ORIGINAL RESEARCH

Antibiotic Resistance Profile of Gram Negative Uropathogens Isolated From a Newly Established Tertiary Care Center

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ABSTRACT

Background: The present study was undertaken for assessing antibiotic resistance profile of gram negative uropathogens isolated from a newly established tertiary care center.

Materials &Methods: A total of 131 participants suspected for UTI were recruited using consecutive sampling techniques. Clean catch mid-stream urine samples were collected using sterile wide mouth container from enrolled patients. The minimum acceptable volume of urine sample was 10ml. As soon as the samples were brought to the lab, they were all examined to make sure that any pathogenic organisms found in the urine were isolated and prevented from becoming too large. Mueller-Hinton agar was subjected to antimicrobial susceptibility testing using the Kirby-Bauer disk diffusion method.

Results: Enterobacter spp. were mainly susceptible to ampicillin, Chloramphenicol, Trimethoprim-Sulfamethoxazole and Amoxycillin. Citrobacter spp. were mainly susceptible to Ampicillin, Chloramphenicol and ciprofloxacin. Providenicia spp. were mainly susceptible to Ampicillin, Trimethoprim-Sulfamethoxazole and ciprofloxacin.

Conclusion: Growing patterns of antibiotic resistance suggest that community antimicrobial usage must be rationalized and done so with caution.

Key words: Resistance, Antibiotic, Uropathogens

INTRODUCTION

Urinary tract infections (UTIs) account for more than 8 million visits to physicians' offices, 1.5 million emergency room visits, and 300,000 hospital admissions in the United States annually. UTIs are the second most common infection of any organ system and the most common urological disease in the United States, with a total annual cost of more than $3.5 billion.[1,] [2]Untreated UTI can result in serious complications such as kidney damage, renal scarring, and renal failure. UTI is commonly caused by bacteria mostly by Gram-negative bacteria such as Escherichia coli, Proteus species, Pseudomonas aeruginosa, Acinetobacter species, Klebsiella species, Enterobacter species, and Citrobacter species. Among Gram-positive bacteria, Staphylococcus saprophyticus, Enterococcus species, and Coagulase-negative Staphylococcus are common predictable spectrum of bacteria which are responsible for causing UTIs.[3- 5] The etiology of bacteria causing UTI as well as their susceptibility to antimicrobials continue to vary over time period and it is different among different countries.[6]Hence; under the light of above-mentioned data, the present study was undertaken for assessing antibiotic resistance profile of gram negative uropathogens isolated from a newly established tertiary care center.

MATERIALS & METHODS

The present study was undertaken for assessing antibiotic resistance profile of gram negative uropathogens isolated from a newly established tertiary care center. The sample size for the study was calculated to be 131. A total of 131 participants suspected for UTI were recruited using consecutive sampling techniques. Clean catch mid-stream urine samples were collected using sterile wide mouth container from enrolled patients. The minimum acceptable volume of urine sample was 10ml. As soon

as the samples were brought to the lab, they were all examined to make sure that any pathogenic organisms found in the urine were isolated and prevented from becoming too large. Using a sterile standard calibrated wire loop, urine specimens were immediately inoculated onto blood agar and MacConkey agar. Sprouted culture plates were then aerobically incubated for 24 hours at 37°C. After counting the quantity and kind of colonies on a blood agar plate, the presence of noteworthy bacteria was identified. According to conventional protocols, the gram reaction of the bacteria, blood agar, MacConkey agar, colony features on blood agar, and biochemical assays were used to identify the bacterial isolates. Mueller-Hinton agar was subjected to antimicrobial susceptibility testing using the Kirby-Bauer disk diffusion method. All the results were recorded in Microsoft excel sheet followed by statistical analysis using SPSS software.

RESULTS

A total of 131 patients were analyzed. Mean age of the patients was 41.8 years. Majority of the patients were males. Gram positive bacteria were isolated in 81 patients while gram negative bacteria were isolated in 50 patients. Among gram positive bacteria isolated, S. aureus, S. saprophyticus, S. epidermides, E. Coli, Proteus spp. and Klebsiella spp. were isolated in 6.11 percent, 8.40 percent, 6.11 percent, 31.30 percent, 5.34 percent, and 4.58 percent of the cases. Enterobacter spp., Citrobacter spp, Providenicia spp., and Non-Fermenter bacteria were isolated in 12.98 percent, 8.40 percent, 9.16 percent and 7.63 percent of the cases respectively. Enterobacter spp. were mainly susceptible to ampicillin, Chloramphenicol, Trimethoprim-Sulfamethoxazole and Amoxycillin. Citrobacter spp. were mainly susceptible to Ampicillin, Chloramphenicol and ciprofloxacin. Providenicia spp. were mainly susceptible to Ampicillin, Trimethoprim-Sulfamethoxazole and ciprofloxacin.

