Research Article

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Isolation of Bacterial Pathogens Causing Urinary Tract Infections and Their Antimicrobial Susceptibility Pattern Among Patients at Misurata Teaching Hospitals, Libya

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ABSTRACT

Introduction: *Urinary tract infection (UTI) is one of the most common bacterial infections encountered by clinician. Therefore, accurate identification of bacterial isolates and their antibiotic susceptibility is essential.*

Objective: *To isolate the etiological bacterial pathogens causing UTI and to determine their antibiotic sensitivity in patients attending the Emergency and Al-shifa Maternity Hospitals in Misurata City-Libya.*

Patients and Methods: *250 urine specimens were collected from patients during the period from January, 1st to February, 15th 2016. The specimens were cultivated and identified according standard methods.*

Results: *Only 25.2% of specimens showed a significant growth whereas 74.8% of specimens were either no growth or insignificant. The sum of isolated gram negative bacilli was 66.66%, while other bacteria represented (33.33%). Escherichia coli (E. Coli) was the most gram negative bacilli isolated (50%), and prevalence of gram negative bacilli was the highest among females 78.57%. Most of the pathogens were sensitive to Aminoglycosides: Amikacin and Gentamicin, but with lower sensitivity to Cephalosporins and high resistance to Ampicillin and to lesser degree toward other antibiotics.*

Conclusion: *Enterobacteriacea was the main cause of urinary tract infections, which recall intensification of education and cultivation programs, general & personal hygiene procedures. As drug resistance among microorganisms pathogens is an evolving process, routine surveillance to provide physicians knowledge on the updated and most effective treatment of UTIs.*

Keywords

Urinary tract infections, Gram negative bacilli, *Escherichia coli*, Aminoglycosides.

Introduction

Urinary tract infections (UTI) is a term applied to a variety of clinical conditions ranging in severity from asymptomatic infections to acute urethritis, cystitis, prostatitis, pyelonephritis with resultant sepsis [1]. It is one of the most common bacterial infections encountered by clinicians in outpatient as well as in hospitalized patients. Every year approximately 150 million people are suffering with UTI all over the world, about 10% of human population gets UTI at some stage during their lives [2,3]. Prevalence of infections may differ with age, sex and certain predisposing factors. The international studies have shown that UTIs in women are very common; therefore, one in five adult women experience UTI in her life and it is extremely common, clinically apparent, worldwide patient problem [4-6]. More than 95% of UTIs are caused by a single bacterial species. Gram negative bacteria have been recognized in 80-84% of UTIs. Among

gram negative bacteria, (*E. Coli*) is the most frequent pathogen in both outpatient and inpatient of both sexes followed by *Klebsiella species*, *Pseudomonas*, and *Proteus*; however, *Enterococcus* and *Staphylococcus species* are the causative gram positive agents for the remainder infection [7-9].

UTI account for a large proportion of antibacterial drug consumption and have large socio-economic impacts. Treatment of UTI is often started empirically and therapy is based on information determined from the antimicrobial resistance pattern of the urinary pathogens [10]. The prevalence of antimicrobial resistance among urinary pathogens has been increasing worldwide due to aberrant use of antibiotics in practice [11,12]. Distribution of urinary pathogens and their susceptibility to antibiotics varies regionally so it becomes necessary to have knowledge of distribution of these pathogens and their susceptibility to antibiotics in a particular setting [13,14]. The estimation of local etiology and susceptibility profile could support the most effective empirical treatment [15]. The objective of this study was to determine the etiological bacterial pathogens of the UTI and to determine the antibiotic sensitivity pattern of pathogens isolated.

Patients and Methods

A total of 250 patients with clinical symptoms of UTIs at Emergency and Al-shifa Maternity Hospitals in Misurata City from January, 1st to February 15th 2016 were involved in this descriptive hospital - based study. Midstream urine specimens (morning void) were collected from patients in wide-mouth sterile containers after instruction for appropriate collection procedure to reduce probable contamination. The collected specimens were individually labeled and sent to the microbiological laboratory for isolation and identification of any bacterial pathogens. In the laboratory, the collected specimen were separately inoculated onto Blood Aga (oxoid, UK), Base, CLED Agar, and MacConkey Agar (Oxide, UK), and identified according to the common standard procedures by Vandepitte et al. [16]. The isolated bacteria cultivated on Muller Hinton Agar (Oxide, CM0337) for antibiogram using the following antibiotics (concentration in µg): Cefuroxime (CXM30), Amikacin (AK30), Nalidixic Acid (NA30), Gentamicin (GE 30), Ceftriaxone (CRO5), Chloramphenicol (C30), Tetracycline (TE30), Cotrimoxazole (SXT25), Ampicillin (AMP10), Augmentin (AMC30). Statistical analysis was done by Microsoft Office Excel 2007, SPSS version 12 (Statistical Package for Social Sciences). Evaluation was carried out at 95% confidence level and P <0.05 was considered statistically significant.

