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Antimicrobial sensitivity patterns of Urogenital Bacterial Isolates among the Pregnant Women, Tertiary Hospital in Puducherry, India

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A B S T R A C T

Urogenital infection during pregnancy may cause complications such as pyelonephritis, hypertensive disease of pregnancy, anaemia, chronic renal failure, premature delivery and foetal mortality. This study aimed to identify the etiologic agents of UTI and to determine the patterns of antimicrobial drug susceptibility among pregnant women at RGGW&CH, Puducherry. Retrospective analysis of symptomatic pregnant women, 550 mid-stream urine specimens processed for culture and antimicrobial drug susceptibility testing. Significant bacteriuria (> 10^5 colony forming units/mL) was found in 176/550 (32%) urine specimens. Of the 176 isolates, the most commonly isolated bacteria were *Escherichia coli* 72 (42%), *Klebsiella* 49 (28%), *Staphylococcus* 12 (7%), *Acinetobacter* 11 (6%), *Enterococcus* species 9 (5%), *Pseudomonas* 7 (4%), Proteus 3 (2%), *Streptococcus* 2 (1%) and *Candida* 12 (7%). Among the 176 isolates 132 (75%) are the gram negative bacteria. They are mostly resistant to penecillins (amocyclav/amoxicillin), Fluroquinoles (ciprofloxacin, norfloxacin). The antibiotic sensitive pattern of E.coli showed a higher sensitivity towards piperacillin/tazobactam (86%), cefoperazone/ sulbactum (88) and amikacin (93%). The antibiotic sensitivity pattern of Klebsiella showed a higher sensitivity towards cefoperazone/ sulbactum (90%), amikacin (83%). E.coli strains were more resistant to Amoxycillin 83%, cefuroxime 90%, ceftriaxone 73%, ciprofloxacin 61%, cotrimaxole 64%. Klebsiella showed comparatively less resistant to ciprofloxacin 58%, cotrimaxole 62%, cefuroxime 75%, and it was highly resistant to Amoxicillin 91%. . Gram-positive organisms tested against vancomycin and methicilin, resistance was found. In conclusion, E coli was found to be the common cause of UTI among the pregnant women. Low to moderately high level of resistance was found in first line drugs while high level of resistance was found in third generation cephalosporin. It is recommended to monitor the levels of resistance for nitrofurantoin, fluoroquinolone (ciprofloaxacin, norfloxacin) and cefotaxime. Over the past years the susceptibility to cephalosporins tends to decrease. Tri glycerides, piperacillin-tazobactam, amikacin and cefoperazone/sulbactum show high antibacterial activity.

Introduction

Urinary tract infection (UTI) is the second most common infectious presentation in community practice. Worldwide, about 150 million people are diagnosed with UTI each year, costing the global economy in excess of 6 billion US dollars. UTI may involve only the lower urinary tract or may involve both the upper and lower tract. The term cystitis has been used to describe lower UTI, which is characterized by a syndrome involving dysuria, frequency, urgency and occasionally suprapubic tenderness. However, the presence of symptoms of lower tract without upper tract symptoms does not exclude upper tract infection, which is also often present(1,2).

UTI is common health problem among pregnant women. Proper investigation and prompt treatment are needed to prevent serious life threatening condition and morbidity due to urinary tract infection that can occur in pregnant women (18,19,20). *Escherichia coli* is the most common pathogen responsible for UTI, both in out-patient and hospitalized patient, whereas *Klebsiella pneumonie, Pseudomonas aeruginosa* and *Staphylococcus aureus* are other reported important pathogens (13,14,15,16). In the laboratory, bacterial infection of the urinary tract is said to exist when a significant number of bacteria, usually greater than 10^5 cells per milliliter of urine, are detected in properly collected early morning mid-stream "clean catch" urine (3,4,5).

