



ANTIMICROBIAL RESISTANCE PATTERN OF VARIOUS UROPATHOGENIC ISOLATES CAUSING UTI: A STUDY FROM MEDICAL COLLEGE IN HIMACHAL PRADESH

Microbiology

Dr. Anjali Sharma JR, Department of Microbiology, DRPGMC Kangra at Tanda

Dr. Aditya Rana* MD, Microbiology, Department of Microbiology, DRPGMC Kangra at Tanda.
*Corresponding Author

Dr. Anuradha Sood Associate professor, Department of Microbiology, DRPGMC Kangra at Tanda

Dr. Subhash Chand Jaryal Professor and Head of the Department, Department of Microbiology, DRPGMC Kangra at Tanda.

Dr. Meenakshi Tamrakar MD, Microbiology, Department of Microbiology, DRPGMC Kangra at Tanda.

Dr. Shruti Sharma JR, Department of Microbiology, DRPGMC Kangra at Tanda

ABSTRACT

BACKGROUND: Urinary tract infections (UTI) are one of the commonest community acquired and nosocomial infections encountered by clinicians in developing countries like India. Untreated UTI may lead to recurrence, renal scarring and renal failure. UTI is most often treated by empirical broad spectrum antibiotics. The main aim of this study was to identify the organism isolated from the urine and determine its antimicrobial resistance pattern so as to provide data for reference which may be of epidemiological and clinical importance regarding widespread multidrug resistance among uropathogens. **MATERIAL AND METHODS:** This study was conducted in the Department of Microbiology at DRPGMC Kangra at Tanda (Himachal Pradesh), India. A total of 3101 urine samples were collected from patients during a period of one and half year from April 2019 to September 2019. The urine samples were then cultured using a standard loop containing 0.01 ml of urine on CLED and MacConkey agar. The inoculated plates were incubated aerobically at 37°C for 18–24 hrs. Antimicrobial susceptibility was done on Mueller hinton agar plates that were incubated aerobically at 37°C for 18–24 hrs as per CLSI guidelines. **RESULT:** A total of 3101 clean catch samples were received in the Department of Microbiology. Out of these only 640 (20.64%) samples show significant bacterial count. Among 640 samples with significant bacterial count 178 (27.81%) were from male and 462 (72.19%) were from female patients. The common isolated Gram Negative bacteria were *E. coli* (68.3%) followed by *Klebsiella* spp. (11.7%). Susceptibility was seen in majority with fosfomycin, imipenem and nitrofurantoin. **CONCLUSION:** *Escherichia coli* remained the predominant isolate among enterobacteriales and gram negative organisms, more commonly in females. Regular antimicrobial susceptibility is required to be carried out to see the current pattern of susceptibility.

KEYWORDS

INTRODUCTION

Urinary tract infections (UTI) are one of the commonest community acquired and nosocomial infections encountered by clinicians in developing countries like India. It is the second most common cause of hospital visits after respiratory infections. UTIs are defined by the presence of a growth of more than 10^5 colony forming units (CFU) of bacteria per ml of urine for asymptomatic individual and much lower for symptomatic individual (10^3 CFU/ml). [1]

Although Gram negative enteric bacilli particularly *Escherichia coli* and *Klebsiella* sp. are the leading pathogens, *Enterococcus* and *Staphylococcus aureus* are also emerging as prominent agents. [2,3]

Although UTI causing pathogens have more aggressive virulence factors so as to avoid the host immune system, certain other factors are also responsible for increased incidence of UTI such as short female urethra, incomplete emptying in old age and vesicoureteral reflux in pregnant women. [4]

Untreated UTI may lead to recurrence, renal scarring and renal failure. UTI is most often treated by empirical broad spectrum antibiotics. In most of the patients, there may be a need to start the treatment until the report of urine culture is awaited. Hence to avoid the antibiotic resistance it is necessary to have the knowledge of uropathogen and its antibiotic sensitivity in its geographical region. The main aim of this study was to identify the organism isolated from the urine and determine its antimicrobial resistance pattern so as to provide data for reference which may be of epidemiological and clinical importance regarding widespread multidrug resistance among uropathogens.

