



Original article

Antibiotic Resistance Pattern among common Bacterial Uropathogens Isolated in A Tertiary Care Hospital

G.Sasikala^{1*}, Reena Rajan², S.Mathavi³, R.Indra Priyadharsini⁴

¹Consultant Microbiologist, VIMS Hospital, Salem,

²Senior Lecturer, Department of Microbiology, Penang International Dental College, Vinayaka Mission's Research Foundation (Deemed to be University), Salem, Tamil Nadu,

³Associate Professor, ⁴Professor, Department of Microbiology, Vinayaka Mission's Kirupananda Variyar Medical College, Vinayaka Mission's Research Foundation (Deemed to be University), Salem, Tamil Nadu.

ABSTRACT

Introduction: Urinary tract infections (UTI's) are one of the most common bacterial infections in community and hospital settings and it is important to know the etiology and susceptibility pattern of uropathogens for optimum management of UTI's. **Aim & Objectives:** This study was conducted to know the etiology of UTI and to determine the antibiotic resistance pattern of these isolates. **Materials & Methods:** A prospective cross sectional study was done on 537 and 486 consecutive urine samples from January to May 2015 and 2016. Isolates obtained were identified by conventional biochemical methods and antimicrobial susceptibility testing was done by Kirby Bauer disk diffusion method as per CLSI guidelines. **Results:** The prevalence of UTI was 41.71% and 51.85% in 2015 and 2016 respectively. 129 (57.59%) and 148 (58.73%) females and 95 (42.41%) and 104 (41.27%) males were infected in 2015 and 2016 respectively. *Escherichia coli* (55.25%) was the predominant organism isolated. An increased resistance to norfloxacin, ampicillin and cefotaxime were shown in 2016 compared to the antimicrobial resistance pattern obtained in 2015. All the gram negative bacilli studied were sensitive to Imipenem and Piperacillin-Tazobactam. **Conclusion:** Constant surveillance of resistance rate of uropathogens is necessary to formulate local antibiotic policy and to assist clinicians in the rational choice of antibiotic therapy.

KEYWORDS: Urinary Tract Infection, E.coli Antibigram, Fluoroquinolone resistance.

INTRODUCTION

Urinary Tract Infection's [UTI's] remains one of the most common bacterial infection in human, both in outpatients and hospital setting. The clinical manifestations of UTI may vary from mild asymptomatic cystitis to pyelonephritis and septicaemia. [1] The treatment of choice for UTI can be classified into uncomplicated and complicated and there is a need to initiate empirical antimicrobial therapy before obtaining microbiological results in almost all cases. The most common organisms among the uropathogens are *E. coli*, *Enterococcus faecalis*, *Staphylococcus aureus* and *Klebsiella* spp. [1,2] Etiology of UTI and antimicrobial susceptibility pattern have been changing over past years both in community and nosocomial infection. The resistance

of uropathogens to commonly prescribed antibiotics is increasing both in developing as well as in developed countries. [2,3]

Fluoroquinolones are potent synthetic agents active against variety of bacterial species *in vitro* including multiple antibiotic resistant gram negative bacilli. [4] Resistance to fluoroquinolones occurs through multiple mechanisms such as chromosomal point mutations in the genes encoding DNA gyrase and/or topoisomerase IV, mutations that cause decreased expression of outer membrane proteins (OMPs), alterations in the lipopolysaccharide (LPS) component of the cell envelope, and enhanced fluoroquinolone efflux by efflux pumps such as AcrAB. Plasmid mediated resistance is

caused by protection of DNA gyrase and topoisomerase IV by Qnr-like proteins, including QnrA.[5,6]

Norfloxacin is the most frequently used fluoroquinolone for empirical therapy of UTI because of its excellent activity against the uropathogens. [7] Resistance to Norfloxacin has markedly increased since their introduction for UTI treatment. This situation has forced the importance of reassessment of empiric treatment for the management of UTI. Knowledge of etiology of UTI's and their antimicrobial resistance pattern may help clinicians in choosing antimicrobial empirical therapy. The present study was undertaken to report the antibiotic resistance pattern among common bacterial uropathogens isolated in a tertiary care hospital.

