ORIGINAL ARTICLE

URINARY TRACT INFECTION: BACTERIOLOGICAL PROFILE AND ITS ANTIBIOTIC SUSCEPTIBILITY IN WESTERN INDIA

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ABSTRACT

Introduction: Urinary tract infections (UTIs) are counted among the most common infections in humans. In spite of the availability and use of the antimicrobial drugs, UTIs caused by bacteria have been showing increasing trends. The extensive and inappropriate use of antimicrobial agents has invariably resulted in the development of antibiotic resistance which, in recent years, has become a major problem worldwide.

Materials & Methods: Patients diagnosed clinically as UTI during the study period were included in the study. Urine sample of these patients were tested for Culture. All positive cultures were tested for antibiotic susceptibility.

Results: Out of total 232 patients, Isolates were detected in 177 (76.29%) samples. Out of these, 137 (77.40%) were female. Most common organism found positive was Escherichia Coli. E. coli was highly sensitive to Amikacin and Nitrofurantoin. Whereas, E.coli was highly resistant to Ampicillin and Nalidixic acid. Antibiotic sensitivity pattern of Klebsiella and Acinitobacter shows that they were also highly sensitive to Amikacin. Klebsiella and Acinobacter were highly resistant to Ampicillin and Gentamycin.

Conclusion: The pattern of resistance to commonly used antibiotics for treating UTI alerts us against indiscriminate usage of antibiotics

Keywords: Urinary tract infection, Gram Negative, Antibiotic resistance

INTRODUCTION

Urinary tract infections (UTIs) are counted among the most common infections in humans, exceeded in frequency among ambulatory patients only by respiratory and gastrointestinal infections.[1,2] Urinary tract infection is said to exist when pathogenic microorganisms are detected in the urine, urethra, bladder, kidney, or prostate with or without the presence of specific symptoms

It is estimated that 20% or more of the female population suffers some form of UTI in their lifetime. Infection in the male population remains uncommon through the fifth decade of life, when enlargement of the prostate begins to interfere with emptying of the bladder.

The most common pathogenic organisms of UTI are Escherichia coli, Staphylococcus saprophyticus and less common organisms are Proteus sp., Klebsiella pneumoniae,Pseudomonas aeruginosa, Enterococci and Candida albicans.[3]

Treatment of UTI cases is often started empirically and therapy is based on information determined from the antimicrobial resistance pattern of the urinary pathogens. In spite of the availability and use of the antimicrobial drugs, UTIs caused by bacteria have been showing increasing trends

The extensive and inappropriate use of antimicrobial agents has invariably resulted in the development of antibiotic resistance which, in recent years, has become a major problem worldwide.[4]

In patients with suspected UTI, antibiotic treatment is usually started empirically, before urine culture results are available. To ensure appropriate treatment, knowledge of the organisms that cause

UTI and their antibiotic susceptibility is mandatory.[5]

This study was planned to explore the common pathogens responsible for UTI and to determine the antibiotic susceptibility pattern of them.

MATERIALS AND METHODS

The study was conducted in a tertiary care hospital of Gujarat, India. All patients clinically diagnosed with urinary tract infection during March 2014 to June, 2014 were included in the study. Informed written consent was taken from all the participants. Those who were not willing to give written consent were excluded. There were total 256 patients diagnosed clinically as UTI during the study period. Out of these, 24 patients had refused to enrol in the study. Thus, total 232 patients were included in this study. Urine sample of these 232 patients were tested for Culture. All positive cultures were tested for antibiotic susceptibility.

Collection of Urine Samples: Early morning mid-stream urine samples were collected using sterile, wide mouthed container with screw cap tops. On the urine sample bottles were indicated name, age, sex, and time of collection along with requisition forms. The samples were analyzed bacteriological using the methods.[6]

Sample processing:

Culture: A calibrated sterile micron wire loop for the semi-quantitative method was used for the plating and it has a 4.0 mm diameter designed to deliver 0.01 ml. A loopful of the well mixed urine sample was inoculated into duplicate plates of Blood and Mac-Conkey agar. All plates were then incubated at 37°C aerobically for 24 h. The plates were then examined macroscopically and microscopically for bacterial growth. The bacterial colonies were counted and multiplied by 100 to give an estimate of the number of bacteria present per milliliter of urine. A significant bacterial count was taken as any count equal to or in excess of 10,000 cfu /ml.[7]

Microscopy: The urine samples were mixed and aliquots centrifuged at 5000 rpm for 5 min. The deposits were examined using both 10X and 40X objectives. Samples with ≥10 white blood cells/mm3 were regarded as pyuric. A volume of the urine samples were applied to a glass microscope slide, allowed to air dry, stained with gram stain, and examined microscopically. Bacterial isolates were identified generally using biochemical reaction.[8]

Antibiotic susceptibility testing

The method used with standardization of the inoculums size was agar diffusion method. The standardized single-disc diffusion method was employed.[9]

This study was ethically approved by institutional ethical committee of the institute.

