Kashf Journal of Multidisciplinary Research
Vol: 02 - Issue 08 (2025)
P-ISSN: 3007-1992 E-ISSN: 3007-200X
https://kjmr.com.pk

# CURRENT TRENDS IN ANTIMICROBIAL SUSCEPTIBILITY PATTERNS OF ESCHERICHIA COLI ISOLATES AT BACHA KHAN MEDICAL COMPLEX SWABI,KPK, PAKISTAN

**[1]Tasbeeh Ullah*, [2]Noor Zaman, [3]Salman Shah, [4]Sibghat Ullah, [5]Arqam Sheraz, [6]Muhammad Usama Khan Toru, [7]Waqas Ahmad**

*[*1, 2, 3, 5, 7]Khyber Medical University, Peshawar, Pakistan.*
*[4]Abdul Wali Khan University Mardan.*
*[6] College of Medical Technology (CMT BKMC) Mardan.*
**** Corresponding Author:*** itasbeehmls@gmail.com

**Article Info**



**Abstract**

**Background:** Escherichia coli (E. coli) is a gram negative bacterium resembling to rod shape that associated with Urinary tract infection, Blood stream infection and sepsis as well. Globally E coli are the primary pathogen which is associated with cause of both community- and hospital-acquired infections worldwide. The prevalence of antibiotic resistance increased with misused of antibiotic in our country.

**Objective:** This research aimed to analyze the current trends of antimicrobial resistance pattern of E coli isolate in various samples including Urine, Pus and Blood.

**Method:** This was a cross sectional study conducted from September to December 2024 in the microbiology section of pathology department. We collected 288 samples of blood, urine and pus from different patients in sterile bottle and antimicrobial susceptibility was examined using clinical Laboratory standards Institute (CLSI) guidelines.

**Results:** Nitrofurantoin (100%) and Amikacin (96.9%) were the highest sensitive antibiotics among those isolated in urine Culture, while Ampicillin (100%) was the most resistant. For Blood isolates Imipenem, Meropenem, and Piperacillin Tazobactam (100%) these all are the most effective antibiotics while ampicillin and cefazolin were highest resistant. And For Pus isolates Meropenem and Gentamycin are the most effective antibiotics with sensitivity (94.1%) while ampicillin and cefazolin (100%) show highest resistant.

**Conclusion:** This study concludes that 48% of isolates yielded the growth of E Coli among the different types of samples include, Urine, Blood, and Pus. The antibiotic pattern shows that in Urine: the most effective antibiotic is Nitrofurantoin and most resistant is ampicillin. In blood Meropenem and imipenem has highest sensitivity while Cefazolin, Cefoxitin, and ceftriaxone shows highest resistivity. In case of Pus Gentamycin and Meropenem show highest effective drugs and Ampicillin, and cefazolin is highest resistant drugs.

**Keywords:**
*E coli, Antimicrobial Susceptibility, Resistance, ESBL, UTI.*

## INTRODUCTION

For the first time, Austrian pediatrician Theodor Escherich described Escherichia coli (E. coli) more than 130 years ago [1]. Escherichia coli is a Gram-negative resembling rod-shaped bacterium that typically confined in the lower intestinal tract of humans. It has the ability to cause both community-associated and nosocomial infections. Notably, E. coli is one of the most frequent causes of urinary tract infections (UTIs)[2].

Most E. coli strains are facultative anaerobes and motile, Gram-negative bacilli, typically present as single cells or in pairs. They are the predominant facultative anaerobes of the human colonic flora. Within hours of birth, the gastrointestinal tract of infants is generally colonized by E. coli, establishing a mutualistic relationship with the host.

While E. coli usually remains harmless and restricted to the intestinal lumen, it can cause infections when gastrointestinal barriers are breached, in immunocompromised individuals, or even in healthy hosts under certain conditions. Pathogenic E. coli strains, which have undergone significant modifications, can cause a broad spectrum of human diseases. Infections may remain confined to mucosal areas or disseminate across the entire body. The three main significant clinical illnesses associated with pathogenic Escherichia coli strains are: (i) Urinary Tract Infections (UTIs), (ii) intenstinal or diarrheal diseases, and (iii) septicemia/meningitis [3] UTIs are the third most common infections in humans, following respiratory and gastrointestinal infections [4].

