International Research Journal of Medical Sciences _____ ISSN 2320 –7353
Vol. **2(2),** 18-21, February **(2014)** *Int. Res. J. Medical Sci.*

Antimicrobial Susceptibility Pattern of *Escherichia coli* isolated from urinary tract infections at Al-Quwayiyah General Hospital, Al- Quwayiyah, Kingdom of Saudi Arabia

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Available online at: www.isca.in, www.isca.me
Received 1st January 2014, revised 22nd January 2014, accepted 21st February 2014

Abstract

Urinary tract infection (UTI) is the most common among all hospital acquired infections worldwide. In UTI, most common organism is E.coli. Organism responsible for the hospital acquired infection may have tendency to develop multiple drug resistance. E.coli acquired from the Al-Quwayiyah General Hospital source may differ in their resistant against antibiotics. This was a retrospective study conducted in an Al-Quwayiyah General hospital to know the prevalence and antibiogram of E.coli. Samples received include mid-stream clean catch urine, suprapubic aspirate and from Foley's catheter. All the plates were inspected for growth and the isolates were identified by observing colony morphology, Gram-stain characteristics and relevant biochemical tests. The isolates were tested for their antimicrobial susceptibility and the results were interpreted by vitek 2 methods, according to the guidelines of Clinical and Laboratory Standards Institute. Out of 96 samples tested, 53 (55.2%) were positive for E.coli. E.coli was highly resistant to Ampicillin (85.1%) followed by Piperacillin (66.03%) and least resistance was seen with Nalidixic acid (5.6%) and Nitrofurantoin (5.6%) followed by and Ciprofloxacin (11.3%). Knowledge of prevalence and antimicrobial susceptibility pattern of E. coli will help in selecting an appropriate antibiotic for empirical therapy. Formulation of hospital infection control committee and strict adherence to the guidelines of the committee will help in preventing the emergence of drug resistance.

Keywords: Antibiotic resistance pattern, urinary tract infection, *E.coli*.

Introduction

One of the commonest bacterial infections are the Urinary tract infections (UTIs), and the most common organism accounted for UTI is Escherichia coli (*E.coli*)[1,2]. Despite the widespread availability of antibiotics, UTI is one of the most important causes of morbidity in general population and also the common cause of nosocomial infection among hospitalized patients[3]. Treatment of UTIs can be difficult because of recurrences and asymptomatic infections. The susceptibility patterns of uropathogens have been changing over the past years, both in community and nosocomial infections[4, 5].

Antibiotics are invariably used for the treatment of UTIs, though resistance to antibiotics has been reported all over the world, particularly in developing countries [6]. Treatment of UTIs is a challenge due to the increasing level of antimicrobial resistance[7]. There is an increased emergence of antimicrobial resistance in the uropathogens, probably due to the empirical administration of anti bacterial therapy, even before the availability of the urine culture results, is a matter of concern worldwide[8]. The prevalence of antimicrobial resistance in patients with UTI is increasing and can vary according to geographical and regional Location[9].

For treatment of UTIs and prevention of antimicrobial resistance, knowledge of the common organisms responsible for UTIs and their antibiotic susceptibility patterns in specific geographical locations will help physicians in choosing an appropriate empirical treatment. There are only few studies of prevalence of UTI and antibiogram of *E.coli* in this part, hence the present study was undertaken to find out the prevalence and antibiogram of UTI due to *E.coli*. UTI is a serious health problem affecting millions of people each year. The prevalence of asymptomatic bacteriuria reported in Saudi Arabia was 5.3 %[10]. The most common organisms causing UTI are *E. coli* while *Proteus*, *Klebsiella*, *Streptococcus* and *Staphylococcus* epidermis also commonly the causative agents[11]. The predominant organisms associated with UTI in Saudi Arabia are Gram negative bacteria which are highly resistant to commonly used oral agents[12]. This present study was conducted to determine the Antimicrobial Susceptibility Pattern of *Escherichia coli* isolated from urinary tract infections at Al-Quwayiyah General Hospital, Al- Quwayiyah, Kingdom of Saudi Arabia.

