

## Original Research Article

# Isolation, identification and antibiotic sensitivity pattern of *Escherichia coli* isolated from various clinical sample in a tertiary care hospital, Jaipur, Rajasthan, India

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## ABSTRACT

**Background:** *Escherichia coli* is one of the most frequent causes of many bacterial infections, including Urinary Tract Infections (UTI), blood stream infections, otitis media, pneumonia, meningitis, traveler's diarrhoea, enteric infections and systemic infections. This study was done with the aim to surveying antibiotic sensitivity pattern of isolated *Escherichia coli* in both sex attended in NIMS Hospital, Jaipur under the taken time period.

**Methods:** In this cross-sectional study, 62 *Escherichia coli* were isolated from various clinical specimens of the patients attending both OPD and IPD. The strains were selected using the laboratory standard methods and culture-specific. The antibiotic susceptibility testing was performed using Kirby-Bauer disk diffusion method.

**Results:** Out of total 62 isolates of *Escherichia coli* 26(41.93%) isolates were from male while 36(58.064%) from female patients. Maximum sensitivity were shown by Polymyxin B and Colistin i.c 100% followed by Nitrofurantoin 82.5% followed by Meropenem 79.03%, Aztreonam 72.58%, Piperacillin/ Tazobactam and Ciprofloxacin 61.30%, each Amikacin 56.45%, Imipenem 54.83%, Ofloxacin 45.16%, Cefepime 43.54%, Ceftazidime 38.71%, Gentamycin and Ceftriaxone 37.09% each, Cefotaxime 30.64%, Norfloxacin 27.5%. Maximum resistance shown against Norfloxacin 72.5%, followed by Gentamycin and Ceftriaxone 62.90%, Ceftazidime 61.30%.

**Conclusions:** *Escherichia coli* infected more in urinary tract infection as compare to other sample in human, and it is common in female than male. Regular monitoring of antimicrobial susceptibility for *E.coli* is recommended to improve treatment. A changing trend in antibiotic sensitivity profile of the isolates need to be monitored as there is limited availability of newer drugs and the emergence of resistant bacteria far exceeds the rate of new drug development.

**Keywords:** Antibiotic resistant, *Escherichia coli*, Sensitivity pattern of *E.coli*, Urinary tract infection

## INTRODUCTION

The genus is named after the German pediatrician, Theodor Escherich who first identified *Escherichia coli* in 1885. The genus *Escherichia* consists of five species of which *Escherichia coli* is the most common and clinically important. Unlike other coli forms, *Escherichia coli* is a

obligate parasite living only in the human and animal intestine that cannot live free in nature.<sup>1,2</sup>

*Escherichia coli* is Gram-negative bacilli, most strains are mostly motile by peritrichate flagella, it is non-spore forming and non-capsulated.<sup>3,4</sup> *Escherichia coli* is one of the most frequent causes of many bacterial infections, including

Urinary Tract Infections (UTI), blood stream infections, otitis media, pneumonia, meningitis, traveler's diarrhea, and other infections enteric infections and systemic infections.<sup>5-7</sup>

The systemic infections include bacteremia, nosocomial pneumonia, cholecystitis and infectious arthritis. *Escherichia coli* is also a leading cause of neonatal meningitis.<sup>8</sup> *Escherichia coli* and related bacteria constitute about 0.1% of gut flora.<sup>9</sup>

Faecal-oral transmission is the major route through which pathogenic strains of the bacterium cause disease. *Escherichia coli* majorly responsible for a wide variety of hospital and community onset infections, affecting patients with normal immune systems as well as those with pre-existing conditions.<sup>10</sup>

Urinary tract infection (UTI) is the most common infection of human population. UTI is defined as the persistence of actively growing microorganisms within the urinary tract. Microorganisms causing UTI almost come from the skin at or near the opening of the urethra. In case of UTI, most susceptible groups are neonates, girls, young women and men. In case of adult person, it occurs more commonly in women than men because the female urethra is much shorter and closer to anus, therefore up to 40% women develop UTI at least once during their lives and a significant numbers of these women suffer recurrent UTI.<sup>11</sup>

Nosocomial infections, also termed health care associated infections on the other meaning these sort of infections acquired by patients as a result of treatment in a hospitals, clinic or healthcare service centre. *E. coli* makes up as much as 90% was acquired from human community compare with 50% considered as UTIs nosocomial.<sup>12</sup> The information of antibiotics resistance by *E.coli* is important because this pathogen associated with urinary tract infection, which is selecting as a guide for antimicrobial therapy. The infections caused by microorganisms are major problems militating against successful organ transplantation, which can cause high morbidity and mortality among drug induced immune suppression in patients with organ transplants also with autoimmune diseases, and with cancer patients who are receiving chemotherapy.<sup>13</sup>

The secretion of male prostate contains the bactericidal substances and Zinc which play a vital role in countering with *Escherichia coli* and prevent this kind of infection in men. Although antibiotics are widely available, UTI still remains one of the most common clinical complications. Because now a day's antibiotic resistance has become an important phenomenon due to widespread use of antibiotic by patient without testing antibiogram.