Results

Out of the total 250 urine specimen tested, 187 (74.8%) specimen were negative for the presence of bacterial pathogens whereas only 63 (25.2%) specimen came out to be positive for isolates. Each positive sample represented by one bacterial isolate. The most common isolates in this study were Gram negative bacilli (42) which accounts for 66.66% of the total positive isolates with the predominant isolate was *E.coli* (50%) followed by other bacilli like *Klebsiella spp.* (23%), *Proteus spp* (14.3%) and *Pseudomonas spp.* (11.9%%) (Figure 1) shows the detailed frequency of all the isolates identified.

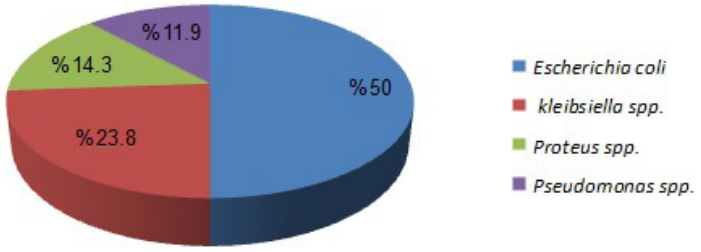

Figure 1: Percentage of isolated Gram negative bacilli.

Concerning the distribution of the isolated pathogens in relation to patient's gender, the majority of bacterial species were isolated from female patients 52/63 (82.54%); however, only 11/63 (17.46%) isolated were from male patient. Also the prevalence of gram negative bacilli was higher in females 33/42 (78.57%) than males 9/42 (21.42%) (Figure 2).

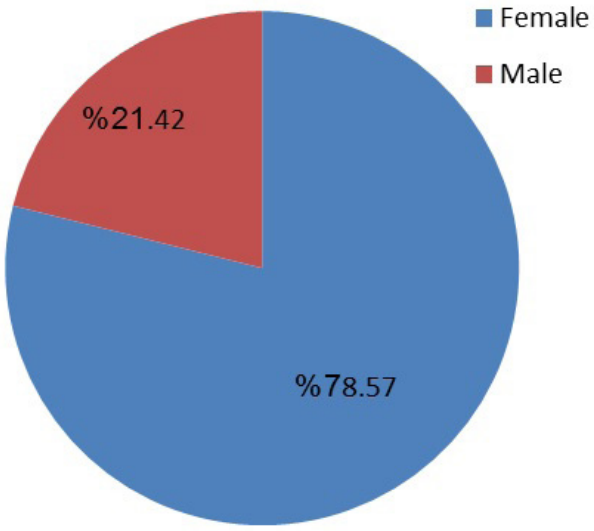

Figure 2: Prevalence of gram negative bacilli in female and male patients.

In females, the distribution of isolates were *E. coli* (80.95%), *Proteus spp.* (83.33%), *Klebsiella spp.* (80%), and *Pseudomonas spp* (60%). Whereas in males, the isolates were *E. coli* (19.04%), *Klebsiella spp.* (20%), *Proteus spp.* (16.66%) and *Pseudomonas spp.* (40%) (Figure 3).

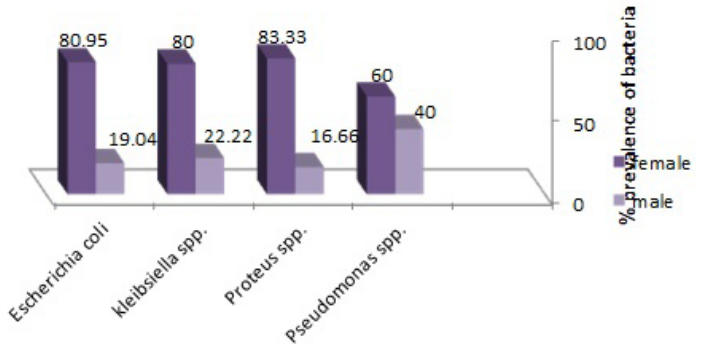

Figure 3: Distrbution of isolates among female and male patients.

The results of susceptibility test showed that *E. coli* isolates were highly sensitive to Chloramphenicol (90.46%) followed by Gentamicin and Co-trimoxazole (71.4%), then to Augmentin and Amikacin (61.9%). The sensitivity to Cephalosporins was low such as Cefuroxime and Ceftriaxone (47%, and 38%) respectively. Whereas these isolates showed high resistance to Ampicillin and Nalidixic acid (66.66%, and 47.6%) respectively (Figure 4).

