www.jmscr.igmpublication.org
Impact Factor 5.84
Index Copernicus Value: 83.27
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: https://dx.doi.org/10.18535/jmscr/v5i7.202

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Original Research Article

Profile of Urinary Tract Infections – A Cross Sectional Study in Chennai

Authors
Dr C.Sridhar, MD[1], Dr T.Mohanasundaram MD[2], Dr Balapriya MD[3], Dr T.Ramesh Kumar MD[4]
[1]Professor and Head, Department of General Medicine, Government Medical College, Omandurar Government estate, Chennai
[2]Assistant Professor of Medicine, Government Kilpauk Medical College, Chennai
[3]Associate Professor of Microbiology, Government Medical College, Omandurar, Chennai
[4]Associate Professor of Medicine, Government Medical College, Omandurar, Chennai
Corresponding Author
Dr T.Mohanasundaram
Assistant Professor of Medicine, Government Kilpauk Medical College, Chennai
Phone – 9884664402, Email: *mohanskgh@gmail.com*

ABSTRACT

Introduction: *Urinary tract infections (UTI) are one of the most common infectious diseases. In a limited resource setting, the availability of and accessibility to the new generation higher antibiotics is always a cause for concern. this study was conducted in patients with uncomplicated UTIs to evaluate the microbial growth pattern obtained from the urine specimens and their corresponding antibiotic sensitivity profile using conventional antibiotics*

Materials and Methods: *A prospective cross sectional study was conducted in a Government Medical College in Chennai comprising of 296 patients with clinically suspected UTI. Urine samples were collected and subjected to standard culture and sensitivity testing. SPSS software (version 16) was used to analyse the data. Simple descriptive statistics, Kruskal Wallis test and Man Whitney U post hoc tests were carried out. $P<0.05$ was considered significant.*

Results: *E.coli was the most common organism isolated in 66 out of total 296 samples (22.3%), followed by Enterobacter (2.7%). For E.coli, Amikacin was the drug to which most cultures (62.1%) were sensitive, followed by Cotrimoxazole (31.8%) and Nitrofurantoin (25.8%). For Enterobacter species, Gentamycin, Amikacin and Nitrofurantoin were equally sensitive (50%)*

Conclusion: *E.Coli is responsible for a vast majority of UTI and that Amikacin can be used as an empirical first line antibiotic for UTI in males and females in a limited resource setting where higher and newer antibiotics are not available*

Keywords: *UTI, E.coli, Amikacin.*

Introduction

Urinary tract infections (UTI) are one of the most common infectious diseases affecting a significant proportion of the population all over the world. About 150 million people are estimated to be affected by UTI globally [(1)]. UTI may involve

only the lower urinary tract (cystitis) or the upper urinary tract (pyelonephritis) or both. Episodes of acute cystitis and pyelonephritis occurring in healthy premenopausal non-pregnant women with no history suggestive of an abnormal urinary tract are generally classified as uncomplicated while all others are classified as complicated [(2)]. A lower UTI is taken to be present when symptoms are restricted to the lower urinary tract, e.g., pain on micturition (dysuria), urgency, frequency or pain above the symphysis pubis. An upper UTI is present when symptoms also include, for example, flank pain, pain on percussion of the renal area, and/or fever (>38 °C) [(3)]

In case of clinically suspected urinary tract infections, samples of urine of patients presenting with fever and dysuria are generally sent for culture and sensitivity in a tertiary care set up. However until the culture results are received the patients are started on antibiotic therapy empirically to control the infection. On receipt of the results the antibiotics are changed to suit the sensitivity pattern revealed in the culture reports. The negative aspect of this approach is that the initial empirical antibiotic therapy is very subjective and at times inappropriate. This leads to wastage of scarce resources, delay in initiation of appropriate treatment and emergence of drug resistant strains. Antibiotic resistance, a global concern, is a particularly noteworthy problem in developing nations, including India, where the burden of infectious disease is high and healthcare spending is low.

In a limited resource setting, the availability of and accessibility to the new generation higher antibiotics is always a cause for concern. Further the usage of newer antibiotics or higher antibiotics leads to the emergence of multi drug resistant bacteria. Hence, this study was conducted in patients with uncomplicated UTIs to evaluate the microbial growth pattern obtained from the urine specimens and their corresponding antibiotic sensitivity profile using conventional antibiotics. The results of our study conducted over a period of six months can be used to guide the appropriate use of common, time tested, cost effective antibiotics based on the locally prevailing microbial profile in the community in a limited resource setting. This can also serve as a baseline or a reference against which future studies involving newer drugs or newer organisms may be evaluated.