Table 1: Frequency of isolated microorganisms

Bacterial isolates		Number (n=131)	Percentage
Gram positive (81)	**S. aureus**	8	6.11
	S. saprophyticus	11	8.40
	S. epidermides	8	6.11
	E. Coli	41	31.30
	Proteus spp.	7	5.34
	Klebsiella spp.	6	4.58
Gram negative (50)	**Enterobacter spp.**	17	12.98
	Citrobacter spp.	11	8.40
	Providenicia spp.	12	9.16
	Non-Fermenter	10	7.63

Graph 1: Antibiotic susceptibility pattern

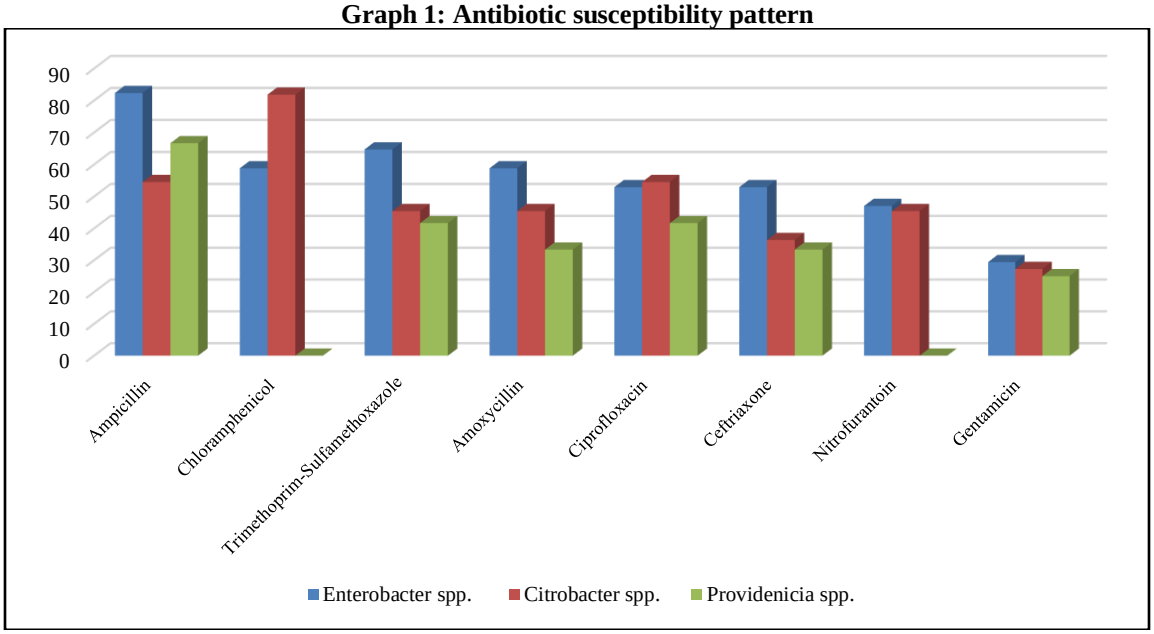

Table 2: Antibiotic susceptibility pattern

Antibiotics susceptibility (%)	Enterobacter spp.	Citrobacter spp.	Providenicia spp.
Ampicillin	82.35	54.55	66.67
Chloramphenicol	58.82	81.82	0.00
Trimethoprim-Sulfamethoxazole	64.71	45.45	41.67
Amoxycillin	58.82	45.45	33.33
Ciprofloxacin	52.94	54.55	41.67
Ceftriaxone	52.94	36.36	33.33
Nitrofurantoin	47.06	45.45	0.00
Gentamicin	29.41	27.27	25.00