The inadvertent use of antibiotics leads to emergence of drug resistant pathogens, which in turn acts as a great challenge to the health services. Moreover, highly

virulent strains and capacity to adapt quickly to changing environment worsens the situation and draws a matter of concern.<sup>14</sup> Different studies have been conducted across the globe from time to time to assess the bacterial profile and the antibiotic susceptibility pattern in pus samples. This is particularly relevant for the treating physician who needs to start empirical treatment of patient until the lab culture reports are awaited.<sup>15</sup>

Routine monitoring of antibiotic resistance provides data for antibiotic therapy and resistance control. Thus, in this study, the aim is to determine antimicrobial susceptibility of *Escherichia coli* from various clinical specimen in a tertiary care hospital, Jaipur.

## METHODS

This study was conducted at National Institute of Medical Sciences and Research and NIMS hospital, Jaipur in between July 2018 to December 2018.

During the study period 62 non repeated isolates of *Escherichia coli* were isolated from various clinical specimens obtained from the OPD, IPD and ICU patients of NIMS Hospital.

### Inclusion criteria

- All isolates of *Escherichia coli* isolated from various clinical samples were included in the study.

### Exclusion criteria

- All other bacteria except *Escherichia coli* were excluded from the study

In this cross-sectional study the samples were processed according to the standard conventional methods and the isolates were identified by standard biochemical tests.

Antimicrobial susceptibility testing was performed on Muller-Hinton agar using Kirby-Bauer disc diffusion method. The antibiotic discs were selected according to the protocol as recommended by Clinical laboratory Standards Institute (CLSI) guideline 2017.

### Statistical analysis

Our statistical analysis was carried out based on Demographic details of *Escherichia coli* associated samples analyzed for *Escherichia coli*.

## RESULTS

During the study period, 62 *Escherichia coli* were isolated from various clinical specimens collected from the patients of all age and both sex group attending various outpatients and inpatients department. As shown in Figure 1 out of total 62 isolates of *Escherichia coli*

26(41.93%) isolates from male while 3(58.064%) from female patients.

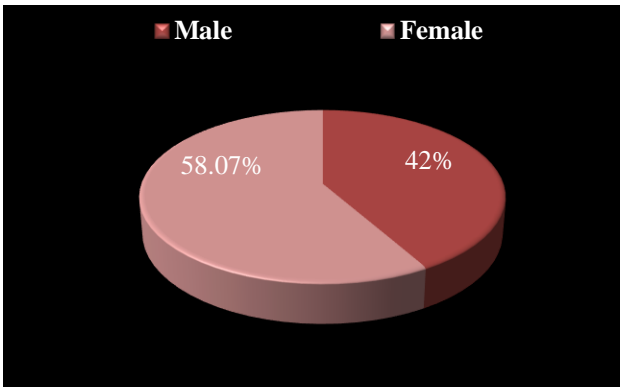


Figure 1: Sex wise distribution of *Escherichia coli*.

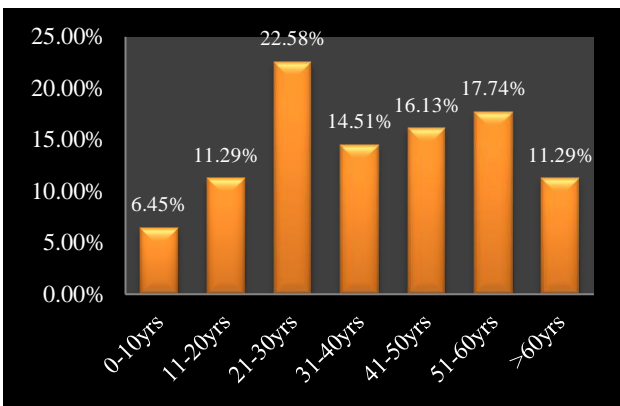


Figure 2: Age wise distribution of *Escherichia coli*.