Globally, it is estimated that six million patients visit outpatient departments (OPDs), approximately 300,000 are treated as inpatients for UTIs annually, and around 400,000 hospitalizations occur due to UTIs, with an estimated cost of $2.8 billion[5] Transient cases of bacteremia in which bacteria enter the bloodstream, are generally not life threatening, as physiological conditions can result in transient bacterial colonization without clinical sequelae. But a serious bloodstream infection called septicemia is a medical emergency. BSIs are a major cause of morbidity and mortality worldwide[6].

The World Health Organization (WHO) recognizes antimicrobial resistance (AMR) as one of the top ten global public health threats, and presents a major challenge with considerable health and socio economic implications. By 2050 at least 10 million people are likely to die each year due to such drug resistant diseases[7]. Compared to at least 700,000 in 2019. However, treatment of infectious diseases has been complicated by the emergence of resistance of bacteria to a wide number of different antibiotics. Antibiotic resistant bacteria, at times multidrug resistant, can cause formidable infections, with patients requiring longer hospital stays, treatment failing and an increased mortality. Indiscriminate use of antimicrobial agents in human and veterinary medicine, agriculture and aquaculture are the main factors contributing to bacterial resistance. Different mechanisms are used by bacteria alone or in concert to become resistant to antibiotics[8].

South Asia has emerged as a hotspot for antimicrobial resistance, with an estimated 70% of global antimicrobial resistance cases occurring in this region, including Pakistan[8].For instance, over 90% of E. coli strains in the region have been reported as resistant to Amikacin. Factors such as overcrowding, poor

sanitation, limited access to quality healthcare, and the misuse of antibiotics contribute significantly to the development of AMR, particularly in Asian countries, including Pakistan. Given the alarming rise in antibiotic resistance and its associated health challenges, there is an urgent need to investigate local patterns of resistance to guide effective treatment strategies and inform public health interventions. This study aimed to determine the antimicrobial susceptibility patterns of E. coli isolated from clinical samples at Bacha Khan Medical Complex, Swabi, Pakistan

**METHOD**

A Prospective cross-sectional study was conducted from September to December 2024, to determine the Current Trend of antimicrobial susceptibility Pattern of E. coli among patients who visited at Bacha Khan Medical Complex Swabi,Khyber Pakhtun khwa, Pakistan. Ethical approval for this study was obtained from the Institutional Review Board (IRB) at Bacha khan medical complex Swabi. The following ethical principles was adhered to throughout the study.

A total of 288 patients were selected for this study. The sample size was determined using Cochran's Formula to ensure statistical relevance, The population for this study was consisting of all group of age, who are visited to Bacha Khan Medical complex Swabi. but based on specific inclusion and exclusion criteria .Patients suspected E coli infection and all group of age people was included. Exclusion criteria include patients who taken antibiotics in last 24 hours and those who have contaminated or insufficient sample.

Processing of Sampling: Inoculation of the collected isolates was performed on three different culture media which include MacConkey agar, Blood agar, and CLED agar, after inoculation these media were incubated for 24 hours at 37 C to promote the growth of bacteria. Biochemical test and gram staining were used to identify the isolated bacteria. The bacteria isolates were also processed using the disk diffusion method on nutrient agar with specific antibiotics to gain the better understanding of their culture.

CLED Agar: CLED agar: The urine samples were streaked on Cysteine Lactose Electrolyte Deficient Agar and placed in the incubator maintained at the temperature of 37 C for 24 hours. CLED Agar is used for differentiation and isolation of bacteria responsible for urinary tract infection as it is a non-inhibitory growth medium. The growth of urinary pathogens fosters the medium enabling specific colony morphology. In a liter of distilled water, 36.2grams of the composition CLED agar was dissolved and boiled for total solidification. The solution was subjected to an autoclaving procedure at the temperature of 121C for fifteen minutes to sterilize it. Before pouring the medium, it was thoroughly mixed

Blood Agar: Blood agar medium is also referred to enrichment medium, primary used for cultivating microbe or bacteria that are difficult to grow. Dissolve 40 grams of the medium in the one litter of distilled water. Heat it to boil to ensure complete dissolution. Sterilize the solution by autoclaving at 121C for 15 mints and allow it to cool to a temperature between 45C to 50C. Add 7% sterile differentiated blood into blood agar.

MacConkey Agar: MacConkey agar is a selective and differentiate medium designed to separate and distinguish lactose fermenting from non lactose fermenting bacteria. To prepared MacConkey agar media required distilled water, autoclaving, and media component. Dissolve 36.2 gram in one liter of distilled

water and bring it to boil ensure solidification. Then sterilize by autoclaving at 122C for 16 mints. Mix thoroughly before pouring along with composition of MacConkey agar media.

