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# Trends in Antibiotic Susceptibility Pattern of *Escerichia Coli* Isolated From Various Clinical Samples at A Tertiary Care Hospital in Chennai


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**ABSTRACT**

**BACKGROUND**: Escherichia coli, a member of the enterobacteriaceae family, is the leading cause of urinary tract, ear, and wound infections in humans. Increasing rate of resistance among E.coli is of growing concern.

**OBJECTIVE**: The present study aimed to investigate the trends in the antibiotic susceptibility pattern of E.coli isolated from various clinical specimens.

**MATERIALS AND METHODS**: A retrospective analysis of culture results obtained from urine, pus, wound, tissue, sputum and blood was done. A total of 644 samples were analysed for identification of bacteria and antimicrobial susceptibility testing.

**RESULTS**: E.coli was isolated from 100(15%) samples. Highest isolation rate was obtained from urine (73%).About 75% of E.coli were isolated from clinical samples of female patients. Isolates showed maximum resistance to nalidixic acid(87%) followed by ampicillin(80%) and gentamicin(76%).(63%) of the isolates were resistant to ciprofloxacin and (69%) were resistant to cefotaxime. on the other hand, nutrofurantoin ,amikacin and cefoperazone plus sulbactam showed a relatively high sensitivity rate of 94.5% ,88% and 74% respectively.

**CONCLUSION**: Results of the present study showed the high rate of resistance for commonly used first line antibiotics. Nitrofurantoin and amikacin are choices to be considered when treating E.coli infections in this geographical location.



**KEYWORDS**: E.coli, antimicrobial resistance, Nitrofurantoin.


## INTRODUCTION

*Escherichia coli* often referred to as *E.coli* is a gram negative bacterial species, a common inhabitant of the human and animal gut. It is the leading pathogen causing urinary tract infections and is among the most common pathogens causing blood stream infections, wounds, otitis media and other complications in humans (Kibret *et al.,* 2011). *E.coli* is also the most common cause of food and water borne human diarrhea worldwide and in developing countries, causing many deaths in children under the age of five years (Gautam *et al.*, 2013).*E.coli* has a relatively large potential for developing antibiotic resistance. Increasing rates of resistance among *E.coli* is a growing concern in both developed and developing countries (Bell et al., 2002).There is a substantial geographic variation in the antibiotic susceptibility profiles of *E.coli* to commonly used antibiotics(Erb *et al.*,2007). Therefore routine monitoring of antibiotic resistance is essential to formulate antibiotic policy and infection control in health care settings. Hence, the present study aimed to study the trends in the antibiotic susceptibility pattern of *Escherichia coli* isolated from various clinical samples.

## MATERIALS & METHODS

### Study design

A retrospective study was done on culture and antibiotic susceptibility results of *E.coli* isolated from samples such as urine, pus, tissue, blood and sputum received in the microbiology laboratory ACS Medical College & Hospital from June 2016 to August 2016. A total of samples were received in the laboratory for bacterial culture & sensitivity during the period of study.

### Culture

Specimens were collected aseptically in sterile containers and inoculated onto appropriate media using standard culture techniques. Isolates were confirmed by conventional biochemical tests (Koneman *et al.,* 2004).

### Antibiotic susceptibility testing

Susceptibility to various antibiotics was tested by disc diffusion technique as per Clinical Laboratory Standards Institute (CLSI) guidelines. Antibiotics tested were ampicillin, amikacin, gentamicin, nalidixic acid, norfloxacin, nitrofurantoin, cefotaxime, ciprofloxacin, cefaperozone plus sulbactam.

## RESULTS

A total of 100 *E.coli* isolates were recovered from 644 clinical samples. As shown in table 1, 75(75%) were from female patients and the majority of the isolates were from urine samples (73%) followed by pus (14%) and tissue (7%).

**TABLE: 1 GENDER DISTRIBUTION OF E.COLI ISOLATED FROM DIFFERENT CLINICAL SPECIMENS.**

| SAMPLE | MALE | FEMALE | TOTAL |
|---|---|---|---|
| URINE | 9 | 64 | 73 |
| PUS | 8 | 6 | 14 |

| | | | |
|---|---|---|---|
| TISSUE | 5 | 2 | 7 |
| SPUTUM | 3 | 2 | 5 |
| BLOOD | 0 | 1 | 1 |
| TOTAL | 25 | 75 | 100 |

As depicted in table 2, the age group most affected is between 51 -60 years. However, the number of samples in the age group above 80 was too low to compare. Table 3 shows the antibiotic sensitivity pattern of *E.coli* isolated from various clinical specimens. Among the antibiotics tested, nitrofurantoin, nalidixic acid and norfloxacin were included for urine isolates only.

| AGE | MALE | FEMALE | TOTAL |
|---|---|---|---|
| 0-10 | 3 | 4 | 7 |
| 11-20 | 1 | 6 | 7 |
| 21-30 | - | 17 | 17 |
| 31-40 | 6 | 9 | 15 |
| 41-50 | 3 | 12 | 15 |
| 51-60 | 7 | 12 | 19 |
| 61-70 | 2 | 11 | 13 |
| 71-80 | 3 | 2 | 5 |
| 81-90 | - | 1 | 1 |
| 91-100 | - | 1 | 1 |
| TOTAL | 25 | 75 | 100 |

