RESEARCH ARTICLE

Multi drug resistance pattern of *Escherichia coli* isolated from urinary tract infected (UTI's) patients

Deshmukh PM and Ukesh CS

Department of Microbiology, Shri Shivaji College, Amravati-444602 (M.S.) India.
Corresponding author: deshmukhmprasad@gmail.com

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ABSTRACT

A urinary tract infection predominates commonly in outpatients as well as in hospitalized patients worldwide. Another, health concern problem is multi drug resistance towards antibacterial drugs which is an alarming situation to medical practitioners. *Escherichia coli* (*E. coli*) are the commonest causative and etiologic agent in urinary tract infection. Of the total 182 isolated uropathogens *E. coli* were the most prevalent bacteria which accounts for 29.12% (53/182) and also high percentage was observed in females 69.78% (127/182). All of these isolates were tested against 14 different antibiotics. *E. coli* showed tremendous resistance towards Amoxyclav 90.56% followed by Ampicillin, 86.79%, Ciprofloxacin, 83.01%, Nalidixic acid, 79.24%, Cefodoxime, 75.47%, Cephalothin, 71.69%, Tetracycline, 69.81%, Gentamicin, 49.05%, Ceftazidime/clavulanic acid, 45.28%, Ceftriaxone, 41.50%, Amikacin, 24.52%, Cefepime, 20.75% and Cefperazone/sulbactum, 13.20%. While Imipenem, is the prominent drug of choice for urinary tract infections.

Key Words: *E. coli,* urinary tract infection, multi drug resistance

INTRODUCTION

Urinary tract infections (UTI's) are the most common infections in human beings, especially in women's because of anatomic arrangement. Recently the UTI management is become more problematic due to the emergence of resistance to different antimicrobial agents (Steadman and Topley, 1998). *Escherichia coli* (*E. coli*) more specifically known as Uropathogenic *Escherichia coli* (UPEC) is the most common pathogen which can be associated with urinary tract infections (UTI) in developed as well as developing countries.(Samra *et al.,* 2005).Bacterial resistance to different antimicrobial drugs is a serious health hazard worldwide. Reasonless or unconditional use of different antimicrobials is one of the major causes of bacterial resistance towards antimicrobial agents.

E. coli is a ubiquitous, diverse bacteria and also harmless commensal organism resides only to acquire a virulence factors for becoming a highly pathogenic which have a capability to cause a diseases such as gastroenteritis and extra intestinal infections of urinary tract and blood stream infections (Shames *et al*., 2009; Ogura *et al*., 2009). Beside these

it can able to survive in different environment which makes them an ideal indicator organism to test fecal contamination and environmental samples (Feng *et al.,* 2002). It is a part of family *Enterobacteriaceae* of gamma probacteria. It is the predominant infectious agent causing urinary tract infections (Wagenlehner *et al.,* 2008; Kashef *et al.,* 2010). *E. coli* is also the most common cause of water and food-borne diarrhea in humans worldwide, causing most of deaths in children under the age of five years (Turner *et al.,* 2006).

Antimicrobial resistance in *E. coli* has been reported worldwide and resistance rate was increased among *E. coli* which is a crucial problem. (Bell *et al.,* 2002; Kholy *et al*., 2003). A continuous rise in resistance to different antimicrobial drugs complicates to treat urinary tract infections. In general, likely 95% of cases with terrible symptoms of UTI's were treated without bacteriological investigation (Dromigny *et al*., 2005). Initially, resistance to particular drug such as ampicillin, amoxyclav, trimethoprim, erythromycin, third generation cephalosporin antimicrobials or tetracycline was described (Coque *et al*., 2008). Occurrence and susceptibility profiles of *E. coli* show considerable topographical differences as well as significant variations in different environments and populations (Erb *et al*., 2007). The use of antibiotics in a proper way to decrease the rate of resistance towards different antibiotics (Islam *et al*., 2010). The aim of this study was design as such to determine prevalence and multi drug resistance pattern of *E. coli* isolated from urinary tract infected patients in hospital settings.