Resistance of urinary tract pathogens to commonly prescribed antibiotics has increased worldwide. There are also reports of change in the resistance pattern over the last decade leading to serious therapeutic challenges. Since the distribution of these pathogens and their susceptibility to antibiotics varies regionally, and treatment for UTI is usually empirical, it is mandatory that there is an adequate knowledge of the epidemiological characteristics of the pathogens involved and their antibiotic susceptibility patterns. This will help to achieve good therapeutic outcomes and prevent the emergence of drug-resistant bacteria strains (1,8,9).

Fluoroquinolone are preferred as initial agents for empiric therapy of UTI in area where resistance is likely to be of concern. This is because they have high bacteriological and clinical cure rates, as well as low rates of resistance among most common uropathogens (2,10,11). The extensive uses of antimicrobial agents have invariably resulted in the development of antibiotic resistance, which, in recent years, this has become a major problem worldwide (6,7).

Current knowledge on antimicrobial susceptibility pattern is essential for appropriate therapy. The etiology of UTI and the antibiotic resistance of uropathogenes have been changing over the past years, both in community and nosocomial infection. However, there are not much information on etiology and resistance pattern of community acquired UTIs in India is available. The aim of this study was to determine the distribution and antibiotic susceptibility patterns and to compare the frequency and drug resistance pattern in uropathogen bacterial isolates from patients with community acquired urinary tract infections (UTI's) at Rajivgandhi Government Women and children Hospital, Puducherry.

Materials and Methods

Urinary isolates from symptomatic UTI cases attending to the outpatient and

inpatient of RGGW&CH were identified by conventional methods. Antimicrobial susceptibility testing was performed by Kirby Bauer's disc diffusion method. Biochemical tests for identification of organisms have been done.

Sample Collection and Analysis

The study was conducted on pregnant women reproductive age group of 18-40 years attending outpatient and inpatient of hospital. Freshly voided midstream specimens of urine (n = 550) were collected and submitted to the microbiology laboratory. Semi quantitative urine culture using a calibrated loop was used to inoculate blood agar and MacConkey agar plates. Significant monomicrobic bacteriuria was defined as culture of a single bacterial species from the urine sample at a concentration of $>10^5$ cfu/ml. Only a single positive culture per patient was included in the analysis. The significant pathogens were identified by standard biochemical procedures. Hi-Media kits' manufacturer instructions were followed to identify species of these genera. Hi25™ Enterobacteriaceae identification kit and Hi E. coli™ Identification Kit were used

Antibiotic Susceptibility Testing

Antimicrobial susceptibility testing was performed using the disk diffusion method as described by the National Committee for Clinical Laboratory Standards-NCCLS (presently called as Clinical Laboratory Standard Institute). Antimicrobial agents (disks) tested and reported were obtained from Microxpress-Tulip diagnostics, Goa, India.

Drugs used for the susceptibility patterns: amikacin-AK, amoxyclav-AMC, azithro-mycin-AZM, chlorampinicol-C, ceftazidime -CAZ, ceforoxime-CXM, cephotaxime-CTX, ceftriaxone-CTR, ciprofloxacin-CIP, co-trimoxazole-COT, cepoperazone + sulbactam-CFS, doxycycline-DO, gentamicin-G, norfloxacin -NA, ofloxacin-OF, levoflox-LE, oxacillin-OX, meropenem-MR, pipercillin/ tazobactam-PT, vancomycin-VA.

Results and Discussion

Out of 550 urine samples, 176 (32%) were found to be positive for microbial isolates. The patients were pregnant women and age between 18-40 years. More cases of UTI's were recorded among the young and middle age patients (20-30 years, 51 %). The isolates of *Escherichia coli* were 72 (41%) was found to be the predominant organism, followed by klebsiella 49 (28%), staphylococcus 12 (7%), *Acinetobacter* 11 (6%), *Enterococcus* 9 (5%), *Pseudomonas* 7 (4%), Proteus 3 (2%) and Candida 12 (7%).

