



Retrospective Study of Urinary Tract Infection in Patients Admitted in a Teaching Hospital of Medical College

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Abstract

Background: Urinary tract infections (UTIs) are caused by microorganism invading and inducing inflammatory response of the urinary tract presenting with signs and symptoms. UTIs are among the most common infections worldwide and the second most common cause of sepsis. The aim of the present retrospective study is to know the common pathogen isolated from the urine culture and sensitivity of the admitted patients, antibiogram preparation and create antibiotic policy.

Material and Method: This study was carried out in the NABL accredited Microbiology department of SAL Hospital and Medical institute, Ahmedabad, Gujarat for a period of one year from January to December 2024. All standard techniques for culture, identification and antibiotic susceptibility testing (AST) were performed according to CLSI guideline 2024 [3]. The data was analyzed through WHONET as well as MS Excel.

Result: A total of 356 urine samples were received from different areas like ICU, ward and OPD of the hospital in one year duration. Out of 356 urine samples, 115 samples were culture positive with significant bacterial growth. Urinary tract infections including catheterized patients was 32.3% on the whole out of the total samples received (115/356) in 2024. Out of the total samples of 356 urine samples, 48 (13.48%) samples were from the catheterized patients. The common uro pathogens were *E. coli* (40.86%), and *Pseudomonas* sp. (30.43%). Maximum *E. coli* (84%) were sensitive to nitrofurantoin followed by Gentamicin (68%), Meropenem (56%), Amp-sulbactam (43%). *Klebsiella* species was found to be multi drug resistant (MDR). *Pseudomonas* (n = 35) were sensitive to most of the antibiotics (50-58%).

Conclusion: Due to increasing antibiotic resistance causing UTIs, it is a commitment of the microbiologists to actively prepare antibiogram and contribute for Antimicrobial stewardship programme.

Keywords: Urinary Tract Infection (UTIs); Antibiogram; Antibiotic Policy

Introduction

Urinary tract infections (UTIs) are caused by microorganism invading and inducing inflammatory response of the urinary tract presenting with signs and symptoms. The bacteriuria is produced by the multiplication of bacteria in the urine within the renal tract with the presence of 105 CFU/ml in pure culture using a standard calibrated loop method in the mid stream urine sample [1].

UTIs are among the most common infections worldwide and the second most common cause of sepsis. UTIs affect around 150 million people worldwide every year [1] and they are the fourth most common cause of health care associated infection with as estimated 93,300 UTIs in ICUs [2]. Among Urinary Tract Infections acquired in the hospitals approximately 75% of them are associated with urinary catheters. Most common bacteria causing UTIs are *E. coli* accounting to 90% followed by other GNB belonging to Enterobacteriaceae.

Mostly in day to day practice the treatment management is by using empiric antibiotics without using culture and sensitivity testing which leads to frequent misuse of antibiotics. Ideally the choice of using empiric antibiotic should be based on the likely pathogen which is isolated and its expected susceptibility pattern in the given healthcare facility. Therefore, a periodic monitoring of etiologic agents of UTI and then susceptibility pattern is necessary [2].

The aim of the present retrospective study is to know the common pathogen isolated from the culture of both non- catheterized and catheterized patients. Urine sample, to analyze the sensitivity pattern of these uropathogen and its combination to modifying hospital antibiotic policy finally supporting the antimicrobial stewardship programme.

Material and Methods

This study was carried out in the NABL accredited Microbiology department of SAL Hospital and Medical institute, Ahmedabad, Gujarat for a period of one year from January to December 2024. Urine samples were collected in sterile container from patients complaining of symptoms of UTI was received in Microbiology laboratory. All standard techniques for culture, identification and

antibiotic susceptibility testing (AST) were performed according to CLSI guideline 2024 [3]. The results were recorded in the specific manner in the registers and AST reports were entered in WHONET software. The data was analyzed through WHONET as well as MS Excel.

Results

A total of 356 urine samples were received from different areas like ICU, ward and OPD of the hospital in one year duration. Out of 356 urine samples, 115 samples were culture positive with significant bacterial growth. The overall prevalence of UTI was 32.30% (115/356). Most of the samples were received from age group belonging between 50-70 years and their diagnosis were Acute kidney injury(AKI), Viral fever associated with burning micturition, Chronic kidney disease(CKD), Diseases of Central nervous system, CKD with recurrent urinary tract infection. Urinary tract infections including catheterized patients was 32.3% on the whole out of the total samples received (115/356) in 2024. 69.2% was the highest – seen in the month of October followed by 58.3% in November. It ranged from 16.7% to 32.3% in the other months of the year (Figure 1).