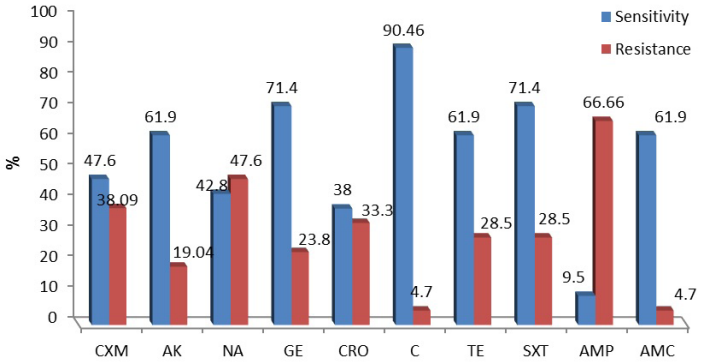

Figure 4: Activity of *E. coli* isolates on tested antibiotics.

The isolates of *Klebsiella spp.* were highly sensitive to Gentamicin (90%), Amikacin (80%), but highly resistant to Ampicillin (80%) and Cephalosporins (60%) (Figure 5).

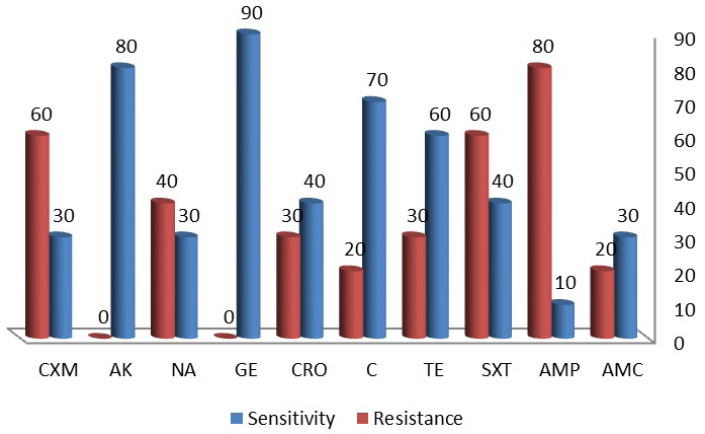

Figure 5: Activity of *Klebsiella spp.* isolates on tested antibiotics.

The susceptibility of *Proteus spp.* isolates showed that, sensitivity rate to Amikacin in the range of (66.6%), but all (100%) isolates were resistant to Nalidixic Acid, followed by Cefuroxime (83.3%) and variable degree of resistance to the rest of antibiotics (Figure 6).

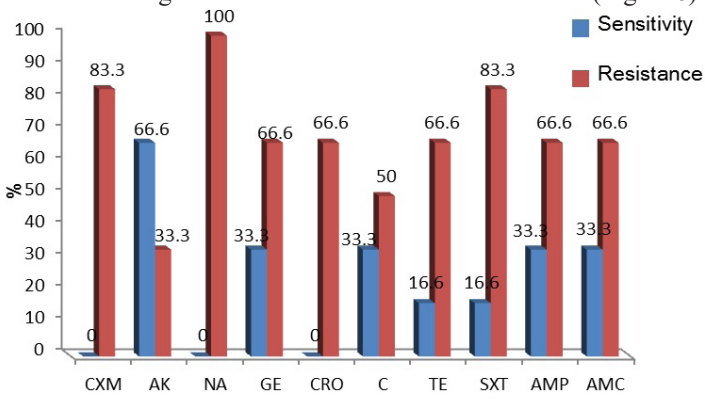

Figure 6: Acivity of *Proteus spp.* isolates on tested antibiotics.

Pseudomonas spp. isolates showed low sensitivity to most tested antibiotics. The isolates were 80% and 40% sensitive to Amikacin and Gentamicin, respectively, but they were highly (80-100%) resistant to the rest of tested antibiotics (Figure 7).

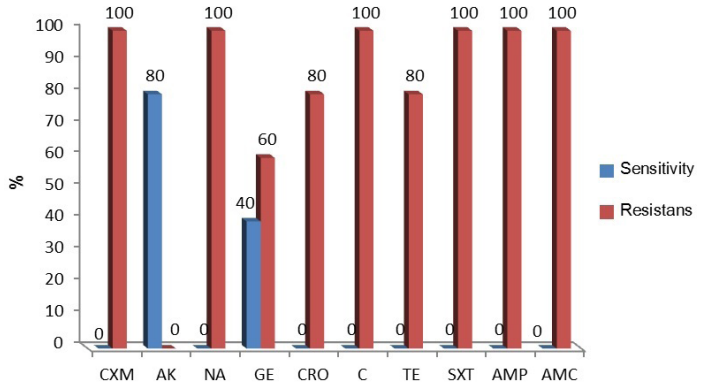

Figure 7: Acivity of *Pseudomonas spp.* isolates on tested antibiotics.