Data Analysis After data collection was analyzed using statistical software such as SPSS (Statistical Package for the Social Sciences)

## RESULTS AND DISCUSION

Prevalence of E coli in clinical isolates was 48.6%. and 140 out of 288 these isolates show growth of E coli on culture Media. Samples were collected from all age of patient visiting to Bacha Khan Medical Complex Swabi, as shown in Table 4.1 and 4.2.

**Table4. 1: Prevalence of E coli in the clinical sample**

| Parameters | Total Cases | E Coli | Non E coli | Percentage |
|---|---|---|---|---|
| **E Coli** | 288 | 140 | 148 | 48.61% |

**Table4. 2: Distribution of different types of samples collected from infected patients.**

| Sample types | Frequency | Percentage |
|---|---|---|
| **Blood** | 8 | 5.7% |
| **Urine** | 98 | 70.0% |
| **Pus** | 34 | 24.3% |
| **Total** | 140 | 100 |

In this study we have 3 different types of samples which include Blood, Urine and Pus .in among the Blood 8 out of 63 were positive case (5.7%). in Urine 98 out of 169 positive cases (70%) And in Pus 34(24.3) out of 56 positive cases as shown in Table 4.2

The antibiotic susceptibility pattern of E. coli in urine culture is essential for understanding the effectiveness of different antibiotics in treating urinary tract infections (UTIs). In this study, 98 E. coli isolates from 169 positive cases were tested against a range of antibiotics following the Clinical and Laboratory Standards Institute (CLSI) guidelines. The findings provide valuable insights into the antibiotics that are most effective against E. coli infections and those that exhibit high resistance.

Nitrofurantoin emerged as the most effective antibiotic, showing 100% sensitivity, making it an ideal choice for treating UTIs caused by E. coli. Other highly effective antibiotics included Amikacin (96.9%), Ertapenem (95.9%), Meropenem (94.9%), Fosfomycin (94.9%), and Imipenem (92.9%). These antibiotics can be relied upon to treat infections caused by E. coli effectively and are crucial in managing multi-drug-resistant strains.

Conversely, some antibiotics exhibited high resistance rates, making them less suitable for treating E. coli infections. Ampicillin showed complete resistance (100%), indicating that it is no longer a viable treatment option. Similarly, Cefazolin (94.9%), Cefoxitin (92.9%), Ceftriaxone (93.9%), and Ceftazidime (96.9%) demonstrated high resistance rates, with sensitivity percentages below 10%, further suggesting their limited effectiveness.

**Table4.3: Antibiotics susceptibility pattern of E. coli in urine culture**

| Antibiotics | Total | Resistant | Resistant % | Sensitive | Sensitive % |
|---|---|---|---|---|---|
| **Ampicillin** | 98 | 98 | 100 | 0 | 0 |
| **Cefazolin** | 98 | 93 | 94.9 | 5 | 5.1 |
| **Cefoxitin** | 98 | 91 | 92.9 | 7 | 7.1 |
| **Ceftriaxone** | 98 | 92 | 93.9 | 6 | 6.1 |
| **Cefotaxime** | 98 | 89 | 90.8 | 9 | 9.2 |
| **Ceftazidime** | 98 | 95 | 96.9 | 3 | 3.1 |
| **Amoxicillin** | 98 | 84 | 85.7 | 14 | 14.3 |
| **Cefoperazone/Sulbactam** | 98 | 52 | 53.1 | 46 | 46.9 |
| **Piperacillin + Tazobactam** | 98 | 50 | 51 | 48 | 49 |
| **Ciprofloxacin** | 98 | 83 | 84.7 | 15 | 15.3 |
| **Doxycycline** | 98 | 69 | 70.4 | 29 | 29.6 |
| **Imipenem** | 98 | 7 | 7.1 | 91 | 92.9 |
| **Meropenem** | 98 | 5 | 5.1 | 93 | 94.9 |
| **Ertapenem** | 98 | 4 | 4.1 | 94 | 95.9 |
| **Amikacin** | 98 | 3 | 3.1 | 95 | 96.9 |
| **Nitrofurantoin** | 98 | 0 | 0 | 98 | 100 |

Moderate sensitivity was observed for Piperacillin + Tazobactam (49%) and Cefoperazone/Sulbactam (46.9%), indicating that these antibiotics may be used as alternative treatments when first-line options are not suitable.