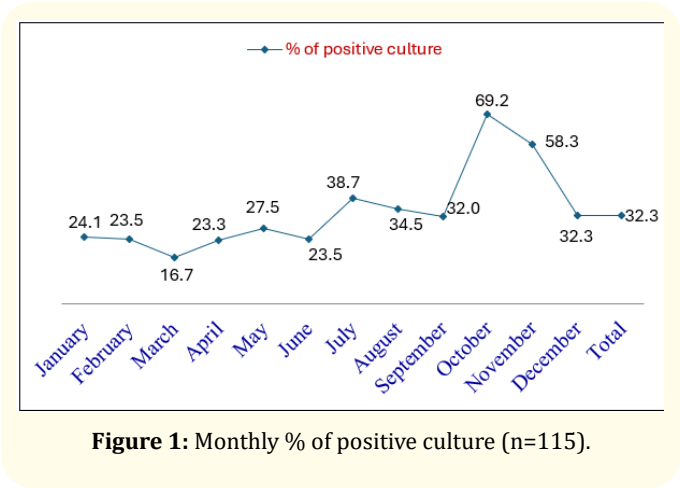


Figure 1: Monthly % of positive culture (n=115).

Out of the total samples of 356 urine samples, 48 (13.48%) samples were from the catheterized patients. 88.2% CAUTI events were seen in the month of February 2024 followed by 24% in January 2024. In rest of the other months CAUTI ranged from 0% to 19.9% (Figure 2).

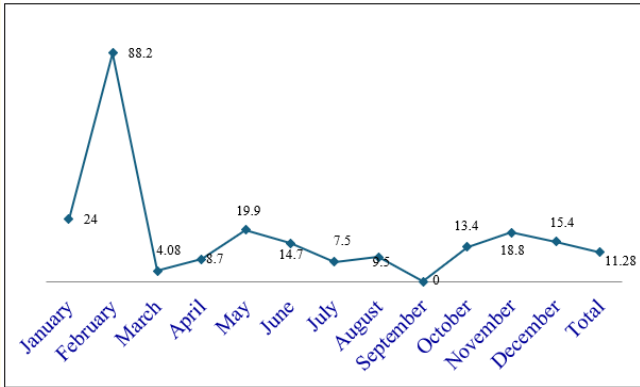


Figure 2: CAUTI /1000cath days.

Out of total 115 uropathogens, E.coli was the 40.86% (47/115) most common isolate causing UTI. The second most common isolate was *Pseudomonas aeruginosa* 30.43% (35/115) and *Klebsiella* species isolated was 14.78%(17/115), 5.22% (6/115) isolates were Enterococcus species, 4.35%(5/115) isolates were proteus species, 3.48% (4/115)isolates of Staphylococcus aureus, and 0.87% (1/115) isolate of Acinetobacter species was found in rest of the positive samples (Figure 3).

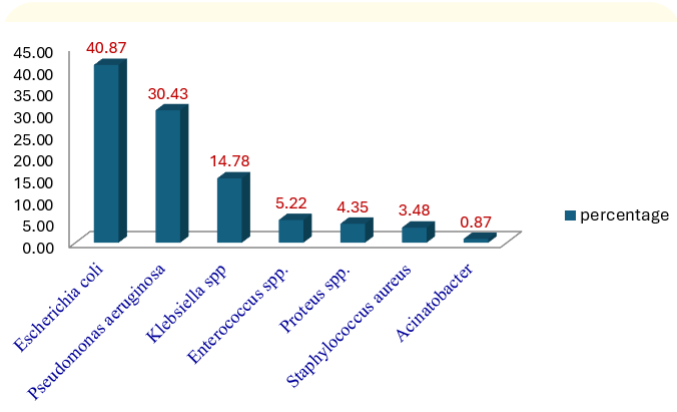


Figure 3: CAUTI /1000cath days.

