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Bacterial Profile and Antimicrobial Susceptibility Pattern of Urinary Tract Infection among Women attending at CIMS, Bhopal

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Purpose: Determine the bacterial profile of urinary tract infection (UTI) and antimicrobial susceptibility pattern among women attending at Career Institute of Medical Science, Bhopal.
Patients and methods: Study was conducted from January 18, 2018 to December 25, 2018. For this study clean-catch midstream urine specimens were collected from 186 women using sterile containers. Then, culture and antimicrobial susceptibility tests were performed by standard disk diffusion method.
Results: Escherichia coli, Staphylococci, Pseudomonas aeruginosa, and Klebsiella spp. were common gram negative bacterial isolates, antimicrobial susceptibility tests show that most of the gram negative bacteria were resistant against ampicillin, tetracycline, cefeperazone-sulbactam and chloramphenicol and sensitive to amikacin, aztreonam, ciprofloxacin, nitrofurantoin, doripenam and imipenal. In case of gram positive bacteria were resistance against Polymixen-B, Azithromycin, Ciprofloxacin and gentamycin and sensitive to Doxycycline, Minocycline, Linezolid, Teicoplanine, Tigycycline, Vancomycin, Ertapanum and tetracycline.
Conclusion: In this study the overall prevalence of UTI was 14% among women. Study recommends that the early detection of causative agent of UTI and determining their drug susceptibility pattern in women will help to ensure adequate treatment of UTI and to prevent its further complication.
Keywords: Urinary tract infections, multidrug resistant, drug susceptibility.

I. INTRODUCTION

Worldwide urinary tract infections (UTIs) are a frequent problem which are caused by microbial invasion to different tissues of the urinary tract.[1&2] Normally urine is sterile, that is, free of bacteria, viruses, and fungi. One or more parts of the urinary system (the kidneys, ureters, bladder, and urethra) become infected in urinary tract infection. In the general population, UTIs are one of the most common bacterial infections. It can range from asymptomatic bacteriuria (presence of bacteria in urine without symptoms) to symptomatic UTIs infections (producing chiefly bladder symptoms).[3,4 & 5]
For the treatment of UTIs antibiotics were given. If routine culture and antibiotic susceptibility testing are not performed, this may lead to the overuse of antibiotics and development of resistant microbial species. Antibiotic resistance of UTIs is a serious public health issue.[6] Thus, knowing the magnitude of drug resistance is of critical importance as the changing rate of antibiotic resistance has a large impact on the empirical therapy of UTIs.[7] Therefore, this study tried to determine the bacterial profile of UTI and antimicrobial susceptibility pattern among women attending at Career Institute of Medical Science in Bhopal.

II. MATERIALS AND METHODS

A. Study Area

Career Institute of Medical Science is located in Bhopal. An institutional-based cross-sectional study was conducted from January 18, 2018 to December 25, 2018.

B. Method of Data Collection

Trained physician using a questionnaire to collect the information about UTI. From all the women, ~10–20 mL of urine specimen was collected by using sterile screw-capped, wide-mouth container.[8] The bottles were labeled with unique sample number, date and time of collection, then immediately they were sent to bacteriology department for testing the culture and antimicrobial susceptibility.

C. Culture

Urine samples were inoculated onto MacConkey agar and blood agar plates by a wire loop that can deliver 0.001 mL of urine specimen by using streak plate method following the standard microbiological procedures.[8,9] Then, the plates were aerobically incubated at 37°C for 24 hours.

After incubation examined the media for the presence or absence of the bacterial growth. Colonies were counted and checked for significant bacteriuria on media.

A culture that grew $>10^5$ colony-forming unit (CFU/mL) was considered as significant bacteriuria and indicates infection. Low count of $< 10^5$ colony-forming unit (CFU/mL) was considered as insignificant bacteriuria indicates presence of commensal bacteria (due to contamination during voiding).[8]

For cultures growing more than one bacterium, subculturing of individual distinct colonies was performed using a sterile wire loop to ensure pure cultures.[10]

Physical characteristics such as colony morphology, odor, swarming, and the presence of hemolysis on their respective media were further tested in all positive urine cultures. Thus, a series of biochemical tests such as triple sugar iron agar, indole, simmons citrate agar, oxidase, urease, and motility were used for identification of gram-negative rods.[8] Morphologically identical colonies of the suspected strains were taken from the agar plates and were suspended in nutrient broth and vortexed. Then, the suspensions were inoculated into the slant of the biochemical testing media. The inoculated media were aerobically incubated at 37°C and after overnight incubation bacteria were identified following the standard flow chart. Gram-positive cocci were identified based on their catalase and coagulase tests. [8,9]