However, commonly used antibiotics such as Ciprofloxacin (15.3%) and Doxycycline (29.6%) displayed moderate to high resistance rates, which limits their effectiveness in treating UTIs caused by E. coli. The results highlight the importance of carbapenems, including Imipenem, Meropenem, and Ertapenem, which showed excellent sensitivity rates above 90%. For treating multi-drug- resistant E. coli infections these antibiotics are vital; they should be considered when other antibiotics have failed.

Overall, it is demonstrated that antibiotic susceptibility testing for treatment of E. coli is necessary to select appropriate antibiotics. Treatment protocols should prioritize effective antibiotics (i.e.

Nitrofurantoin, carbapenems) and avoid high resistance rate antibiotics including Ampicillin and older generation cephalosporins where treatment failure and spread of resistant strains is increased.

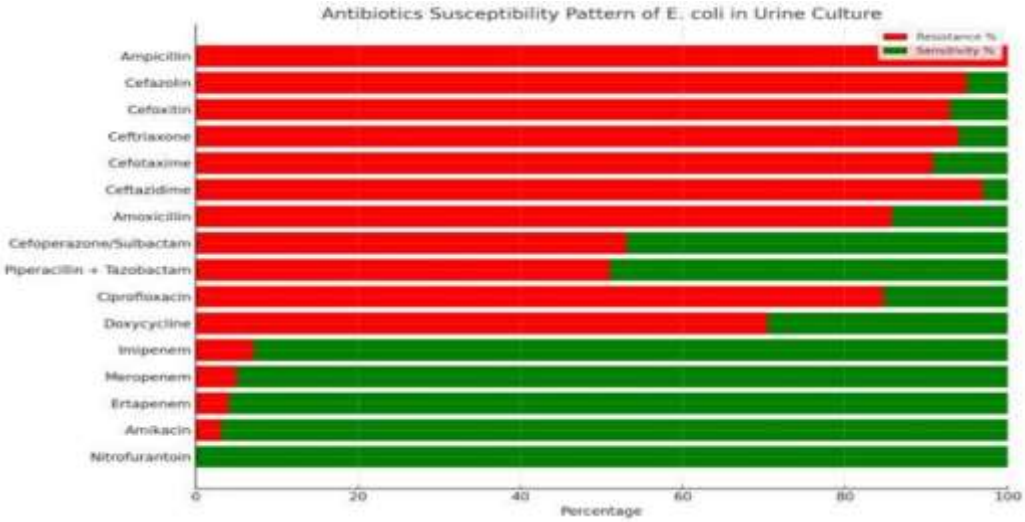



Figure shows visually the resistance and sensitivity percentage of several antibiotics which were tested against E. coli isolates from urine samples. The sensitive percentage is shown by the green bars while the resistant percentage is shown by the red bars.

The comparative effectiveness of different antibiotics in treating E. coli urinary tract infections is clearly illustrated using this graphical comparison. The figure shows that Nitrofurantoin has the highest sensitivity of 100%. This reports that all E. coli isolates tested were fully susceptible to this drug, which is a very dependable use for the management of UTIs.

Like the highly effective antibiotics, Amikacin has 96.9% sensitivity, then Ertapenem (95.9%), Meropenem(94.9%),and Imipenem(92.9% sensitivity).There are low percentages of resistance against these antibiotics, such as E. coli and these antibiotics will continue to be a critical treatment piece for multidrug resistant E. coli strains. The figure, however, shows that some antibiotics have high resistant rates meaning that they are less effective against E. coli infections. The highest resistance rate is seen for Ampicillin (100%), Other antibiotics Cefazolin(94.9%),Cefoxitin(92.9%),Cefotaxime(93.9%) and Ceftazidime did not work in (96.9%), however do not seem suitable to be used for E. coli UTI treatment,

While Doxycycline is moderately effective (29.6%) and Ciprofloxacin is effective only in 15.3% of cases. These antibiotics are only of limited efficacy because a large proportion of E. coli isolates are resistant. As a result, they should not be regarded as first line treatment choices. Piperacillin + Tazobactam and Cefoperazone/Sulbactam, are almost as sensitive and resistant as each other, with 49% and 46.9% sensitivity respectively. Alternative treatments for these antibiotics should be used when first line treatments fail, though caution should be used due to a relatively high resistance rate for these antibiotics.

This figure provides overall sense that proper antibiotics selection such as Nitrofurantoin and carbapenems are necessary for E. coli management. It also underscores the importance of regular practice antibiotic susceptibility testing especially to avoid broad assumptions that all UTIs are sensitive to Ampicillin or the older generation cephalosporins which have very high resistance rates. So, by doing this, treatment outcomes can be improved, the risk of treatment failures reduced and the propagation of antibiotic-resistant E. coli strains in the community can be fought.