Discussion

In the management of UTI in both males and females, it is very much essential to isolate and identify the bacteria which cause urinary tract infections. In addition to that the susceptibility pattern of these bacteria to antibiotics is very important to avoid the development of drug resistant [4]. The present study provided a view on the frequency and the antibiogram of the uropathogens isolated from patients attending our hospitals and suffering UTI. Positive specimen for pathogens represented only (25.2%) of all specimen collected, while, the remaining (74.8%) of specimens showed either insignificant bacteriuria or no growth. Our results nearly similar to that previously reported in a recent study conducted in Zawiya city, Libya which found only 20.7% as Positive specimens for pathogens [17] but both were higher than the result reported in Messalata city, Libya (13.9%) [18] and lower than the result reported in Zleten city, Libya 37.3% [19]. In other countries, the prevalence of positive cultures was also variable [20-22]. The reason of low growth rate may be due to irrational use of antibiotics which is easily available in the local market in this country and these are given without prior culture and antibiotic sensitivity pattern. In addition to that, incomplete dose is another factor. Prior antibiotic therapy before sending urine samples for culture and sensitivity and other clinical conditions like non-gonococcal urethritis could be the factors responsible for insignificant bacteriuria or no growth [23].

The sex distribution of patients in our study showing a statistically predominance of UTI in females (82.54%) compared to males (17.64%). This result is similar to those reported from many other centers [7,18,19,24]. Women are particularly at risk of developing UTIs because of their short urethra, and certain behavioral factors which include delay in micturition, sexual activity and the use of diaphragms and spermicides which promote colonization of the periurethral area with coliform bacteria. Infection in women most often results from perineal or periurethral bacteria that enter

the urethra and ascend into the bladder, often in association with sexual activity, or due to mechanical instrumentation such as catheterization [25].

Regarding the causative uropathogens, gram negative bacilli were the most common isolates in the present study, accounting 66.66% of total isolated bacteria and amongst them *E. coli* was the most predominant bacteria (50%) followed by *Klebsiella, Proteus,* and *Pseudomonas spp.* This finding was in agreement with the result of other studies which showed the predominance of *E. coli* [17-19,26,27].

Monitoring of antimicrobial susceptibility can aid clinicians for prescription of appropriate antibiotics and prevention of development of drug resistance. In the context of antibiotic susceptibility, *E. coli* isolates were found to be highly sensitive to Chloramphenicol which is not commonly used in treatment of UTI and contraindicated in pregnancy, but also sensitive with variable degrees to Gentamicin, Co-trimoxazole, Augmentin and Amikacin. The sensitivity to Cephalosporins was also low which is alarming because they are the most widely used antibiotics in our area. However, the resistance was mostly toward Ampicillin and Nalidixic acid. *Klebsiella spp.* isolates were highly sensitive to Gentamicin and Amikacin, and showed low sensitivity to Cephalosporins, but highly resistant to Ampicillin and to a lesser extent to Co-trimoxazole. The susceptibility of *Proteus spp.* isolates showed moderate sensitivity rate to Amikacin, but all (100%) isolates were resistant to Nalidixic Acid, followed by Cefuroxime. *Pseudomonas spp.* isolates showed high sensitivity to Amikacin and to a lesser extent to Gentamicin, but they were highly resistant to the rest of tested antibiotics.

In other words, most of the isolates were considerably sensitive to Gentamicin and Amikacin which is going with results of many published studies, but the sensitivity was low for the Cephalosporins, and with high resistance towards Ampicillin, Nalidixic acid and to a variable degree of resistance towards other classes of antibiotics which is also in agreement with previous studies [17-19,28,29]. The variation in sensitivity patterns of the isolates might be due to the irrational prophylactic usage, easy availability and the over the counter sale of antimicrobials without a proper prescription and an inappropriate dosing schedule.

Conclusion

In this study, it has been found that Gram-negative bacteria are the commonest organisms isolated from UTI patients among which *E coli* and *Klebsiella species* are the two principal urinary pathogens. Also the prevalence of UTIs was high in females than in males because of the obvious anatomical and physiological differences among both sexes. In addition, this study indicates that, antibiotics commonly used for the treatment of UTIs are less effective. Therefore, regular surveillance and monitoring is necessary to provide physician's knowledge on the updated and most effective empirical treatment of UTIs. Periodic reassessment of in vitro susceptibility pattern of urinary pathogens serve as a guide for antibiotic therapy since these organisms exhibit resistance to first-line drugs used for UTI infection. In order to prevent or decrease resistance to antibiotics, the use of antibiotics should be kept under supervision, should be given in appropriate doses and for an appropriate period of time.

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