The resistance among the uropathogens to the agents that had traditionally recommended as the first line therapy is on the rise. The gram negative bacteria which were isolated showed higher resistance to the widely used antimicrobials like amoxyclav/amoxicillin, cefuroxime, ceftriaxone, ciprofloxacin, norfloxacin and cotrimoxazole. The antibiotic sensitive pattern of *E.coli* showed a higher sensitivity towards piperacillin/tazobactam (86%), cefoperazone/ sulbactum (88) and amikacin (93%).

The antibiotic sensitivity pattern of klebsiella showed a higher sensitivity towards cefoperazone/sulbactum (90%), amikacin (83%), whereas *Acinetobacter*, *Pseudomonas* and *Proteus* shows 90% susceptibility towards cefoperazone/ sulbactum. The gram positive bacteria *Staphylococcus* and *Enterococcus* shows

high sensitivity towards vancomycin and amikacin.

Uropathogens Isolated from Pregnant Women

E.coli strains were more resistant to Amoxycillin 83%, cefuroxime 90%, ceftriaxone 73%, ciprofloxacin 61%, cotrimaxole 64%. *Klebsiella* showed comparatively less resistant to ciprofloxacin 58%, cotrimaxole 62%, cefuroxime 75%, and it was highly resistant to Amoxicillin 91%. *Pseudomonas* and *Proteus* also shows high resistance towards amoxicillin, ciprofloxacin and Norfloaxacin.

Prevalence of uropathogenes revealed that *E. coli* (46%) *Klebsiella pneumoniae* (30%), *Staphylococcus aureus* (2.24%), *Psueodomonas aeruginosa* (5.6%) and *Acinetobacter* (3.37%).

This study shows the distribution and antibiotic susceptibility pattern of microbial species isolated from Pregnant women. Antibiotic resistance is a major clinical problem in treating infections caused by these microorganisms. The resistance to the antimicrobials has increased over the years. Resistance rates vary from country to country[18]. Overall, isolates from Latin American countries show the lowest susceptibility rates to all antimicrobial agents followed by Asian-Pacific isolates and European strains. Strains from Canada exhibit the best global susceptibility testing results. (SENTRY Antimicrobial Surveillance Program, SASP) [18]. In this study, it accounted for approximately 32% of all clinically significant urinary isolates and 81% of all Enterobacteriaceae.

Table.1 Number of Uropathogens Isolated

Name of Isolate	No. of Isolates	% of isolates
E.coli	72	41
Klebsiella	49	28
Staphylococcus	12	7
Acinitobacter	11	6
Enterococcus	9	5
Pseudomonas	7	4
Proteus	3	2
Streptococcus	2	1
Candida	12	7