MATERIALS AND METHODS

This prospective cross sectional study was done in Department of Microbiology, Vinayaka Mission's Kirupananda Variyar Medical College, Salem. A total of 537 and 486 consecutive urine samples from January to May 2015 and 2016 were included. The samples were inoculated on to Blood agar and Mac Conkey agar with standard loop(4mm diameter) and were incubated at 37°C overnight. Growth of $\geq 10^5$ Colony Forming Units per ml was considered as significant bacteriuria. The isolates obtained were identified by gram staining and conventional biochemical methods.[8]Antimicrobial susceptibility testing was done on Muller Hinton Agar plates by Kirby Bauer disk diffusion method and interpretation was done as per Clinical Laboratory Standard Institute (CLSI) guidelines.[9]

The antibiotics used were Ampicillin(10µg), Amikacin(30µg), Nitrofurantoin(30µg), Cefotaxime (30µg), Cotrimoxazole(25µg), Imipenem(10µg), Piperacillin T

azobactam(100µg), Norfloxacin(10µg). Escherichia coli ATCC 25922, Staphylococcus aureus ATCC 25923, Enterococcus faecalis ATCC 29212 and Pseudomonas aeruginosa ATCC 27853 were used as a quality control.

RESULTS

The prevalence of UTI was 41.71% (224) and 51.85%(252) in 2015 and 2016 respectively. UTI was more common among females. There is no significant difference in the occurrence of UTI among males. (p = 0.8) and females. (p = 0.8) in 2015 and 2016. 129 (57.59%) and 148 (58.73%) females and 95(42.41%) and 104(41.27%) males were infected in 2015 and 2016 respectively. [Table:1]

Among Gram negative bacilli (GNB) E.coli(63.22%) was the predominant organism followed by Klebsiella sp (24.04%) and Pseudomonas aeruginosa (5.53%). Among gram positive cocci, Enterococcus spp (72.55%) were the commonest organisms isolated, followed by Staphylococcus aureus(27.45%). [Table:2]

All the gram negative bacilli were sensitive to Imipenem and Piperacillin-Tazobactam. Of the total isolates studied, 71.20% were resistant to Norfloxacin. Staphylococcus aureus and Enterococcus spp showed 61.5% and 58.9% resistance to Norfloxacin. About 80.10% isolates were resistant to Ampicillin, 22.35% to Amikacin, 25.50% to Nitrofurantoin, 61.65% to Cefotaxime and 37.24% to Cotrimoxazole respectively [Table :3].

Overall resistance pattern showed increased resistance to Ampicillin(80.60%), Norfloxacin(74.70%) and Cefotaxime(62.80%) in 2016 compared to the resistance pattern observed in 2015 which is 79.60%, 69.51% and 60.50% respectively.

Table 1: Prevalence of UTI among males and females

| Gender | Year 2015 | Year 2016 | P value |
|---------|-----------------|-----------------|---------|
| Males | 95/224(42.41%) | 104/252(41.27%) | 0.8015 |
| Females | 129/224(57.59%) | 148/252(58.73%) | 0.8015 |

Table :2 Distribution of Isolates from Urine for the year 2015 and 2016

| S.No | Organisms isolated | Number of isolates in 2015 | Number of isolates in 2016 |
|------|------------------------|----------------------------|----------------------------|
| 1 | E.coli | 117(52.23%) | 146(57.94%) |
| 2 | Klebsiella | 51(22.77%) | 49(19.44%) |
| 3 | Proteus spp | 9(4.02%) | 8(3.17%) |
| 4 | Citrobacter freundii | 5(2.23%) | 6(2.38%) |
| 5 | Morganella | 1(0.45%) | 1(0.40%) |
| 6 | Pseudomonas aeruginosa | 12(5.36%) | 11(4.37%) |
| 7 | Staphylococcus aureus | 7(3.13%) | 7(2.78%) |
| 8 | Enterococcus spp | 18(8.03%) | 19(7.54%) |
| 9 | Candida spp | 4(1.78%) | 5(1.98%) |
| | Total | 224 | 252 |