As shown in Figure 2 out of total 62 isolates of *Escherichia coli* 04(6.45%) Isolated from age 0-10 yrs, 11-20 yrs 07(11.29%), 21-30 yrs, 14(22.58%), 31-40 yrs, 09(14.51%), 41-50yrs, 10(16.129%), 51-60yrs, 11(17.74%) above >60 yrs, 07(11.29%).

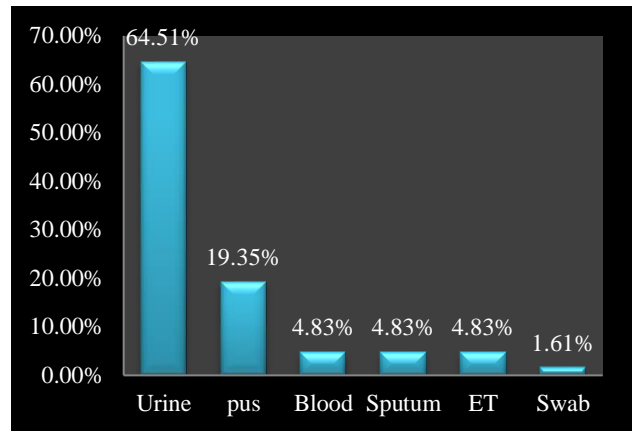


Figure 3: Clinical Specimens from Which *Escherichia coli* are isolate.

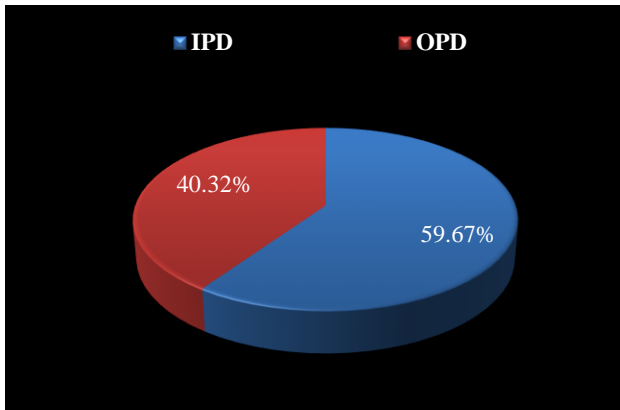
According to figure 3 *Escherichia coli* species isolated maximum from urine sample i.e, 40(64.51%) followed by from pus 12(19.35%), from blood 03(4.83%), from sputum 03(4.83%), from Endotracheal Tube 3(4.83%) and minimum from High vaginal swab 1(1.61%).

As shown in figure 4 out of 62 isolates of *Escherichia coli* 37(59.67%) were from IPD and 25(40.32%) were from OPD i.e maximum number was isolated from IPD.

Table 1: Antibiotic sensitivity pattern of *E. coli* isolates.

S. No	Antibiotics	Disc potency	Sensitive	Percentage	Resistance	Percentage
1	Ceftazidime	30µg	24	38.71%	38	61.30%
2	Ceftriaxone	30µg	23	37.09%	39	62.90%
3	Cefotaxime	30µg	19	30.64%	43	69.35%
4	Aztreonam	30µg	45	72.58%	17	27.41%
5	Cefepime	30µg	27	43.54%	35	56.45%
6	Amikacin	30µg	35	56.45%	27	43.54%
7	Piperacillin/Tazobactam	100/10µ	38	61.30%	24	38.71%
8	Meropenem	10µg	49	79.03%	13	20.96%
9	Ofloxacin	5µg	28	45.16%	34	54.83%
10	Imipenem	10µg	34	54.83%	28	45.16%
11	Ciprofloxacin	5µg	38	61.30%	24	38.71%
12	Polymyxin B	300units	61	100%	00	00%
13	Colistin	10µg	60	100%	00	00%
14	Ceftazidime/clavulanic acid	30/10µg	44	70.96%	18	29.03%
15	Gentamycin	10µg	23	37.09%	39	62.90%
16	Norfloxacin*	10µg	11	27.5%	29	72.5%
17	Nitrofuratoin*	300µg	33	82.5%	7	17.5%

Note: Norfloxacin, Nitrofuratoin used only in urine sample



**Figure 4: Distribution of *Escherichia coli* among patient of IPD/OPD.**

As shown in table 1 Out of 62 isolates of *Escherichia coli* maximum sensitivity was shown by Polymyxin B and Colistin i.c 100% followed by Nitrofurantoin 82.5% followed by Meropenem 79.03%, Aztreonam 72.58%, Piperacillin/ Tazobactam and Ciprofloxacin 61.30%, each, Amikacin 56.45%, Imipenem 54.83%, Ofloxacin 45.16%, Cefepime 43.54%, Ceftazidime 38.71%, Gentamycin and Ceftriaxone 37.09% each, Cefotaxime 30.64%, Norfloxacin 27.5%.