Material and Methods

This was a retrospective study conducted in an Al-Quwayiyah General Hospital, Al-Quwayiyah, Saudi Arabia. Data was collected from Aug 2013 to Nov 2013 using the microbiological records of consecutive urine samples received in the laboratory during the study. All positive samples reports from both communities acquired and nosocomial UTI was included from various specialties. Urine samples were cultured using a 1µm calibrated loop onto CLED agar, blood agar and MacConkey agar plates, incubated at 37°C for 18-24 hours and the number of colonies was counted. All specimens were inoculated from CLED agar (Media, Ministry of Health) by semi quantitative method. The specimen yielding more than or equal to 10^5 organisms/ml of urine was interpreted as significant. Samples received include mid-stream clean catch urine, suprapubic aspirate and urine obtained from Foley's catheter. All the plates were inspected for growth and the isolates were identified by observing colony morphology, Gram-stain characteristics and relevant biochemical tests by Vitek 2 Instrument.

The isolates were tested for their antimicrobial susceptibility and the results were interpreted by modified Vitek 2 method[13], according to the guidelines of Clinical and Laboratory Standards Institute[14]. The antibiotics tested were Cephalothin, Augmentin, Ampicillin, Piperacillin, Gentamicin, Nalidixic acid, Nitrofurantoin, Ciprofloxacin, Trimethoprim Sulfate, Cefoxitin, Cefpodoxime, ATCC *E.coli* 25922 was inoculated was used as control strain (Vitek 2 cards from Ministry of Health).

Results and Discussion

The total of 96 urine samples were collected from outpatient, Pediatrics, Emergency department, gynecology ward, female and male medical ward , out of which 53 (55.2%) were positive for *E. coli*. The age, gender and wise data of prevalence revealed that gram negative *E.coli* infection was found to be more prevalent female candidates (table 1 and figure 1). Highest number of cases was in the age group of 20-50 years, and maximum cases were from females (table 2). Highest resistance was seen with Ampicillin and least resistance to Nitrofurantoin and Nalidixicacid (figure 2).

Table-1
Age, Sex and Nationality distribution of *E.coli* from isolated cases

Age groups (years)	Nationality				Total
	Saudi		Non-Saudi		
	M	F	M	F	
0-10	2	7	1	1	11
11-20	2	2	-	-	4
21-30	5	6	2	1	14
31-40	1	5	1	2	9
41-50	3	2	4	1	10
50-90	1	4	-	-	5
Total	14	26	8	5	53

Table-2
Antibiotic Resistance Pattern of *E.coli*

Antibiotic	Number	Percentage
Cephalothin	15	28.3%
Augmentin	27	51.1%
Ampicillin	45	85.1%
Piperacillin	35	66.03%
Gentamicin	10	19.1%
Nalidixic acid	3	5.6%
Nitrofurantoin	3	5.6%
Ciprofloxacin	6	11.3%
Trimethoprim Sulfate	29	54.7%
Cefoxitin	7	13.2%
Cefpodoxime	17	32.07%