Materials and Methods

A prospective cross sectional study was conducted in a Government Medical College in Chennai for a period of six months from April 2016 to October 2016. The study sample consisted of 100 patients who satisfy the inclusion criteria.

Inclusion Criteria

1. Fever >100^{o} F and Dysuria
2. Either sex
3. Age >18
4. Out patients and in patients

Exclusion Criteria

1. Patients who have already started empirical antibiotic therapy
2. HIV positive patients
3. Patients with complicated UTI
4. Patients with indwelling catheters
5. Patients on steroid therapy
6. Antenatal women

A written informed consent was obtained from all patients participating in the study. Ethical clearance was obtained from the Institutional Ethics Committee. The patients were asked to collect a midstream sample of the urine after suitable cleansing. The specimen was transported to the department of Microbiology. The culture of the specimen was obtained by standard culture techniques and the antibiotic sensitivity was assessed using common time tested antibiotics. The results were analysed using SPSS software. Simple descriptive statistics were used to describe the distribution of the data collected. The Kruskal Wallis test was used to analyze the sensitivity of the organisms to the various antibiotics. The post hoc/ multiple pair wise comparison was carried out using Man Whitney U test. $P<0.05$ was considered significant.

Results

The mean age of the sample was 44.72 ± 15.79 years. The minimum age was 18 years and the maximum age was 78 years. In patients less than 40 years of age, 45 samples were positive out of a total of 139 (32.4%). In patients over 40 years of age, 29 tested positive out of 155 (18.7%). E Coli was the most common organism in both age groups.

There were 82 males and 213 females in the sample. Of the 82 males, 22 (26.8%) showed a positive culture. Of the 213 females 52 (24.4%) showed a positive culture. E Coli was the most common organism grown in the urine samples (23.2% in males and 22.1% in females), followed by Enterobacter spp. (3.7% in males and 2.3% in females). There was no statistically significant difference in the culture positivity of the samples between males and females. (p=0.61)

In the intensive care set up 18 cases out of 74 tested positive (24.32%). In the general wards 56 out of 221 cases tested positive (25.35). E Coli was the most common organism isolated from patients in Intensive care Units as well as in the general wards. There was no statistically significant difference in the culture positivity of the samples obtained from the intensive care unit and the general wards. (p=0.86)

The efficacy of each antibiotic was analysed with respect to sensitivity of E.Coli and Enterobacter spp. In the case of Amoxycillin, 38 out of 66 samples (57.6%) that showed growth of E.Coli were resistant to itwhile 33.3% were moderately sensitive. Only 9.1% of E.coli samples were highly sensitive to Amoxycillin. Similarly, 37.5% of Enterobacter samples were resistant to Amoxicillin, another 37.5% was moderately sensitive while 25% were highly sensitive.

The next antibiotic to be considered was Amikacin. Among the 66 E.Coli samples, 41 cases (62.1%) showed high sensitivity to Amikacin. 21.2% were moderately sensitive and 16.7% were resistant to Amikacin. Among the 8 Enterobacter cases, 50% showed high sensitivity to Amikacin while 50% showed moderate sensitivity.

Nitrofurantoin was considered next. Out of the 66 E.Coli samples, only 17 cases (25.8%) showed high sensitivity to Nitrofurantoin. 33.3% were moderately sensitive and 40.9% were resistant to Nitrofurantoin. Among the 8 Enterobacter cases, 50% showed high sensitivity to Nitrofurantoin, 12.5% showed moderate sensitivity and 37.5% showed resistance.

Gentamycin sensitivity was considered next. 32 out of 66 samples (48.5%) that showed growth of E.Coli were resistant to Gentamycin. 36.4% were moderately sensitiveand only 15.2% of E.coli samples were highly sensitive to Gentamycin. In comparison, 25% of Enterobacter samples were resistant to Gentamycin, another 25% was moderately sensitive while 50% were highly sensitive.

The next antibiotic considered was Cotrimoxazole. Out of the 66 E.Coli samples, only 21 cases (31.8%) showed high sensitivity to Cotrimoxazole.22.7% were moderately sensitive and 45.5% were resistant to Cotrimoxazole. Among the 8 Enterobacter cases, 37.5% showed high sensitivity to Enterobacterand 62.5% showed resistance to Cotrimoxazole.

In the case of Ciprofloxacin, 46 out of 66 samples (69.7%) that showed growth of E.Coli were resistant to Ciprofloxacin. Only 16.7% were moderately sensitive while 13.6% of E.coli samples were highly sensitive. In comparison, 37.5% of Enterobacter samples were resistant to Ciprofloxacin, another 25% was moderately sensitive while 37.5% were highly sensitive.