**Table4. 4: Antibiotics susceptibility pattern of E. coli in blood culture**

| Antibiotics | Total | Resistant | Resistant % | Sensitive | Sensitive % |
|---|---|---|---|---|---|
| **Ampicillin** | 8 | 8 | 100.0 | 0 | 0.0 |
| **Cefazolin** | 8 | 8 | 100.0 | 0 | 0.0 |
| **Cefoxitin** | 8 | 8 | 100.0 | 0 | 0.0 |
| **Ceftriaxone** | 8 | 8 | 100.0 | 0 | 0.0 |
| **Cefotaxime** | 8 | 8 | 100.0 | 0 | 0.0 |
| **Ceftazidime** | 8 | 7 | 87.5 | 1 | 12.5 |
| **Amoxicillin** | 8 | 6 | 75.0 | 2 | 25.0 |
| **Cefoperazone/Sulbactam** | 8 | 8 | 100.0 | 0 | 0.0 |
| **Piperacillin + Tazobactam** | 8 | 0 | 0.0 | 8 | 100.0 |
| **Ciprofloxacin** | 8 | 8 | 100.0 | 0 | 0.0 |
| **Doxycycline** | 8 | 1 | 12.5 | 7 | 87.5 |
| **Imipenem** | 8 | 0 | 0.0 | 8 | 100.0 |
| **Meropenem** | 8 | 0 | 0.0 | 8 | 100.0 |

E. coli in blood culture antibiotic susceptibility pattern reports are important in detecting the effectiveness of different antibiotics in treating E. coli bloodstream infections. Eight E. coli isolates from blood samples were tested against different antibiotics against the Clinical and Laboratory Standards Institute (CLSI) guidelines.

According to the results Piperacillin + Tazobactam, Imipenem, and Meropenem are the best antibiotics, with a 100% sensitivity rate. This means that these antibiotics are highly reliable therapy for E. coli bloodstream infection and should be given first choice in treatment protocol. On the other hand some antibiotics were totally resistant, and should not be used anymore to treat bloodstream infections caused by E. coli, such as Ampicillin, Cefazolin, Cefoxitin, Ceftriaxone, Cefotaxime, Ciprofloxacin and Cefoperazone/Sulbactam, that were 100% resistant. Here we show that the effectiveness of older

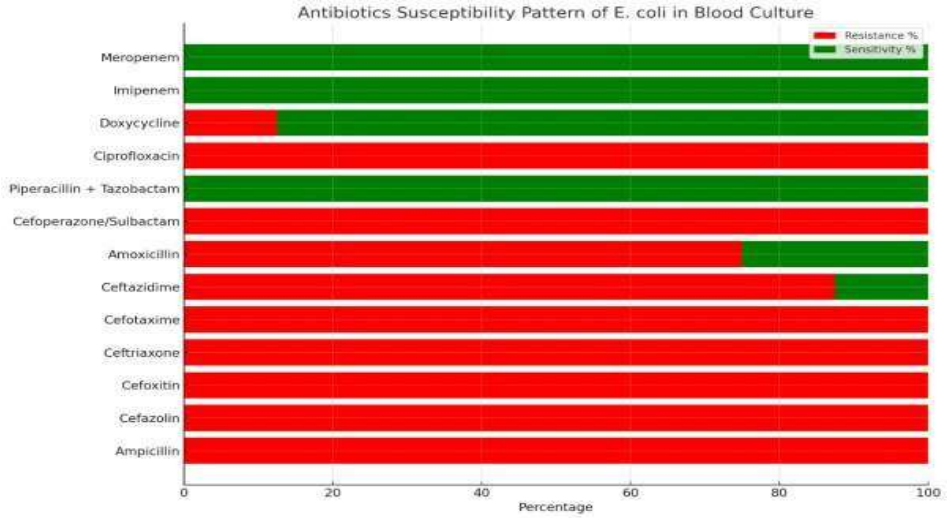
generation antibiotics is waning, while the use of such antibiotics for serious infections needs to be avoided.

The sensitivity rates for Ceftazidime and Amoxicillin were 12.5% and 25.0% respectively, moderately effective. But these antibiotics could be considered as alternative treatments in situation where more effective antibiotics are not available. But the drugs' high resistance rates indicate that care needs to be taken with their prescribing.