Antimicrobial susceptibility test of commonly isolated enterobacteriaceae like *E. coli*, *Klebsiella* and *Pseudomonas* species were noted through WHONET software.

Figure 4 shows the susceptibility pattern of 47 isolates of E.coli. Maximum E.coli (84%) were sensitive to nitrofurantoin followed by Gentamicin (68%), Meropenem (56%), Amp-sulbactam (43%). Sensitivity to few cephalosporin group range from 19% to 36%. They were resistant to other antibiotics like Nalidixic acid (100%), Cefixime and Ampicillin(81%), Cefuroxime(76%), Cefotaxime (72%).

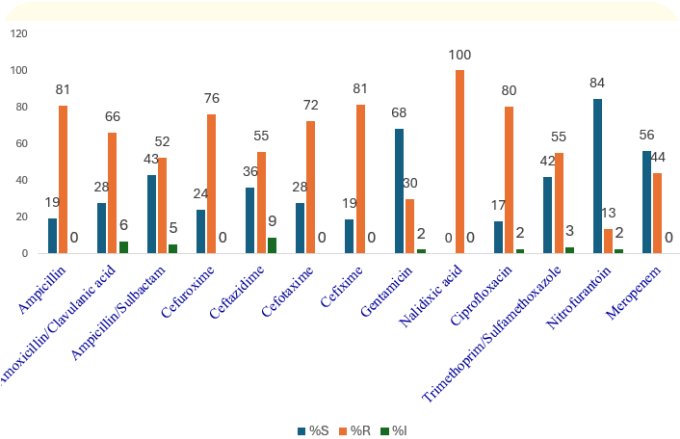


Figure 4: E. coli Jan- Dec 24 (n = 47).

As per Figure 5 of *Pseudomonas* (n = 35) were sensitive to most of the antibiotics and ranged from 50% - 58% to Piperacillin, Piperacillin-tazobactam, Ceftazidime, Cefepime, Aztreonam, Meropenem, Amikacin, Gentamicin and Ciprofloxacin. 58% of them were resistant to Imipem.

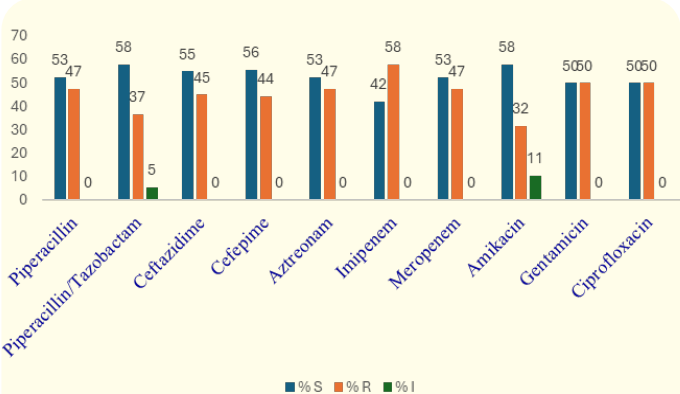


Figure 5: Pseudomonas aeruginosa Jan- Dec 24 (n = 35).

All the 17 isolates of *Klebsiella* species showed 71% - 88% resistant to antibiotics like Amoxycillin, Amoxy-clav, Ampicillin-sulbactam, Cefuroxime, Ceftazidime, Cefotaxime, Gentamicin, Ciprofloxacin, Cotrimoxazole, Nitrofurantoin, Meropenem (Figure 6).

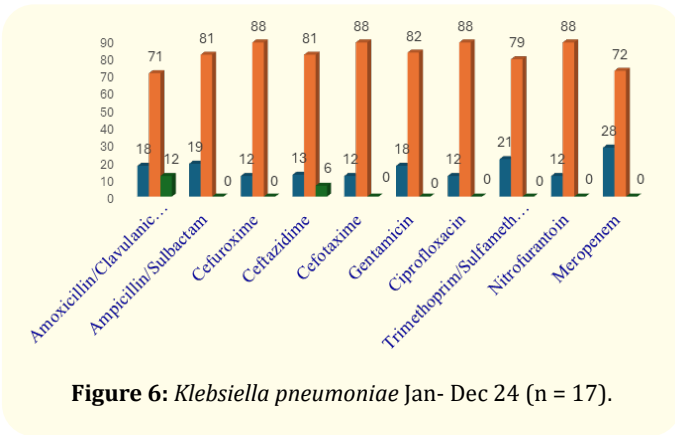


Figure 6: *Klebsiella pneumoniae* Jan- Dec 24 (n = 17).