D. Antimicrobial Susceptibility Testing

With significant bacteriuria antimicrobial susceptibility testing was performed for the bacterial isolates. Kirby-Bauer disk diffusion method was used on Mueller-Hinton agar (Oxoid Ltd) to determine the susceptibility patterns of the commonly used antibiotics. For this pure colonies are inoculated in a suitable liquid medium (peptone water broth) and incubated at 35-37^{0}C for 4-6 hours. The density of the microorganisms is adjusted to approximately 1.5 x 10^8 cfu/ml until the turbidity of the suspension becomes adjusted to the density of 0.5 McFarland standards.

A cotton swab is dipped into inoculums and squeezed to drain out the excess fluid. Then the swab is inoculated on to the Mueller-Hinton agar plate by streaking the swab three times over the entire agar surface.

After drying the surface of agar plate for 3-5 minutes the antibiotic disks are applied.

Using sterile forceps, the selected antibiotics disks were applied to the plates at a distance of 15 mm away from the edge and 24 mm apart from each other. The antibiotics disks were obtained from Himedia Ltd in the following concentrations: Ampicillin (10 µg), Ceftriaxone (30 µg), Chloramphenicol (30 µg), Gentamicin (10 µg), cefoperazone-sulbactam (30 µg); Amikacin (10 µg), Ciprofloxacin (30 µg), Aztreonam (30 µg), Nitrofurantoin (30 µg), Doripenam (30 µg), Imipenam (30 µg), Tigecycline (30 µg), Polymixen-B (30 µg), Azithromycin (30 µg), Doxycycline (30 µg), Minocycline (30 µg), Linezolid (30 µg), Teicoplanine (30 µg), Vancomycin (30 µg), Ertapanum (30 µg) and Tetracycline (30 µg). The plates are then incubated at 37^{0}C for 16-18 hours. The zone of complete growth of inhibition around each of the disks are measured using a ruler. According to the standardized table the susceptibility or resistance to the agent in each disk was determined, and the isolates were classified as sensitive, intermediate, or resistant. according to the standardized table.

III. RESULTS AND DISCUSSION

A total of 186 women were included in this study. The women were in the age range of 25–34 years (44.4%) and they mentioned married (92.5%) in their marital status, high school (9–12; 40.3%) in their educational status, and urban dwellers (90.9%) in their residence. In this study, 26 (14%) of the study women have significant bacteriuria. Gram negative bacilli and gram positive cocci were isolated in this study. The majority of the isolates were Gram-negative organisms followed by Gram-positive organisms. *E. coli* was found to be the most frequent isolate, followed by Staphylococci, *P. aeruginosa* and *Klebsiella* spp.

A. Antimicrobial Susceptibility Pattern

Gram-negative isolates showed a high level of sensitivity to Aztreonam, Ciprofloxacin, Amikacin, Nitrofurantoin, Doripenem, Tigecycline and imipenem. However, it was relatively low resistant to Gentamycin and resistant to Ampicillin, Ceftriaxone, Cefeperazone-Sulbactum, Chloramphenicol and Tetracycline.

Sno	Antibiotic	Interpretation
1	Amikacin	S(20mm)
2	Ampicillin	R
3	Aztreonam	S(16mm)
4	Ceftriaxone	R
5	Ciprofloxacin	S(21mm)
6	cefoperazone-sulbactam	R
7	Chloramphenicol	R
8	Gentamicin	I
9	Nitrofurantoin	S(18mm)
10	Doripenam	S(20mm)
11	Imipenam	S(17mm)
12	Tetracycline	R
13	Tigecycline	S(17mm)

Antibiotics susceptibility pattern on Gram-negative isolates

Gram positive bacteria were resistance against Polymixen-B, Azithromycin, Ciprofloxacin and gentamycin and were highly susceptible to Doxycycline, Minocycline, Linezolid, Teicoplanine, Tigycycline, Vancomycin, Ertapanum and tetracycline.