We found that doxycycline had a relatively high effectiveness, with a sensitivity rate of 87.5% and resistance rate of 12.5%. But this makes it a good option for treating E. coli bloodstream infections where first line antibiotics won‘t do. This table presents a clear picture of how to choose good antibiotics (Piperacillin + Tazobactam, Imipenem, Meropenem), to be used to treat E. coli bloodstream infections. It additionally underscores the requirement for ordinary genetic test through determination of the acceptance of suitable medicines and counteracting the prescription of ineffectual medications that may lead to treatment disappointment and spread of compelling E. coli mutants.

Figure 4.4 "Antibiotics Susceptibility Pattern of E. coli in Blood Culture" represents the resistance and sensitivity percentages of different antibiotics tested on E. coli isolates from blood samples. It can be seen in the green bars and red bars that green bars represent the percentage of sensitive isolates, red bars represent the percentage of resistant isolates. This comparison looks visually at how well different antibiotics combat bloodstream E. coli

Infections From this figure Piperacillin+ Tazobactam, Imipenem and Meropenem are the best antibiotics




as they had 100% sensitivity rate. Many antibiotics tested were highly reliable choices to use in treating E. coli bloodstream infections because they were used on all E. coli isolates test.Without any resistance developing.

But these antibiotics are important to treat serious infections such as infections with multi-drug resistant E. coli strains. By contrast, a number of antibiotics were completely resistant to treatment of E. coli infection in blood samples. Ampicillin, Cefazolin, Cefoxitin, Ceftriaxone, Cefotaxime, Ciprofloxacin, and Cefoperazone/Sulbactam all showed 100% resistance and should be avoided in treatment of bloodstream infections produced by E. coli.

When effective antibiotics are missing, these antibiotics may be used as alternatives. However, due to their relatively high resistance rates they should be used with caution. With a sensitivity rate of 87.5%, an 87.5% rate, doxycycline, appeared relatively effective. All this makes Doxycycline a candidate to treat E. coli bloodstream infection especially when carbapenems are unavailable or not fit.

In general, the figure indicates that the choice of highly effective antibiotics, Piperacillin (with Tazobactam), Imipenem, or Meropenem is critical for treatment of E. coli bloodstream infection. The necessity of routine antibiotic susceptibility testing to select suitable antibiotics and prevent administering useless antibiotics that may favor the spread of antibiotic-resistant E. coli strains are also emphasized.

**Table4. 5: Antibiotics susceptibility pattern of E. coli in pus culture**

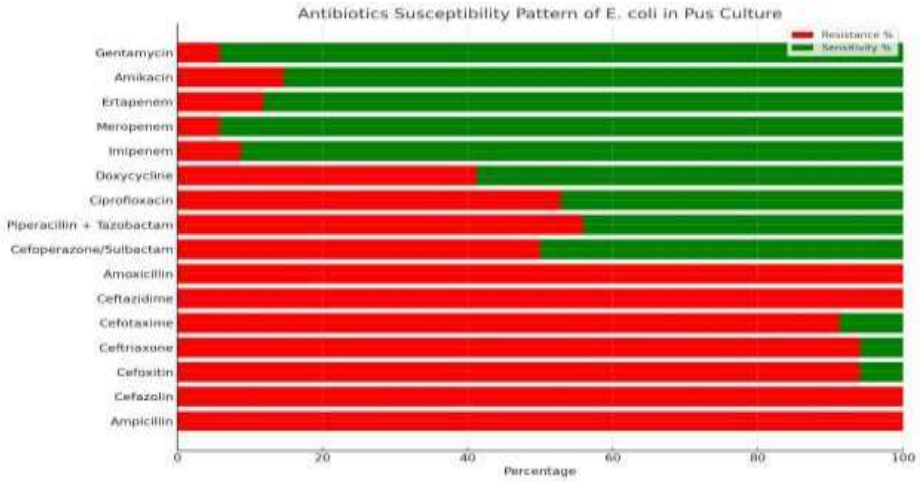
| Antibiotics | Total | Resistant | Resistant % | Sensitive | Sensitive % |
|---|---|---|---|---|---|
| **Ampicillin** | 34 | 34 | 100.0 | 0 | 0.0 |
| **Cefazolin** | 34 | 34 | 100.0 | 0 | 0.0 |
| **Cefoxitin** | 34 | 32 | 94.1 | 2 | 5.9 |
| **Ceftriaxone** | 34 | 32 | 94.1 | 2 | 5.9 |
| **Cefotaxime** | 34 | 31 | 91.2 | 3 | 8.8 |
| **Ceftazidime** | 34 | 34 | 100.0 | 0 | 0.0 |
| **Amoxicillin** | 34 | 34 | 100.0 | 0 | 0.0 |
| **Cefoperazone/Sulbactam** | 34 | 17 | 50.0 | 17 | 50.0 |
| **Piperacillin + Tazobactam** | 34 | 19 | 55.9 | 15 | 44.1 |
| **Ciprofloxacin** | 34 | 18 | 52.9 | 16 | 47.1 |
| **Doxycycline** | 34 | 14 | 41.2 | 20 | 58.8 |
| **Imipenem** | 34 | 3 | 8.8 | 31 | 91.2 |
| **Meropenem** | 34 | 2 | 5.9 | 32 | 94.1 |
| **Ertapenem** | 34 | 4 | 11.8 | 30 | 88.2 |
| **Amikacin** | 34 | 5 | 14.7 | 29 | 85.3 |
| **Gentamycin** | 34 | 2 | 5.9 | 32 | 94.1 |