MATERIALS AND METHODS

In the present study total 70 urine samples from urinary tract infected patients were collected. Fresh midstream urine samples were collected aseptically in a sterile clean catch container. Urine samples were transported to laboratory in sterilized Luria Broth (LB) broth within 2 hours of collection. LB broth was incubated overnight at 37^{O}C (Dash *et al*., 2012). Then each sample were inoculated on Mackonkey agar, Cystein Lactose Electrolyte Deficient (CLED) agar and Eosin Methylene Blue (EMB) agar plates using calibrated loop delivering 0.01ml of the sample. Then, plates were incubated overnight at 37^{O}C for 24 hrs. Further, our interest is in *E. coli* isolates they were identified by their morphological, cultural and biochemical characteristics.

The antibiotic resistance pattern of *E. coli* isolates were performed using single disc diffusion method suggested by Bauer-Kirby (1966). For this, loop full of bacterial culture was inoculated in 3 ml of sterile nutrient broth tubes and incubated at 37^{O}C for 4-6 hrs. A sterile cotton swab was then dipped into the nutrient broth tube. This swab was used to inoculate the entire surface of Mueller-Hinton agar plates. Now, with the help of sterile forcep the antibiotic disc were put on the surface of Mueller-Hinton agar and then these plates were incubated overnight at 37^{O}C. The antibiotics were used in the present study, Amikacin (30µg), Amoxyclav (30µg), Ampicillin (20µg), Ciprofloxacin (5µg), Gentamicin (10µg), Nalidixic acid (10µg), Imipenam (10µg), Tetracycline (10µg) and different generation cephalosporin viz, Cefepime (30µg), Cefodoxime (30µg), Cefperazone/sulbactum (20/10µg), Cephalothin (30µg), Ceftazidime/clavalunic acid (20/10µg) and Ceftriaxone (30µg). All antibiotics were obtained from Hi Media laboratory, India. Quality control strain was obtained from MTCC (443) were used in the study.

RESULTS AND DISCUSSION

In present study total 70 urine samples were collected from District Civil Hospital of Amravati, Maharashtra. From these, 182 different types of Gram negative and Gram positive bacterial isolates were obtained. *Escherichia coli* which accounts for 75.71% (53/70) and was the commonest etiologic agent in our study. Fig.1 depicted the prevalence of different uropathogens isolated from urine samples. Majority of isolates from females (68.57%) than males (31.42%). Fig. 2 depicts gender wise distribution of different uropathogens. Fig. 3 showed the resistance pattern *E. coli* against 14 different antibiotics.

In the present study, the resistance pattern of *E. coli* isolates were done using guidelines of Clinical and Laboratory Standards Institute (CLSI) formerly known as National Committee on Clinical Laboratory Standards (2006).

Table 1: Rate of *E. coli* and other microorganisms isolated from urine specimen

Sr. No.	Bacteria	No. of bacterial isolate	Percentage of bacterial isolate
1	*E. coli*	53	75.71%
2	*P. aeruginosa*	41	58.57%
3	*K.pneumoniae*	37	52.85%
4	*S. aureus*	29	41.42%
5	*B. subtilis*	22	31.42%
	Total	182	

Table 2: Gender wise % distribution of different uropathogens

Gender	Uropathogens				
	E. coli	***P.aeruginosa***	***K.pneumoniae***	***S. aureus***	***B. subtilis***
Male (%)	11(20.75%)	16(39.02%)	09(24.32%)	10(34.48%)	09(40.90%)
Female(%)	42(79.24%)	25(60.97%)	28(75.67%)	19(65.91%)	13(59.09%)
Total	53	41	37	29	22

Table 3: Resistance pattern of *E. coli* against 14 different antibiotics

Sr. No	Antibiotics	No. of resistant isolates	% of resistant isolates (n=53)
1	Amikacin	13	24.52%
2	Amoxyclav	48	90.56%
3	Ampicillin	46	86.79%
4	Cefepime	11	20.75%
5	Cefodoxime	40	75.47%
6	Cefperazone/sulbactum	07	13.20%
7	Cephalothin	38	71.69%
8	Ceftazidime/clavulanic acid	24	45.28%
9	Ceftriaxone	22	41.50%
10	Ciprofloxacin	44	83.01%
11	Gentamicin	26	49.05%
12	Imipenam	00	00.00%
13	Nalidixic acid	42	79.24%
14	Tetracycline	37	69.81%