Figure.1 Number of Uropathogens Isolated from Pregnant Women

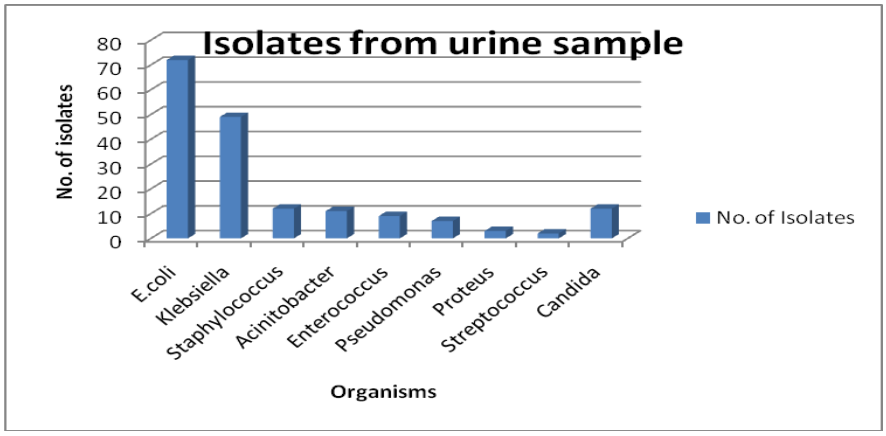

Table.2 Percentage of Isolates Showing Multi Drug Resistance

Isolated Bacteria	No Resistant to				Total MDR
	No. of isolate	3 Drugs	4 Drugs	>5 Drugs	
E.coli	72	32	17	11	60
Klebsiella	49	20	13	7	40
Staphylococcus	12	5	3	1	9
Acinitobacter	11	4	1	1	6
Enterococcus	9	4	2	1	7
Psedomonas	7	1	1	1	3
Proteus	3	2	1	1	4
Streptococcus	2	1	1	0	2

This is consistent with the findings of previous studies in which *E. coli* was the predominant pathogen isolated from patients with community acquired UTIs [9, 19]. However, *Klebsiella pneumoniae* are rarely encountered in cases of community-acquired UTI [8, 9, 20]. In the present study 22% of *Klebsiella* isolates were found to be present among all uropathogens studied. These isolates shows resistance against first generation cephalosporin, cephalothin, aminoglycosides, macrolides and lincosamides which is consistent with the previous data of other community- based studies [21].

Our *E. coli* and *Klebsiella* isolates are equally resistant to ampicillin (76% and 75% respectively) while for Co-trimoxazole, *E. coli* is more resistant (75%) than *Klebsiella* (53%) in this region. Indian isolates showed higher resistance against ampicillin and co-trimoxazole than the isolates from USA (39.1% and 18.6 % respectively) [22] and Europe (29.8% and 14.1% respectively) [23]. On the other hand, rate of resistance against these antibiotics in countries like Senegal (77% and 55%), Spain, (65% and 33%), Taiwan (80% and 56%), and Israel (66% and 26%) is comparable with Indian isolates [24–27].

This is consistent with the findings of previous studies in which *E. coli* was the predominant pathogen isolated from patients with community acquired UTIs. However, *Klebsiella* are rarely encountered in cases of community-acquired UTI. In the present study 28% of *Klebsiella* isolates were found to be present among all uropathogens studied. These isolates shows resistance against first generation drugs. The

uropathogens shows high susceptibility to cefoperazone/sulbactam, amikacin and pipercillin/tazobactam. The results are similar to previous studies. The antimicrobial resistance among uropathogens is one of the barricads that might interfere with an effective treatment. The organisms from the enterobacteriaceae family which showed heavy resistance towards amoxyclav, a majority of the flouroquinolones (ciprofloxacin, norfloxacin) and the cephalosporins (cefuroxime and ceftriaxone).

In conclusion, this study revealed that *E. coli* was the predominant bacterial pathogen of community acquired UTIs in puducherry. It also demonstrated an increasing resistance to Amoxicillin and Co-trimoxazole . This study is useful for clinician in order to improve the empiric treatment.

It is quite alarming to note that almost all of the isolates included in this study were found resistant to four or more antibiotics. Antibiotic resistance is becoming a big problem for the public health, which threaten the lives of hospitalized individual as well as those with chronic conditions and add considerably to health care cost. Therefore, it is an important issue to be addressed by the policy makers to formulate a strict antibiotics prescription policy in our country. Moreover, this study concludes the most dominant pathogen causing UTI was *E.coli*, followed by Klebsiella sp. The antibiotic sensitivity patterns of uropathogens were also analysed. The antibiotics Amikacin, cefoperazone+ sulbactum and pipercillin/tazobactam showed high antibacterial activity against uropathogens. The uropathogens shows resistance to penicillins, cephalosporins, flouroquinolones.

Significant bacteriuria was observed in symptomatic pregnant women. Periodic studies are recommended to check the outcome of symptomatic bacteriuria and also monitor any changes in the susceptibility patterns of urinary tract pathogens in pregnant women.

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