Amikacin was the drug to which most cultures of E.Coli (62.1%) were sensitive, followed by Cotrimoxazole (31.8%) and Nitrofurantoin (25.8%). Krusker Wallis test showed that there was a statistically significant difference in the sensitivity of E.Colito the various antibiotics used($P<0.01$). Upon Post hoc analysis using Man Whitney U test, E.Coli showed a statistically greater sensitivity to Amikacin than Cotrimoxazole and other drugs. The sensitivity to

Cotrimoxazole was statistically greater than that of Gentamycin, Ciprofloxacin and Amoxycillin. (Table 1)Ciprofloxacin was the drug to which most cultures of E.Coli (69.7%) were resistant, followed by Amoxycillin(57.6%) and Gentamycin (48.5%).Krusker Wallis test showed that there was no statistically significant difference in the resistance of E.Coli to the various antibiotics used.(P>0.05). (Table 2)

For Enterobacter species, Gentamycin, Amikacin and Nitrofurantoinwere equally sensitive (50%) followed by Cotrimoxazole and Ciprofloxacin (37.5%). Krusker Wallis test showed that there was no statistically significant difference in the sensitivity of Enterobacter to the various antibiotics used. (P>0.05).Cotrimoxazole was the drug to which most cultures of Enterobacter (62.5%) were resistant, followed by Amoxycillin, Nitrofurantoin and Ciprofloxacin (37.5%) Krusker Wallis test showed that there was no statistically significant difference in the resistance of Enterobacter to the various antibiotics used. (P>0.05).

Table 1 - Sensitivity of E.Coli to various antibiotics

Antibiotics	Highly Sensitive- N (%)	P value (KruskalWallis)	Post Hoc Analysis using Man Whitney U test.
Amoxycillin(AMOX)	6 (9.1%)	<0.01*	Amikacin*>(COT=NIT)*> (GEN=CIP=AMOX)
Amikacin	41 (62.1)		
Nitrofurantoin(NIT)	17 (25.8%)		
Gentamycin(GEN)	10 (15.2%)		
Cotrimoxazole(COT)	21 (31.8%)		
Ciprofloxacin(CIP)	9 (13.6%)		

Table 2 - Resistance of E.Coli to various antibiotics

Antibiotics	Not Sensitive- N (%)	P value (Kruskal Wallis)
Amoxycillin	38 (57.6%)	>0.05 (NS)
Amikacin	11 (16.7%)	
Nitrofurantoin	27 (40.9%)	
Gentamycin	32 (48.5%)	
Cotrimoxazole	30 (45.5%)	
Ciprofloxacin	46 (69.7%)	

Discussion

Urinary tract infection presents as the clinical syndromes of acute, uncomplicated, urinary infection, including acute cystitis, pyelonephritis, complicated urinarytract infection, asymptomatic bacteriuria, and, in men, bacterial prostatitis [4]. In our study, we had 82 men and 213 women. E.Coli was the most common organism grown in both males and females. It has been established by several studies that Urinary tract infections are more common in females than in males and that the gram-negative rod Escherichia coliis the most common cause of UTI in all settings [5]. Urinary tract infections in men have been reported commonly in the elderly. Similar to the results of our study, E.coli has been reported to be the most common organism isolated in male UTI also [6]. In another Indian study, more than half of the UTI cases were caused by E.coli, followed by Klebsiella, Pseudomonas, Proteus spp and Staphylococcus aureus.[7]. However, in our study, we found E.coli to be the most common organism isolated, followed by Enterobacter spp.

In our study, about 25% of samples tested in symptomatic patients in intensive care unit were positive. Studies have shown that Healthcare-associated urinary tract infections (UTIs) account for up to 40% of infections in hospitals and 23% of infections in the intensive care unit (ICU) and that the vastmajority of UTIs are related to indwelling urinary catheters [8]

It has been reported that many bacterial isolates show a higher percentage of resistance against Amoxicillin, Ciprofloxacin and Cotrimoxazole and that several organisms show multiple antibiotic resistance [9]. *E coli* susceptibility rates have been found to decrease progressively with fluoroquinolones, co-trimoxazole, cephalosporins and Amoxycillin over a 7 year surveillance study period to study the evolution of antibiotic resistance in UTI [10].