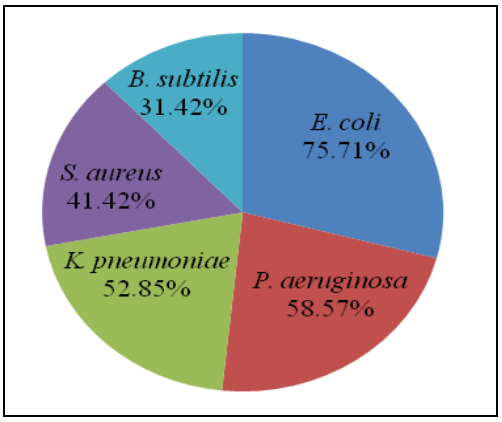

Fig. 1: Prevalence of diffrenet veacteria from Urine Sample.

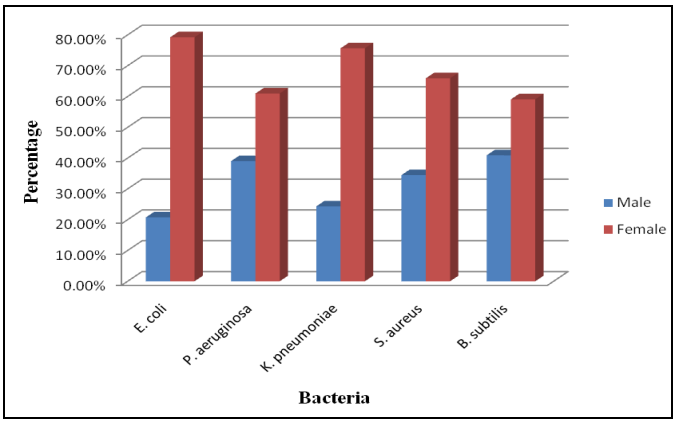

Fig. 2: Geneder wise pecent distribution difference uropathogens.

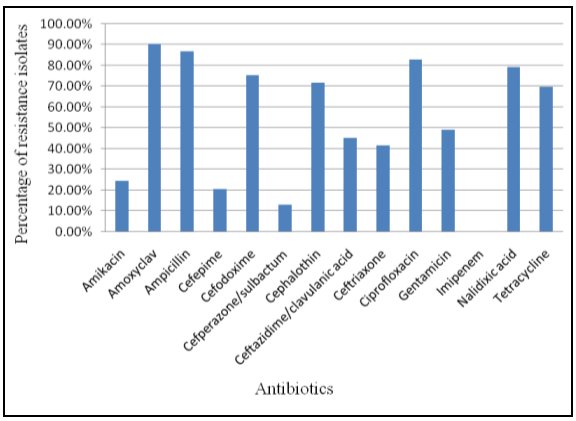

Fig. 3: resistance of *E coli* against 14 different antibiotics.

According to the results, high resistance rate was observed against eleven different antibiotics.These antibiotics are Amoxyclav (90.56%), Ampicillin (86.79%), Ciprofloxacin (83.01%), Nalidixic acid (79.24%), Cefodoxime (75.47%), Cephalothin (71.69%), Tetracycline (69.81%), Gentamicin (49.05), Ceftazidime/clavulanic acid (45.28) and Ceftriaxone (41.50%). Moderate resistance rate were observed against three antibiotics viz, Amikacin (24.52%) followed by Cefepime (20.75%), Cefperazone/ sulbactum (13.20%) respectively. Imipenem was the most effective antibiotic because none of the single isolate was found to be resistance i.e. all isolates of *E. coli* was highly susceptible to imipenem and hence it is a drug of choice in community acquired urinary tract infections.

DISCUSSION

The existing study showed that *E. coli* was the most common pathogen isolated from patient infected with urinary tract infection. Majority of uropathogens were isolated from female samples. Similar study was carried out by Akram *et al*. (2007). Manges *et al*. (2006) reported that *E. coli* was the prevalently found pathogen in community acquired urinary tract infected patients. Zahera *et al*. (2011) also showed that *E. coli* was commonest bacterial isolate found in urine samples.