Maximum resistance shown against Norfloxacin 72.5%, followed by Gentamycin and Ceftriaxone 62.90%, Ceftazidime 61.30%, Cefepime 56.45%, Ofloxacin 54.83%, Imipenem 45.16%, Amikacin 43.54%, Piperacillin/ Tazobactam and Ciprofloxacin 38.71%, Aztreonam 27.41%, Meropenem 20.96%, Nitrofurantoin 17.5%, Colistin and Polymyxin-B 100%.

## DISCUSSION

*Escherichia coli* is one of the most frequent causes of many bacterial infections, including urinary Tract Infections (UTI), blood stream infections, otitis media, pneumonia, meningitis, traveler's diarrhoea, and other infections enteric infections and systemic infections.

The systemic infections include bacteremia, nosocomial pneumonia, cholecystitis and infectious arthritis. *Escherichia coli* is also a leading cause of neonatal meningitis. *Escherichia coli* and related bacteria constitute about 0.1% of gut flora

During the study period, total 62 *Escherichia coli* were isolated from various clinical sample from the patients of different age and sex group of various outpatients and inpatients departments. *Escherichia coli* was common in female i.e. 36(58.06 %) as compare to male i.e. 26(41.96%). Similar observation of female predominance male was seen by Abolfazl Jafari-Sales et al, i.e female 76% and 24% in male.<sup>16</sup> In the present study, out of 62 *Escherichia coli* strains isolated from different age group.

Maximum number of *Escherichia coli* are found in between the age of 21-30 years old patients i.e 22.58%, 51-60 years old i.e. 17.74%, 41-50 years old i.e. 16.12%, 31-40 years old i.e. 14.51%, 11-20 years old and above 60 years old 11.29% each, 0-10 years old 6.45%. As compare to study by Tanzina Akter et al, 31- 45 years old 41.98% followed by 16-30 years old 27.16%, 46-60 years old 19.75%, above 60 years old (7.4%) and 0-15 years old 3.7%.<sup>17</sup>

In the present study, out of 62 *Escherichia coli* strains isolated from various clinical samples, maximum no. of isolates from Urine 64.51% followed by Pus 19.34%, Blood and Sputum 4.83% each. As compare to Manu Chaudhary et al, maximum no. of isolates from Urine 41.59% Pus 20.47 %, Blood 19.82%, Sputum 18.10 % it's a approximately same with my study.<sup>18</sup> In the present study out of 62 *Escherichia coli* strains isolated from different department of NIMS Hospital maximum isolates from IPD 59.67% followed by OPD 40.32%.

In the present study, out of 62 *Escherichia coli* strains maximum sensitivity was shown against Polymyxin B i.c 98.38%, Colistin 96.77% followed by Nitrofurantoin 82.5% followed by Meropenem 79.03%, Aztreonam 72.58%, Piperacillin/Tazobactam and Ciprofloxacin 61.30%, each, Amikacin 56.45%, Imipenem 54.83%, Ofloxacin 45.16%, Cefepime 43.54%, Ceftazidime 38.71%, Gentamycin and Ceftriaxone 37.09% each, Cefotaxime 30.64%, Norfloxacin 27.5% as compare to Sumera Sabir et al, Meropenem 100%, Piperacillin/ Tazobactam 90.6%, Amikacin 71.7%, Norfloxacin 58.9%, Aztreonam 55.1%, Imipenem 39.5%, Ceftriaxone 38.0%, Gentamycin 26.4%, Ceftazidime 16.1%, Cefotaxime 10.2%.<sup>19</sup>

## CONCLUSION

This study gives us the selection of drug of choice in any condition especially in infective diseases which is not easy. We have to take into consideration the efficacy, safety, cost, pharmacokinetic, pharmacogenetics, convenience of administration and many other factors. In case of infectious diseases we have to pay attention to microbial sensitivity and resistance pattern to various antimicrobials. *Escherichia coli* infected more in urinary tract infection as compare to other sample in human, and it is common in female than male. Regular monitoring of antimicrobial susceptibility for *E.coli* is recommended to improve treatment. A changing trend in antibiotic sensitivity profile of the isolates need to be monitored as there is limited availability of newer drugs and the emergence of resistant bacteria far exceeds the rate of new drug development.

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