Statistical analysis: All data were entered in Microsoft Excel and analysed using EpiInfo software (version 6.04)

RESULTS

In this study, urine sample of total 232 patients clinically diagnosed with urinary tract infection was collected and tested for microorganism.

Out of total 232 patients, Isolates were detected in 177 (76.29%) samples. Out of these, 137 (77.40%) were female and 40 (22.60%) were male.

Table 1: Gender wise distribution of Various Urinary Pathogens (N=177)

Isolates	Infected male (%)	Infected female (%)	Total (%)
Escherichia coli	21 (11.86)	87 (49.15)	108 (61.02)
Klebsiella	7 (3.95)	17 (9.60)	24 (13.56)
Acinetobacter	5 (2.82)	12 (6.78)	17 (9.60)
Pseudomonas	5 (2.82)	7 (3.95)	12 (6.78)
Other	2 (1.13)	14 (7.91)	16 (9.04)
Total	**40 (22.60)**	**137 (77.40)**	**177 (100)**

Table 2: Percentage of In Vitro Antibiotic Sensitivity Pattern of Most Frequently Isolated Microorganisms

Drugs	E.coli (n=108)	Klebsiella (n=24)	Acinetobacter (n=17)
Amikacin	74.07	41.67	41.18
Ampicillin	3.70	16.67	11.76
Gentamycin	32.41	12.50	17.65
Ciprofloxacin	8.33	33.33	35.29
Cotrimoxazole	25.93	16.67	29.41
Nitrofurantoin	88.89	25.00	35.29
Nalidixic acid	5.56	16.67	29.41
Norfloxacin	10.19	29.17	23.53

Most common organism found positive was Escherichia Coli. Out of total 177 samples, E. Coli was found positive in 108 (61.02%) samples. Out of these 108 samples, 21 (11.86%) were males and 87 (49.15%) were females. Klebsiella was found in 24 (13.56%) sample. Acenatobacter and Pseudomonas were found in 17 (9.60%) and 12 (6.78%) of samples respectively. 16 (9.04%) samples were

found positive for Proteus, Staphylococci species etc.

Table 2 shows percentage of In Vitro Antibiotic Sensitivity Pattern of E. coli, Klebsiella and Acinetobacter. It was seen that E. coli was highly sensitive to Amikacin and Nitrofurantoin. Whereas, E.coli was highly resistant to Ampicillin and Nalidixic acid. Antibiotic sensitivity pattern of Klebsiella and Acinitobacter shows that they were also highly sensitive to Amikacin. Klebsiella and Acinobacter were highly resistant to Ampicillin and Gentamycin.

DISCUSSION

In community and hospital settings the etiology of UTIs and the antimicrobial susceptibility of UTI causing bacteria's have been changing over the years.[10,11]

Over the last decade, the treatment of choice for urinary tract infections (UTIs) has changed from co-trimoxazole to quinolones owing to the rate of resistance to Co-trimoxazole and its high level of therapeutic failure.[12]

Antimicrobial resistance has been associated with an increased rate of clinical failure, and reports from Canada and the US indicate that the prevalence of Co-trimoxazole resistance exceeds 15% and can be as high as 25%. Use of fluoroquinolones is recommended for uncomplicated UTIs in areas where the incidence of cotrimoxazole resistance exceeds 10%, as well as for the treatment of complicated UTIs and acute pyelonephritis.[13]

In our study the prevalence rate of isolation of urinary pathogen was 76.29%. In a similar study by Das RN et al isolation rate was 71.6%.[14] Another study done in Karnataka had reported 71.72%.prevalence rate of isolation of urinary pathogen [15]

Prevalence of UTIs was more in females when compared to males. This was in agreement with other studies by Bashir MF et al.[16] Women are more prone to UTIs then men because, in females, the urethra is much shorter and closer to the anus.[17]

The most commonly isolated organism in UTI among female outpatients in our study was *E. coli*. The proportion of bacterial species isolated was similar to those described in several previous studies.[18, 19, 20]

In our study E-coli was most resistant to Ampicillin, followed by Nalidixic acid and Norfloxacin. It was most sensitive to Nitrofurantoin followed by Amikacin. The similar findings were seen in a study by Bashir MF et al who concluded that the organisms showed resistance to older urinary antimicrobial agents such as Ampicillin which indicates that increased consumption of a particular antibiotic can be a pathway to its resistance.[16]

All the three most frequently isolated organisms showed resistant to commonly used antibiotics like Ampicillin, Norfloxacin and Nalidixic acid.