Sno	Antibiotic	Interpretation
1	Doxycycline	S(17mm)
2	Gentamycin	R
3	Minocycline	S(16mm)
4	Linezolid	S(22mm)
5	Teicoplanine	S(17mm)
6	Tigecycline	S(18mm)
7	Tetracycline	S(19mm)
8	Vancomycin	S(18mm)
9	Polymixen-B	R
10	Ertapenum	S(23mm)
11	Azithromycin	R
12	Ciprofloxacin	R
13	Cefoxitin	I

Antibiotics susceptibility pattern on Gram-positive isolates

IV. CONCLUSION

In this study, 26 (14%) of the study women have significant bacteriuria. *E. coli* , *P. aeruginosa*, and *Klebsiella* spp. were common bacterial isolates. Therefore, the empirical antibiotic selection should be based on the knowledge of the local prevalence of bacterial organisms and antibiotic sensitivities rather than on universal guidelines. This study recommends that the early detection of causative agent of UTI and determining their drug susceptibility pattern in women will help to ensure adequate treatment of UTI and to prevent its further complication.

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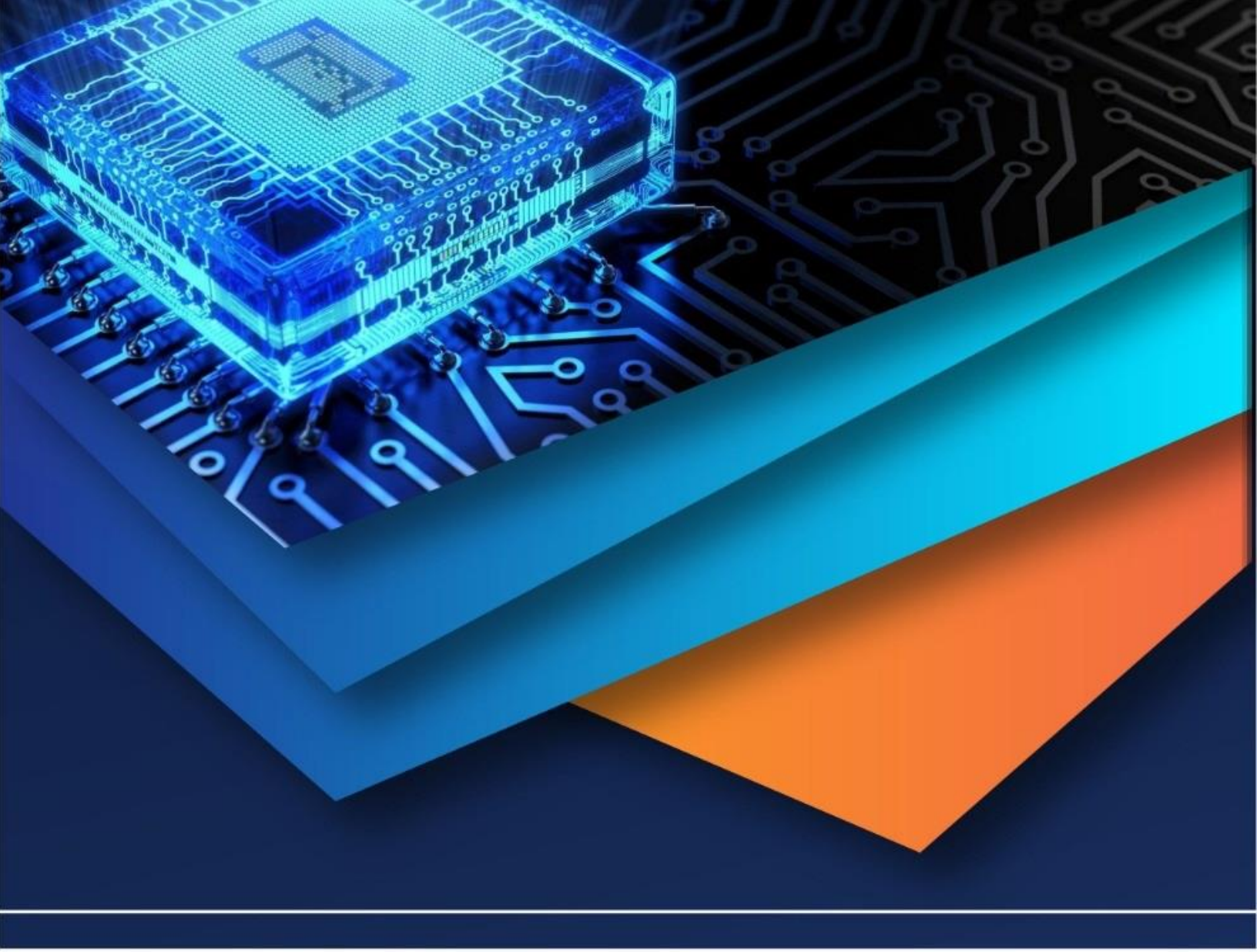

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