Discussion

Urinary tract infection is among the most common infection in healthcare settings. Treatment and management of UTIs is very important to prevent complication like sepsis. In this study there was an overall prevalence of 32.2% out of the total samples (356) received for culture in the laboratory over a period of one year (2024). The prevalence rate (33.54%) is similar in the study conducted by Pritampardesi [4]. Though our sample size was much lesser than theirs. The prevalence of UTI was mostly seen amongst the patients either with direct UTIs or patient suffering from co morbid diseases [4].

The present study showed 69.2% UTI cases in the month of October 2024 followed by 58.3% in November 2024 in comparison with the study of Pritampardesi [4] 69% of UTIs were in the month of June, the rate was same but the month differed from their study.

Now it was also observed that around 13.48% of the catheterized patients had UTI. Whereas the study conducted by Singh A., et al. [2] was 10.6% which is less than ours. The overall incidence rate of catheter associated urinary tract infection in our study was

11.28 per 1000 catheter days. The incidence of CAUTI in the month of February (88.2) was more because there were only 3 cases of CAUTI and catheter days were 34. These patients were admitted in medical ICU and catheterization was for longer duration of time.

UTIs are generally caused by Gram negative bacilli (GNB) primarily belonging to enterobacteraciae family, our study contributes to 91.3% of the total bacterial isolates while Gram positive cocci(GPC) was 8.6%, whereas the study of Pritampardesi [4] showed 98.50% of GNB and 1.5% GPC. Our study showed more isolation of GPC when compared to pritampardesi [4] study. The most common bacteria grown was E.coli (40.86%) similar to the study of Pritampardesi [4] and Singh A., et al. [2].

According to our study, 84% of Escherichia coli were sensitive to Nitrofurantoin followed by 68% Gentamicin, 56% Meropenem, 43% Ampicillin-sulbactam. They were resistant to many of the cephalosporins, Nalidixic acid and ampicillin, cefuroxime and cefoxitin. Similar such findings were there by the study conducted by Pritampardesi [4]. They found Meropenem (80.3%) sensitive when compared to Gentamicin and Nitrofurantoin, Higher resistance was found among fluroquinolones, amoxicillin and 3rd generation cephalosporins [4].

Klebsiella species (around 88%) were the toughest isolates to be treated as they were found to be multi drug resistant, unlike *Pseudomonas* species which were around 58% sensitive to piperacillin, Piperacillin, Piperacillin-tazobactam, Ceftazidime, Cefipime, Aztreonam, Meropenem, Amikacin, Gentamicin and Ciprofloxacin. 58% of *Pseudomonas* species were resistant to Imipem.

The most effective antibiotic as per our study for these commonly isolated GNB are Nitrofurantoin, Gentamicin, Meropenem. For MDR *Klebsiella* species, recommendation is for using restricted antibiotics like Polymyxin B and Fosfomycin.

After preparation of the antibiogram, the amendment of Hospital antibiotic policy was done and the suggestion to the treating doctor was done as follows.

Urinary syndrome	Drug of choice	Alternative choice
Acute cystitis	Nitrofurantoin	Co-trimoxazole, Ertapenem, Amikacin (can be used in children as well)
Acute Pyelo-nephritis	Piperacillin-tazobactam Ertapenem	Imipenem Meropenem Amikacin (recommended for children as well)
Acute Prostatitis	Ertapenem 1g IV once daily	Piperacillin-tazobactam Imipenem Meropenem Trimethoprim-Sulfamethoxazole
Epididymo-orchitis (High risk of sexually transmitted)	Ceftriaxone+ Doxycycline	Ofloxacin Levofloxacin
Epididymo-orchitis	Ofloxacin Levofloxacin	

Table 1

Conclusion

As there is increasing evidence of antibiotic resistance to the bacterial pathogens causing UTIs. It is a commitment of the microbiologists to actively prepare antibiogram and suggest appropriate antibiotics to the treating doctors besides regular surveillance and strict infection control practices are advised to prevent the spread of MDRs in the hospital.

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