Antimicrobial resistance is a natural biological response of microbes to antimicrobial drugs. Resistance may be inherent.[21]

CONCLUSION

Urinary Tract Infection was more common among females than males.

E. coli was the most commonly isolated organisms in UTI.

Urinary pathogens showed resistance to commonly used antibiotics like Ampicillin, Norfloxacin and Nalidixic acid. This pattern of resistance to commonly used antibiotics for treating UTI alerts us against indiscriminate usage of antibiotics.

REFERENCES

1. Shalini, Joshi MC, Rashid MK, Joshi HS. Study of Antibiotic Sensitivity Pattern In Urinary Tract Infection At A Tertiary Hospital. NJIRM 2011; Vol. 2(3): 43-46
2. Levi ME, Redington J, Barth L. The Patient With Urinary Tract Infection. Manual of Nephrology 6th Edition. Lippincott Williams & Wilkins. 2005; 7: 91.
3. Salek, SB., 1992. Infective syndrome in medical microbiology, 4th edition, pp. 740
4. Goldstein FW. Antibiotic susceptibility of bacterial strains isolated from patients with community-acquired urinary tract infections in France. Multicentre Study Group. Eur J Clin Microbiol Infect Dis. 2000; 19:112-7.
5. Ashkenazi S, EvenTov S, Samra Z, et al. Uropathogens of various childhood populations and their antibiotic susceptibility. Pediatr Infect Dis J. 1991; 10: 742–6.
6. Kass, E. H.: Bacteriuria and diagnosis of infections of urinary tract. Arch. Intern. Med., 100: 709-714, 1957. 5.
7. National Committee for Clinical Lab Standards, Performance Standardization for Antimicrobial Disc Susceptibility test. 4th ed. Villanona PA. CC 1993; DC M2 AS.
8. District laboratory Practice in Tropical Countries Monika Cheesbrough,2nd Edition 2006.
9. Koneman's Textbook of Diagnostic Microbiology,6th Edition 2005.
10. New HC. Urinary tract infections. Am J Med. 1996; 100

(Suppl.4A): S63-70.

11. Jones RN. Impact of changing pathogens and antimicrobial susceptibility pattern in treatment of serious infections in hospitalized patients. Am J Med. 1996; 100 (Suppl.6A): S3-12.

12. Yilmaz K, Nilay C, Aysegül G, et al. Co-trimoxazole and quinolone resistance in Escherichia coli isolated from urinary tract infections over the last 10 years. International J Antimicrbial Agents. 2005; 26 (1): 75-77.

13. Blondeau JM. Current issues in the management of urinary tract infections: extended-release ciprofloxacin as a nove

14. Das RN, Chandrashekhar TS, Joshi HS, Gurung M, Shrestha N, Shivananda PG. Frequency and susceptibility profile of pathogens causing urinary tract infections at a tertiary care hospital in western Nepal. Singapore Med J 2006; 47(4) : 281.

15. Razak SK, Gurushantappa V. Bacteriology of urinary tract infection and antibiotic susceptibility pattern in a tertiary care hospital in South India. Int J Med Sci Public Health 2012; 1:109-112.

16. Bashir MF, Qazi JI, AhmadN Riaz S. Diversity of urinary tract pathogens and drug resistant isolates of Escherichia coli in different age and gender groups of Pakistanis. Tropical Journal of Pharmaceutical Research September 2008; 7 (3):1025-1031

17. Dielubanza EJ, Schaeffer AJ (2011 Jan). Urinary tract infections in women. The Medical clinics of North America 95 (1): 27–41.

18. Zhanel GG *et al.* (2005) Antibiotic resistance in outpatient urinary isolates: final results from the North American Urinary Tract Infection Collaborative Alliance (NAUTICA). Int J Antimicrob Agents 26:380-388.

19. Andrade SS, Sader HS, Jones RN, Pereira AS, Pignatari AC, Gales AC (2006) Increased resistance to first-line agents among bacterial pathogens isolated from urinary tract infections in Latin America: time for local guidelines? Mem Inst Oswaldo Cruz 101:741-748.

20. Gupta KD, Scholes WE, Stamm. Increasing prevalence of antimicrobial resistance among uropathogens causing acute uncomplicated cystitis in women. Journal of the American Medical Association 1999; 281: 736-738

21. Ahmed K, Imran. Prevalence and antibiogram of uncomplicated lower urinary tract infections in human population of Gilgit, northern areas of Pakistan. Pakistan J Zool. 2008; 40(4):295-301.