Methods

Study Area And Population

This study was conducted in the Department of Microbiology at Dr. Rajendra Prasad Government medical college Kangra at Tanda (Himachal Pradesh), India. The urine samples were collected from an

outdoor patient department who were suspected clinically with urinary tract infections. A total of 3101 urine samples were collected from patients during a period of one and half year from April 2019 to September 2019.

Sample Collection And Processing

The patients were instructed appropriately regarding sample collection in order to avoid probable contamination. Clean catch midstream urine samples were collected from each patient into a wide mouth sterile universal container with tight fitting lid. The samples were properly labelled, transported to laboratory and analysed within two hours. The urine samples were then cultured using a standard loop containing 0.01 ml of urine on CLED and MacConkey agar. The inoculated plates were incubated aerobically at 37°C for 18–24 hrs. After incubation, the plates were examined and growth characteristics noted. Bacteria were identified using colony growth characteristics, Gram staining and standard biochemical reactions. Only the samples with significant bacterial count ($>10^5$ CFU/ml) were included in the study.

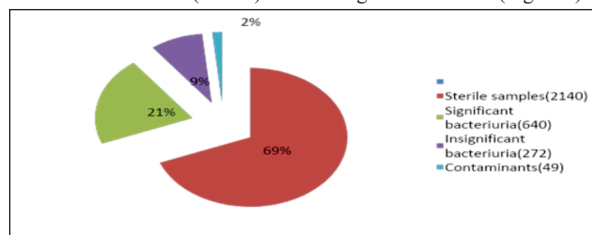
Antibiotic Susceptibility Testing

Antibiotic susceptibility testing was performed using the Kirby-Bauer disc diffusion method on Mueller-Hinton agar as described by CLSI (Clinical Laboratory Standard Institute). The isolated Gram negative bacteria were tested against commonly prescribed antibiotics Ampicillin, Amoxicillin-Clavulanic acid, Norfloxacin, Cotrimoxazole, Doxycycline, Cefepime, Ceftazidime, Nitrofurantoin, Imipenem, and Fosfomycin. Gram positive bacteria were tested against Penicillin, Ciprofloxacin, Amoxicillin-Clavulanic acid, Norfloxacin, Cefoxitin, Vancomycin, Linezolid and Gentamicin.

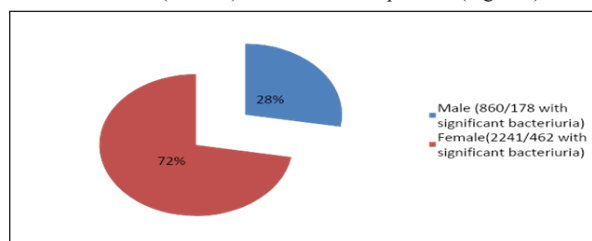
RESULTS

A total of 3101 clean catch samples were collected in the Department of Microbiology, Dr. Rajendra Prasad Government Medical College Kangra at Tanda (Himachal Pradesh), India. Out of these only

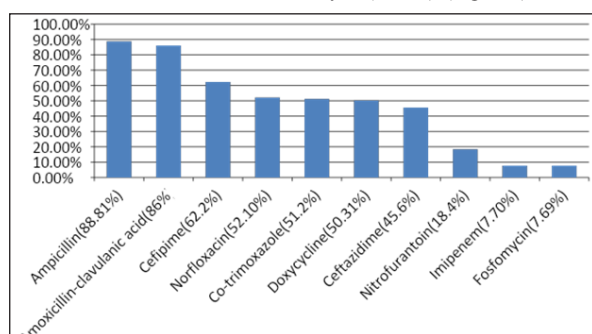
640(20.64%) samples show significant bacterial count. 2140(69%) samples were sterile, 272(8.77%) samples showed insignificant bacterial count and 49(1.58%) were having concomitants. (Figure 1)