Antibiotic susceptibility pattern of E. coli in pus culture is used to show how effective they are for E. coli isolates taken from pus samples. The Clinical and Laboratory Standards Institute (CLSI) guidelines were used to test 34 E. coli isolates in this study.

The results showed that Meropenem, Imipenem, Gentamycin, and Ertapenem were the best antibiotics with sensitivity rate ≥ 88%. In addition, these antibiotics can be relied upon for treating wound infection caused by E. coli and Amikacin also showed high effectiveness with the sensitivity of 85.3%, being an alternative for treatment.

On the other hand, several antibiotics were completely resistant including Ampicillin, Cefazolin, and Ceftazidime. Given 100% resistance rates to these antibiotics in E. coli isolates from pus samples, they should not be used in treatment, as they will not succeed in treatment. Cefoperazone/Sulbactam, Piperacillin + Tazobactam, and Ciprofloxacin rendered moderate effectiveness with the sensitivity ranges, 44.1–50%. When drugs with a more powerful effect are not available, these antibiotics may be an alternative treatment. Their relatively high resistance rate means that caution should be exercised, however.

In particular doxycycline sensitivity rate for E. coli wound infections reached 58.8%, which is a moderate success as an antibiotic treatment. When first line antibiotics are not possible, it can be regarded as second line treatment in such cases. All in all, it is very conspicuous that out of the antibiotic thus tested, Meropenem, Imipenem, Gentamycin and Ertapenem have the most effective result in the management of E. coli in pus samples.




Highlights the importance of regular antibiotic susceptibility testing to select appropriate antibiotics that also minimize prescribing unhelpful antibiotics that may aid in the propagation of the antibiotic-resistant strains of E coli.

The resistance and sensitivity percentages of different antibiotics tested on E. coli isolates gotten from pus samples are visually presented in the figure 4.5. The green bars show how many of the isolates were sensitive and the red bars how many isolates were resistant. It displays the effectiveness of various antibiotics used to treat E. coli wound infections using a graphical format, to make it easier to understand.

As figure seen, Meropenem, Imipenem, Gentamycin and met Ertapenem are the best antibiotics with the sensitivity rate above 88%. They have excellent effectiveness against E. coli isolates in pus cultures and are to be given high priority in treatment protocols of wound infections.

Additionally, a high efficiency was recorded by amikacin, with 85.3% sensitivity, which can be considered as an efficient treatment of E. coli in pus samples. On the other hand, some antibiotics were fully resistant meaning they are not effective in treating E. coli infections from pus samples. None of the isolates was susceptible to Ampicillin, Cefazolin and Ceftazidime with 100% resistance. Because of the high resistance rates for these antibiotics, they should be avoided for the treatment of E coli wound infections in order to prevent failure of treatment and complications.

In moderate sensitivity, the sensitivity ranged from 44.1% – 50% for Cefoperazone/Sulbactam, Piperacillin + Tazobactam and Ciprofloxacin. When first line antibiotics are not suitable these antibiotics may be considered as alternative treatment options.

Their relatively high resistance rates caution, however. Moderate effectiveness was demonstrated by doxycycline (58.8% sensitivity rate) for the treatment of E. coli wound infections. In some cases, it can be used as a second line treatment if no or unsuitable other antibiotics are available.

The figure also taken together highlights the use of powerful antibiotics like Meropenem, Imipenem, Gentamycin and Ertapenem to control E. coli infections in pus samples. The study goal brings out the purpose of frequent antibiotic susceptibility testing as combined strategies of early and consequent selection of good antibiotics with less chances of treatment failure and spread of antibiotic-resistant E. coli strains.