In our study, Amikacin was the most effective in-vitro drug for E.coli infections. Our results are similar to those of another study done in North India, in which more than 80% of the isolates were sensitive to Amikacin, while showing resistance to Ampicillin and Fluoroquinolones. [11]. In a study that evaluated the prevalence and antimicrobial susceptibility pattern of E.Coli in hospital acquired and community acquired UTI in India, it was found that Amikacin and Imipenem were found to be the most susceptible drugs in 95.65% of E.Coli isolated from outpatients [12]. In another Indian study, monotherapy with Amikacin and Imipenem demonstrated statistically significant susceptibility patterns and these were found to effective against a majority of the isolates. [13]. Considering the cost and availability of Imipenem, Amikacin could stillprove to be an equally efficacious antibiotic in a limited resource setting in India.

For the Enterobacterspp, we found Amikacin, Gentamycin and Nitrofurantoin to be equally sensitive, although the number of samples that showed growth of Enterobacterspp was considerably lower than E.Coli. Another interesting finding reported by authors after a 10 year surveillance period was that although *E. coli* was responsible for more than an half of UTI, its resistance to antibiotics was low when compared with other pathogens implicated in UTI, showing also the lowest percentage of multidrug resistant (MDR) isolates and that organisms isolated from females were less resistant than those isolated from males [14]. The treatment of true infections with multidrug-resistant organisms requires additional clinical reflection regarding which of the few remaining antibiotics with activity should be chosen, whether single or combination therapy is warranted, and when tohospitalize or switch to intravenous antimicrobial treatment for sicker patients[15]

In conclusion, it can be said that E.Coli is responsible for a vast majority of UTI and that Amikacin can be used as an empirical first line antibiotic for UTI in males and females in a limited resource setting where higher and newer antibiotics are not available. However, it must be remembered that emergence of drug resistance among uropathogens is a matter of grave concern and therefore, every effort should be made to prescribe antibiotic in a rational and scientific manner at all times.

References

1. Stamm WE, Norrby SR. Urinary tract infections: disease panorama and challenges. The Journal of infectious diseases. 2001;183(Supplement_1):S1-S4.
2. Hooton TM. Uncomplicated urinary tract infection. New England Journal of Medicine. 2012;366(11):1028-37.
3. Grabe M, Bartoletti R, Bjerklund-Johansen T. Guidelines on urological infections. European Association of Urology Web site. 2015.
4. Nicolle LE. Urinary tract infection. Critical care clinics. 2013;29(3):699-715.
5. Foxman B. Urinary tract infection syndromes: occurrence, recurrence, bacteriology, risk factors, and disease burden. Infectious disease clinics of North America. 2014;28(1):1-13.
6. Hummers-Pradier E, Ohse A, Koch M, Heizmann W, Kochen M. Urinary tract infection in men. International journal of clinical pharmacology and therapeutics. 2004;42(7):360-6.
7. Patel S, Taviad PP, Sinha M, Javadekar T, Chaudhari VP. Urinary tract infections (UTI) among patients at GG hospital &

medical college, jamnagar. National Journal of Community Medicine. 2012;3(1): 138-41.
8. Chenoweth C, Saint S. Preventing catheter-associated urinary tract infections in the intensive care unit. Critical care clinics. 2013;29(1):19-32.
9. Tuli L, Rai S, Arif D, Singh DK. Bacteriological profile and Antimicrobial Susceptibility pattern of isolates from Urinary Tract Infections in Eastern Uttar Pradesh, India. Int J Curr Microbiol App Sci. 2016;5(3):428-35.
10. Sorlozano A, Jimenez-Pacheco A, Del Castillo JdDL, Sampedro A, Martinez-Brocal A, Miranda-Casas C, et al. Evolution of the resistance to antibiotics of bacteria involved in urinary tract infections: a 7-year surveillance study. American journal of infection control. 2014;42(10):1033-8.
11. Niranjan V, Malini A. Antimicrobial resistance pattern in Escherichia coli causing urinary tract infection among inpatients. The Indian journal of medical research. 2014;139(6):945.
12. Prakash D, Saxena R. Prevalence and antimicrobial susceptibility pattern of Escherichia coli in hospital acquired and community acquired patients related to urinary tract infection in India. 2013.
13. Ahmed SM, JAKRIBETTU RP, KOYAKUTTY S, Arya B, Shakir V. Urinary Tract Infections-An overview on the Prevalence and the Anti-biogram of Gram Negative Uropathogens in A Tertiary Care Centre in North Kerala, India. Journal of Clinical & Diagnostic Research. 2012;6(7).
14. Linhares I, Raposo T, Rodrigues A, Almeida A. Frequency and antimicrobial resistance patterns of bacteria implicated in community urinary tract infections: a ten-year surveillance study (2000–2009). BMC infectious diseases. 2013;13(1):19.
15. Gupta K, Bhadelia N. Management of urinary tract infections from multidrug-resistant organisms. Infectious Disease Clinics. 2014;28(1):49-59.