DISCUSSION

Among the most common infectious diseases, urinary tract infections (UTIs) are a commonly encountered diseases by clinicians in developing countries with an estimated annual global incidence of at least 250 million. UTIs refer to the presence of microbial pathogens within the urinary tract and it is usually classified by the infection site:-bladder [cystitis], kidney [pyelonephritis], or urine [bacteriuria]) and also can be asymptomatic or symptomatic, UTIs that occur in a normal genitourinary tract with no prior instrumentation are considered as "uncomplicated," whereas "complicated" infections are diagnosed in genitourinary tracts that have structural or functional abnormalities, including instrumentation such as indwelling urethral catheters, and are frequently asymptomatic.[7, 8]Although UTI is caused by a range of pathogens, the most commonly studied UTIs are Escherichia coli, Enterococcus faecalis, Proteus mirabilis, Klebsiella pneumoniae, and Staphylococcus saprophyticus. The majority of the UTIs are biofilm-associated infections, wherein pathogenic bacterial strains colonize both the tissues of the urinary tract and indwelling devices such as surgical catheters. Catheter-Associated Urinary Tract Infections is a representative type of biofilm infection where the bacterial cells colonize the surfaces of catheters and grow as biofilm communities and contain gel-like polysaccharide matrix that protects from antimicrobial compounds.[9, 10] Hence; the present study was undertaken for assessing antibiotic resistance profile of gram negative uropathogens isolated from a newly established tertiary care center.A total of 131 patients were analyzed. Mean age of the patients was 41.8 years. Majority of the patients were males. Gram positive bacteria were isolated in 81 patients while gram negative bacteria were isolated in 50 patients. Among gram positive bacteria isolated, S. aureus, S. saprophyticus, S. epidermides, E. Coli, Proteus spp. and Klebsiella spp. were isolated in 6.11 percent, 8.40 percent, 6.11 percent, 31.30 percent, 5.34 percent, and 4.58 percent of the cases. Enterobacter spp., Citrobacter spp, Providenicia spp., and Non-Fermenter bacteria were isolated in 12.98 percent, 8.40 percent, 9.16 percent and 7.63 percent of the cases respectively. Our results were in concordance with the results obtained by Ahmed et al who also reported similar findings. In their study, authors determined the prevalence of uropathogens causing urinary tract infections (UTIs) and to determine their pattern of antimicrobial resistance. Antibiotic resistance was commonly observed in ampicillin (88.3%), piperacillin (72.7%), clindamycin (66.7%), amoxicillin/clavulanic acid (66.2%), and trimethoprim/sulfamethoxazole (50%). The commonly isolated microorganisms were Escherichia coli 24 (27%), Klebsiella pneumoniae 11 (12.4%), Proteus mirabilis 4 (4.5%), Pseudomonas aeruginosa 4 (4.5%), Enterobacter cloacae 5 (5.6%), Enterococcus faecalis 5 (5.6%), and Staphylococcus saprophyticus 3 (3.4%).[11] In another similar study conducted by Mamuye Y et al, authors determined the current antibiotic resistance pattern among common bacterial uropathogens. Resistance to Tetracyclin, Ampicilin, Amoxycilin and Nalidixic Acid was more than 70% of all isolates of E.coli strains.[12]In the present study, Enterobacter spp. were mainly susceptible to ampicillin, Chloramphenicol, Trimethoprim-Sulfamethoxazole and Amoxycillin. Citrobacter spp. were mainly susceptible to Ampicillin, Chloramphenicol and ciprofloxacin. Providenicia spp. were mainly susceptible to Ampicillin, Trimethoprim-Sulfamethoxazole and ciprofloxacin. In a similar study conducted by Mosonik, G. C et al, authors assessed the profile of antibiotic resistance among uropathogens. Antibiotic resistance was observed among these uropathogens to commonly used antibiotics namely; ampicillin (84.3%), azithromycin (71.9%) and augmentin (69.8%). However, there were some bacteria that were susceptible to all or some commonly used antibiotics. There was moderate resistance to norfloxacin (43%) except in Staphylococcus aureus which showed 64% resistance. The isolates showed less resistance to cefoxitine (13.2%), gentamycin (11.6%) and ciprofloxacin (10%). While most bacteria showed multiple resistance to 3 drugs, some showed resistance to at most 5 drugs tested.[13] Similar findings were also reported in the study conducted by Abdel Gawad AM et al. They reported common local uropathogens and their antibiogram profiles. The resistance rates ranged from

26.9 to 79.7%. Piperacillin-tazobactam antibiotic had the lowest resistance rate. The multi-drug resistance pattern was recorded in 181 (23.9%) of the isolates; 159/597 (26.6%) Gram-negative and 22/160 (13.8%) Gram-positive isolates.[14]

CONCLUSION

Gram-negative bacterial infections with high resistance to routinely used antibiotics were highly prevalent. Growing patterns of antibiotic resistance suggest that community antimicrobial usage must be rationalized and done so with caution.

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