Mulla *et al*. (2011) was also reported that *E. coli* found in majority as the common nosocomial pathogen in hospital settings. In our findings form total 182 different bacterial isolates *E. coli* accounts for 29.12%. These findings are in fair correlated with Melaku *et al*. (2012) in which *E. coli* was found to be 28% making it is a prevalent pathogen. In the present study revealed that the rate of resistance of *E. coli* against ampicillin was worrying i.e. 90.56%. Similar type of results was found by Rawat *et al.* (2010) as 94.29% resistant to ampicilin.

In the present study, the level of resistance among *E. coli* isolates was also high in case of fluroquinolone such as ciprofloxacin. 83.01% isolates of *E. coli* were resistant to ciprofloxacin. These results are correlate with previous studies such as 84% by Ahmad *et al*. (2009) and 90.28% by Rawat *et al*. (2010). However the present findings in our study are somewhat different. Kiffer *et al*. (2007) reported that less resistance rate was observed towards ciprofloxacin. Gentamicin was quite effective antibiotic against *E. coli* as compared to other antibiotics as only 49.05% of isolates were resistant. Manjunath *et al.* (2011) showed that 42.05% of *E. coli* isolates resistant to gentamicin. Rawat *et al.* (2010) reported that very high resistance rate among *E. coli* for gentamicin (70.86%). Higher resistance to tetracycline was found in *E. coli* isolates i.e. 69.81% in our study. Similar type of results were found by Yengkokpam *et al*. (2007) who observed that 73.30% isolates were resistant to tetracycline.

In our study tremendous resistance rate was observed towards amoxyclav as 90.56%. This data was correlated with other study and find that Mulla *et al*. (2011) shows amoxyclav was not an effective drug. Organism such as *E. coli* and *K. pneumoniae* are resistant to this antibiotic due to production of extended spectrum β-lactamase, a plasmid mediated enzyme in them. Our study revealed that 45.28% *E. coli* isolates was found to be less resistance to ceftazidime/ clavulanic acid as compared to amoxyclav.

In the present investigation slightly high susceptibility was observed in cefepime as only 20.75% isolates were resistant. Our findings showed quite equally with the findigs of Khadri *et al*. (2009) they found that there was a less number of isolates were resistant to this antibiotic. Only 8.75% isolate was found to be resistant to this antibiotic Rawat *et al*. (2010). In case of aminoglycosides i.e. amikacin less resistance was found in our study as only 24.52%. Similar kind of results was shown by Akram *et al.* (2007). While ceftriaxone antibiotic observed 41.50% resistance. Similar type of study carried out by George *et al*. (2012) as only 26.80% *E. coli* isolates were resistant to ceftriaxone. High resistance rate was observed in nalidixic acid and cephalothin which accounts for 79.24%, 71.69% respectively. Also frequently resistance rate was observed in case of cefodoxime i.e. 75.47%.

The present study revealed that rate of resistance was decreased in case of cefperazone/sulbactum as only 13.20% isolates of *E. coli* were resistance to this antibiotic because of combination therapy with sulbactum and it is a potent inhibitor of extended spectrum β- lactamase, this combination can be used in future for severe nosocomial infections.

Imipenem can be the most prominent drug of choice as no single isolate of *E. coli* was found to be resistant in our study. Similarly Farshad *et al*. (2010), states that imipenem was sensitive to all isolates of *E. coli.* Also high sensitivity to imipenem was observed by Adwan *et al*. (2004).

CONCLUSION

From the above study it was concluded that, there is tremendous multiple drug resistance found to different class of antibacterial drugs. There is a quite alarming signal to note that all isolates of *E. coli* were resistance to seven or more antibiotics. All of the isolates showed multiple drug resistance property, very high resistance rate was found against amoxyclav, ampicillin, ciprofloxacin, nalidixic acid, cefodoxime, cephalothin and tetracycline. All *E. coli* isolates were found sensitive to imipenem and there is a drug of choice to treat bacterial infection.

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