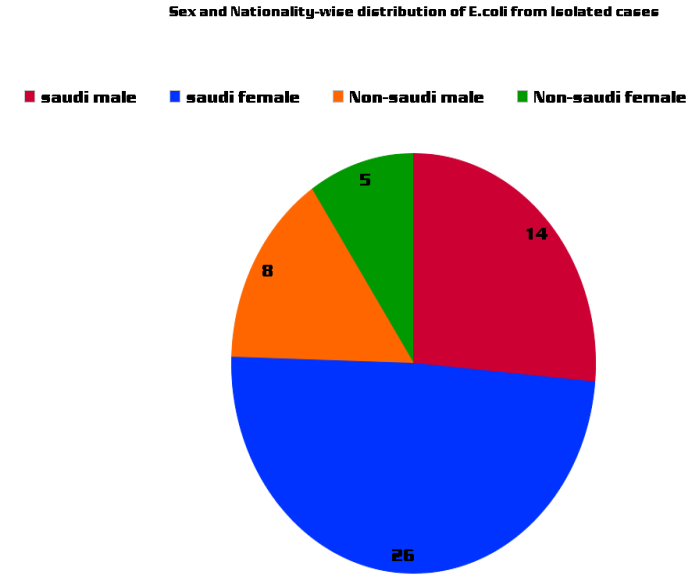

Figure-1
The ratio of *E.coli* infected patients

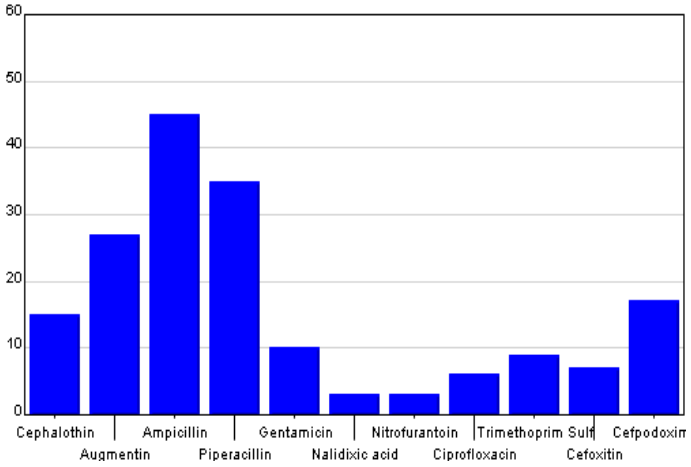

Figure-2
The ratio of Antibiotic Resistance Pattern of *E.coli*

Discussion: Knowledge on local prevalence and antimicrobial resistance trends among urinary isolates is important in guiding clinicians appropriate for appropriate empirical treatment of UTI. *E. coli* is the most prevalent pathogen contributing to this infection, but resistance is seen nearly 70-80% of the strains to the commonly used antibiotics[15]. In the present study *E. coli* accounted for 62.21% of all the positive cases. This is in accordance with the recent studies where the predominant organism isolated was *E. coli*[16]. In the present study highest resistance was seen with Ampicillin (85.1%), followed by Piperacillin (66.03%) and least resistance to Nalidixic acid (5.6%) and Nitrofurantoin (5.6%). This is in accordance with other studies where a high percentage of *E. coli* isolates were resistant to Ampicillin and Ofloxacin[17, 18]. Fluoroquinolones are considered highly effective in treatment of UTI because of concentrating ability in urine and high renal clearance[19]. However due to wide spread use of Fluoroquinolones, there has been a report of evolving bacterial resistance to Fluoroquinolones[20]. *E.coli* showed varied resistance among Aminoglycosides (56% to Gentamicin and 21.9% to Amikacin) the finding differs from the other study where resistance to Gentamicin and Amikacin was high[21], but another study showed 40% resistance to Gentamicin and resistance to Amikacin was only 9% [22]. Resistance to Trimethoprim Sulfate (55.5%), Augmentin (52.7%), Cephalothin (27.7%). The findings are similar with the other studies [23, 24]. Tazobactam in combination with piperacillin has an excellent clinical efficacy in various infections[25]. Tazobactam seems to be the most promising beta lactamase inhibitor, which has unlike clavulanic acid and sulbactam, its own antibiotic activity[26]. Resistance to Nitrofurantoin was 31.5%. In some studies Nitrofurantoin was found to be the most effective drug for UTI [27, 28]. Antimicrobial resistance pattern varies with time which might increase or decrease[29]. Antibiotic susceptibility studies will help in early detection of development of antibiotic resistance and preserve powerful antibiotics like Imipenem for the treatment of life threatening infections.

Conclusion

In the present study, *E.coli* showed resistance to commonly used antibiotics. Antimicrobial susceptibility patterns vary with time and region. Prevalence and antibiotic susceptibility studies need to be conducted regularly, which will help in developing guidelines for treatment of UTI. The present study emphasizes the need for constant monitoring of susceptibility of uropathogens in different regions in order to rationalize the antibiotic use.

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