9 (36)
***Acinetobacter* (n=17) %**	15 (88.2)	6 (35.2)	10 (58.8)	11 (64.7)	9 (52.94)	8 (47.05)	7 (41.1)	14 (82.3)	7 (41.17)	14 (82.3)	13 (76.4)	16 (94.1)	6 (35.2)	9 (52.9)	9 (52.9)
Total (n=520)	368 (70.76)	229 (44.03)	142 (27.30)	126 (24.23)	120 (23.07)	141 (27.11)	121 (23.26)	374 (77.91)	218 (45.41)	281 (55.19)	319 (61.34)	483 (92.88	215 (41.34)	186 (35.76)	188 (36.17)

Cf - Ciprofloxacin, Gf - Gatifloxacin, Ca – Ceftazidime, Le- Leofloxacin, G - Gentamicin, Of –Ofloxacin, Co-Co-trimoxazole, I-Imipenem, Nx – Norfloxacin, Ce – Cefotaxime, Ci- Ceftriaxone, Nf – Nitrofurantoin, PT – Piperacillin-tazobactam, Ak – Amikacin, Nt - Netilmicin

NA- Not Applicable

Surrounding with various antibiotics tested against Gram negative uropathogens, imipenem (92.88%) was instituted the most effectual followed by nitrofurantoin (77.91%), amikacin (70.76 %) and piperacillin -tazobatum (61.34%). Rests of the antibacterial agents were found effective against less than 50% gram negative bacilli isolated from UTI cases. Gatifloxacin (23.07%) and norfloxacin (23.26) were found the least potent antibacterial agents. **(Table 3)**

Discussion:

With rapidly increasing UTI worldwide, the popularity of antimicrobial resistance among micro-organisms is creating a valuable point in selecting the error-free antibiotics for treatment. Among urinary pathogens in different hospitals, community disparities in the antimicrobial susceptibility is evident. For basic diagnosis and treatment of UTI a healthy contribution between the clinician and the microbiologist is required.

The present survey data reveals about the prevalent tendencies of increased resistance of uropathogens in this section, which may be due to geographical variations or non-selective or fatal use of antibiotics.

The commonest isolate was E. coli (52%) followed by K*lebsiella spp.* (24%) from total 500 isolated uropathogens of UTI patients. This matched with the study by Tankhiwale *et al*[9], who highlighted the high incidence of 47.4% for *E. coli* followed by 37.8% for *Klebsiella spp.* It is announced that UTI is more familiar in females compared to males, in our analysis too there was a female preponderance and this observation resembles with the previous studies.[10,11]

E.coli, which was the principle pathogen isolated, manifested high vulnerability to nitrofurantoin (81%), amikacin (73.07%) and slightest susceptible to third generation cephalosporins and fluroquinolones. Similar consequences are outlined from other studies.[12,13] Throughout the gram negative isolates, *Pseudomonasaeruginosa* and *Acinetobacter spp.* are established with hospital acquired infections.[14] Pseudomonas aeruginosa, the third frequently isolated organism from hospitalised UTIs was less sensitive to commonly used to antibiotics, but highly sensitive to piperacillin-tazobactam (72.5%) and amikacin (77.5%). Identical results are summarized from previous studies by Das et al.[15]

The quinolones viz. levofloxacin, norfloxacin, gatifloxacin, ciprofloxacin and ofloxacin, which highly recommended drugs against UTI were short-end active against all the uropathogens considered during this study period. This observation positively resembled with the previous documented studies.[16-18] Considering the mechanism of action of these quinolones is almost same, emergence of resistance against one will also decrease the activity of any other quinolones. This created controversies with the previous studies reported with higher susceptibility to the fluroquinolones.[15]

Conclusion:

The conclusion of present study proclaimed that UTIs are more prevailing in women. The uropathogens are more responsive to the carbapenems. Nitrofurantoin justified the next leading substitute for treating UTI caused by Gram negative organisms followed by amikacin, piperacillin-tazobactam, netilmicin and co-trimoxazole. Making cautious selection of correct antimicrobial drugs helps in lessening the emergence and outspread of developing the resistance. To reduce the risk of unsuitable antimicrobial drugs, various public health education promotions are beneficial in community. The susceptibility analyzed record in this study suggest that drug resistance is common issue in uropathogens isolated from hospitalized patients. So, the deep knowledge of sensitivity pattern analysis of uropathogen culture is crucial before prescribing any empirical antimicrobial therapy. Therefore to overcome these issues, routine monitoring and surveillance are decisive factors for the better management of patients.

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