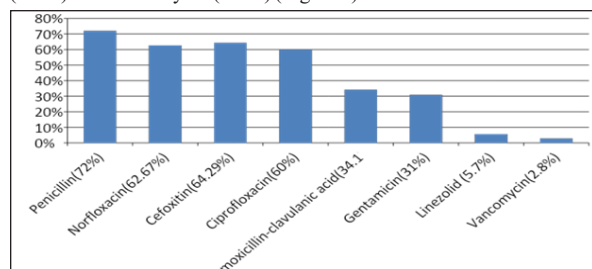
Among 640 samples with significant bacterial count 178(27.81%) were from male and 462(72.19%) were from female patients. (Figure 2)



The common isolated Gram Negative bacteria were *E. coli* (68.3%) followed by *Klebsiella* spp. (11.7%), *Citrobacter* spp. (5.9%) and *Proteus* spp. (3.9%). Non fermenters include *Acinetobacter baumannii* (5.2%) and *Pseudomonas aeruginosa* (2%). Among Gram positive bacteria *Staphylococcus aureus* (6.4%) and *Enterococcus* spp. (2.7%) were common isolates. *Candida* species account for 3.4% which includes 2.34% of *Candida albicans* and 1.1% of non albican *Candida*. Antimicrobial resistance in gram negative isolates were seen highest in ampicillin(88.81%) and amoxicillin with clavulanic acid(86%). Resistance was seen least with Fosfomycin(7.69%). (Figure 3).



Similarly in gram positive isolates resistance was seen maximally with penicillin(72%) and norfloxacin(62.6%) with least with linezolid (5.7%) and vancomycin (2.8%) (Figure 4)



DISCUSSION:

In the present study we focused on the antimicrobial susceptibility towards urinary tract infection causing microorganisms. In our study we saw the majority of the urine samples collected were sterile (69%) or showed insignificant bacteriuria(9%) and only 20.6% urine samples showed significant bacteriuria(>10⁵ CFU/ml) . Similarly in study by Gupta et al showed 64% as sterile.[5]

Majority of the urine samples with significant bacteriuria showed *E.coli*(68.3%) as the predominant bacterial isolate followed by *Klebsiella* sp. Similarly in study by Rana et al in their respective study showed predominance of *E.coli* 50.7% followed by *Klebsiella* sp. with

14.1%.[6]. *Escherichia coli* as most predominant pathogen isolated from urine samples with prevalence of 66.08% ,64.33% and 63.6% respectively[7-9]

Increasing antimicrobial resistance has created tremendous pressure on the clinicians for choosing the suitable antimicrobial agents in cure of most commonly occurring infection like UTI. In our study the majority of the bacterial isolates were sensitive to fosfomycin ,imipenem and nitrofurantoin. Old antibiotic like fosfomycin is again getting into the role as first line antibiotic in UTI due to its targeted mode of action.

ESBL and MBL producing bacteria have grown rapidly in recent times and showed resistance towards penicillins and beta lactamases significantly. In our study we found the majority of the uropathogens were resistance to ampicillin(88.8%) and amoxicillin with clavulanic acid(86%). Similarly, a study by Sugianli et al showed high resistance towards ampicillin(85.5%) and amoxicillin with clavulanic acid (50.5%).

CONCLUSION:

Escherichia coli remained the predominant isolate among enterobacteriales and gram negative organisms, more commonly in females. This study shows that fosfomycin, imipenem and nitrofurantoin were found to be susceptible in most of the uropathogens. As it is a sparing drug it should be used wisely. A review of antibiotic policy pertaining to treatment of urinary tract infections is necessary. Regular antimicrobial susceptibility is required to be carried out to see the current pattern of susceptibility.

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