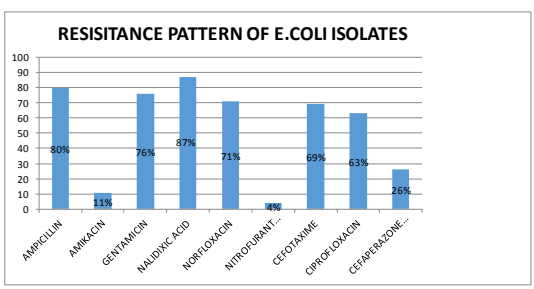
**TABLE: 2 AGE & GENDER DISTRIBUTION OF *E.COLI***

**TABLE: 3 ANTIBIOTIC SENSITIVITY PATTERN OF *E.COLI***

| ANTIBIOTICS | Urine n= 73 | Pus n = 14 | Tissue n =7 | sputum n = 5 | Blood n = 1 | Total n =100 |
|---|---|---|---|---|---|---|
| AMPICILLIN 10mcg | 13(17.8%) | 2(14.3%) | 0 | 3(60%) | 0 | 18(18%) |
| AMIKACIN 10 mcg | 69(94.5%) | 11(78.6%) | 7(100%) | 0 | 1(100%) | 88(88)% |
| GENTAMCIN 10 mcg | 11(15%) | 7(41%) | 5(71.4%) | 0 | 0 | 23(23%) |
| NALIDIXIC ACID (30 mcg) | 09(12.3%) | ND | ND | ND | ND | 9/73(12.3)% |
| NORFLOXACIN(10) | 17(23.3%) | 2(14.3%) | ND | ND | ND | 19/87(21.8%) |
| NITROFURANTOIN(300 mcg) | 69(94.5%) | ND | ND | ND | ND | 69/73(94.5%) |
| CEFOTAXIME(30 mcg) | 23(31.5%) | 0 | 1(14.2%) | 3(60%) | 0 | 27(27%) |
| CIPRO- FLOXACIN 5 mcg | 22(30.1%) | 4(28.5%) | 1(14.2%) | 3(60%) | 1(100%) | 31(31%) |
| CEFAPERAZONE SULBACTAM(50/50 mcg) | 53(72.6%) | 11(78.5%) | 5(71.4%) | 4(80%) | 1(100%) | 74(74%) |

ND: not done

**Fig: 1**




## DISCUSSION

Antibiotic resistance in *E.coli* has increased worldwide and its susceptibility patterns show substantial geographic variations as well as differences in population and environment (Kibret *et al,*2011).The isolation rate of *E.coli* in the present study is 15.5% which is similar to the study conducted by Nepal *et al*.,2013 and *Kibret et al*.,2011. In this study, *E.coli* was most commonly isolated from urine and the presence of *E.coli* was higher in female patients (75%) than in males which is consistent with the findings of previous studies (Anyanwu *et al*., 2013, Kibret *et al*., 2011& Odimayo *et al*., 2016). Among the various antibiotics tested, *E.coli* showed highest resistance to nalidixic acid (87%) as shown in Fig 1. Similar finding was reported in the studies conducted in Bangladesh, Nepal,India and North America (Odimayo *et al*.,2016).Higher percentage of resistance has been detected for ampicillin(80%) which is similar to the finding of Odimayo *et al*.,2016 . In the current study, 76% of the *E.coli* isolates exhibited resistance to one of the commonly used aminoglycoside gentamicin. Nepal *et al*.,2013 also showed a similar finding .Emerging resistance to these antibiotics is alarming because persistent infections may require newer drugs.*E.coli* isolated from various clinical specimens in this study showed a high rate of resistance to fluoroquinolones ciprofloxacin (63%)and norfloxacin(52%) which is similar to the study conducted by Sanchez *et al*.,2014 & Gobernado *et al*.,2007 .However, Anyanwu *et al*.,2013 reported a higher sensitivity rate of 92% for ciprofloxacin in their study. Resistance to cefotaxime was reported in 69% of the isolates which is similar to the finding of Nepal *et al.,*2013 .Whereas, Oteo *et al*., 2002 had reported a lower resistant rate to cefotaxime in their study conducted in Spain. Resistance for cefoperazone plus sulbactam combination was reported in 26% of the isolates in the present study but in a study conducted by Manu *et al*.,2012 in north India showed a relatively higher percentage of resistance(43.6%). In the current study, only 11% of the isolates were resistant to amikacin and 4% of the isolates showed resistance to nitrofurantoin a finding similar to the previous study conducted by Nepal *et al*., 2013. Urine isolates of *E.coli* has retained the susceptibility to nitrofurantoin despite its use in clinical practice for more than 50 years. A study conducted in south India by Mathai *et al*., 2008 also reported a high sensitivity rate of *E.coli* to nitrofurantoin.

## CONCLUSION

From this study, it can be concluded that the pattern of antibiotic susceptibility will vary according to geographic location. Hence, Periodic monitoring of antimicrobial susceptibility both in the community and hospital settings is recommended. Further the study concludes that, ampicillin, nalidixic acid and gentamicin and ciprofloxacin are less effective on *E.coli* in this environment. Our study shows the consistent antimicrobial activity of amikacin and nitrofurantoin against *E.coli* and hence can be considered for appropriate antimicrobial therapy.

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