Table 3: Comparison of Antibiotic resistance pattern among Gram negative uropathogens in the year 2015 and 2016

| Antibiotics | Year(2015) | Year(2016) |
|-------------------------|------------|------------|
| Ampicillin | 79.60% | 80.60% |
| Amikacin | 23.20% | 21.50% |
| Norfloxacin | 69.51% | 74.70% |
| Nitrofurantoin | 26.90% | 24.10% |
| Cefotaxime | 60.50% | 62.80% |
| Cotrimoxazole | 38.07% | 36.40% |
| Imipenem | 0.00% | 0.00% |
| Piperacillin-Tazobactam | 0.00% | 0.00% |

DISCUSSION

The etio-pathology of UTI varies with the differences in host factors, environmental factors, health care and hygiene practices and socio-economic conditions in different parts of the world. This study showed that prevalence of UTI is more common among females (58.16%) than males (41.84%). The predominance of UTI among females is related to the anatomical differences between male and female genitourinary systems and alteration in normal vaginal flora. This is comparable to another Indian study by Ratna Pratab et al where incidence of UTI among females was reported as 56.6% .[10]

In the present study, E.coli (63.22%) was the predominantly isolated gram negative bacilli, followed by Klebsiellasp (24.04%) and Pseudomonas aeruginosa (5.53%). Enterobacteriaceae colonize the urogenital mucosa with adhesin, pili, fimbriae, and P1-blood group phenotype receptor. Among the Gram positive cocci, Enterococcus spp (72.55%) were the commonest organisms isolated, followed by Staphylococcus aureus(27.45%). In another South Indian study by Somashekara et al., 53 % isolates were E.coli followed by Klebsiellasp (10%).[11] In a similar study from North India by Gupta N et al, the commonest isolates were E. coli (69.9%), followed by Klebsiella pneumoniae (25%), Pseudomonasaeruginosa(0.89%).[12] A study from North India by Sood and Gupta have reported Enterococcus sps as commonest gram positive organism isolated from UTI's.[13]

The percentage resistance to Norfloxacin in this study was found to be higher in 2016 compared to 2015. Usually, the prevalence of fluoroquinolone resistance is related to the intensity of antibiotic use. This high resistance rates may be because fluoroquinolones are preferred as initial agents for empiric therapy in UTI because of their excellent activity against the pathogens commonly encountered in UTI. Fluoroquinolones resistance was also closely associated with multi-drug resistance thus making the treatment options limited.[14,15] Various studies from India have reported Norfloxacin resistance among uropathogens in the range of 10 % to 60 % .[16,17,18,19,20]. Comparing the results obtained for urinary isolates in 2015 (69.51%), an increase in resistance to Norfloxacin was observed in 2016(74.70%).

All Gram negative bacilli studied showed 100 % sensitivity to Imepenem and Piperacillin- Tazobactam. Of the total isolates, 80.10% were resistant to Ampicillin, 22.35% to Amikacin, 25.50% to Nitrofurantoin, 61.65% to Cefotaxime respectively. A study from North India have reported 92.26% isolates sensitive to Imepenem.[21] In a similar study among uropathogens, Kumar et al have reported 22.38% resistant to Ampicillin, 17.61% to Cefotaxime, and 57.14 % to Norfloxacin.[22]

As the distribution of uropathogens and their antimicrobial susceptibility pattern vary regionally, the knowledge of etiology and their susceptibility to various drugs are necessary for better therapeutic outcome.

CONCLUSION

Isolates showed increased resistance to norfloxacin and cefotaxime in 2016 compared to the resistance pattern obtained in 2015. Inappropriate use of quinolones as empirical therapy for UTI's results in wide spread emergence of resistance . Increasing antibiotic resistance trends indicate that it is essential to rationalize the use of antimicrobials in the community and also use these conservatively. Hence it is necessary to know the resistance rate of uropathogens to formulate local antibiotic policy and to assist clinicians in the rational choice of antibiotic therapy.

Competing interest: The authors declare that they have no competing interests.

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*Corresponding author: Dr. G. Sasikala
E-Mail: reenarajan83@gmail.com