**Discussion**

Drug resistance, highly the case of antimicrobial resistance, is a global challenge that is affecting people worldwide, especially, those in the developing country. This study gives significance findings on antibiotic susceptibility patterns of E. coli isolates from urine, blood, and pus culture.

The results underline the fact that not all antibiotics are equally effective against E. coli infections and choosing the right antibiotics after susceptibility testing will enhance patient outcomes and will reduce the emergence of antibiotic-resistant strains. Culture of the urine results found that Nitrofurantoin came out on top and exhibited the least sensitivity of 100%. This is supported by previous findings showing Nitrofurantoin to be very good in curing urinary tract infections (UTIs) due to E. coli. Amikacin, Ertapenem, Meropenem, and Imipenem had some acts as other effective antibiotics with sensitivity rate greater than 90%. However, these traditional antibiotics (Ampicillin, Cefazolin, and Cefoxitin) exhibited high resistance rates and subsequently are not recommended for the treatment for E. coli infections[9].

In comparison with a study conducted in 2022 also reported that E coli prevalence was 27% and antimicrobial susceptibility pattern of E coli show that the highest sensitive drugs is Fosfomycin(99.1%), amikacin (98.2%), Meropenem(93.8%)and the lowest sensitive drugs were cefotaxime (13.4%) and ampicillin(23.2%)[10].

Another study also reported that, E coli prevalence is 76% and antimicrobial susceptibility pattern show that Amikacin and Tigecycline (100%),Meropenem and Fosfomycin (97.2%), Imipenem (94.4%), Ertapenem (91.6%), Piperacillin-tazobactam (88.9%), Nitrofurantoin (86.1%), and lowest sensitive drug was Ampicillin(27.8%)[11].

Furthermore, a study conducted in a tertiary care hospital in Kanpur, the findings of this study show that the prevalence of E coli more prevalent in female(60%) than male(40%).overall antimicrobial susceptibility pattern reveled that E coli is significantly high sensitivity rate to Nitrofurantoin(100%),Imipenem(98%),meropenem(94%),and gentamycin(88%)[2].

Similarly, a study conducted in a tertiary care hospital in Rawalpindi, Pakistan reported that E coli accounted for 40.7% of urinary tract infections. Revealed its sensitivity to some antibiotics including fosfomycin (93.2%), imipenem (78.1%), and amikacin (77.1%). These antibiotics are highly effective against E coli. however, highly resistance patterns observed with cefotaxime (82.%), Ceftazidime (86.5%), ceftriaxone (91.5%), and ampicillin (95.6%)[12].

**References:**


**[1]** U. Escherichia and M. Rozwadowski, "Molecular Factors and Mechanisms Driving Multidrug," 2022.

**[2]** M. Mishra, R. Sujatha, and N. Afaq, "' Antibiotic susceptibility pattern of Escherichia coli isolated from various clinical samples at a tertiary care Hospital in Kanpur ' Antimicrobial susceptibility tests :," vol. 2022, no. 8, pp. 10–12, 2023.

**[3]** I. Haq *et al.*, "Multi-Drug Resistance of Escherichia coli ( E . coli ) Isolated from Clinical Isolates in District Peshawar Kp Pakistan," vol. 16, no. 01, pp. 830–835, 2022.

**[4]** K. Ahmed *et al.*, "Prevalence of Escherichia coli in Suspected Urinary Tract Infected Gilgit-Baltistan , Pakistan," vol. 46, no. 6, pp. 1783–1788, 2014.

**[5]** H. Mengal, G. S. Pirkani, S. Ramzan, and S. Aziz, "Antimicrobial susceptibility of e. coli isolates from urinary tract infections in quetta, pakistan," vol. 5, no. 2, 2022, doi: 10.31580/pjmls.v5i2.2471.

**[6]** M. Qureshi and F. Aziz, "PREVALENCE OF MICROBIAL ISOLATES IN BLOOD CULTURES AND THEIR ANTIMICROBIAL SUSCEPTIBILITY PROFILES," vol. 27, pp. 136–139, 2011.

**[7]** S. Perestrelo *et al.*, "Building an International One Health Strain Level Database to Characterise the Epidemiology of AMR Threats : ESBL — AmpC Producing E . coli as An Example — Challenges and Perspectives," 2023.

**[8]** A. A. Ayandele, E. K. Oladipo, O. Oyebisi, and M. O. Kaka, "Prevalence of Multi-Antibiotic Resistant Escherichia coli and Klebsiella species obtained from a Tertiary Medical Institution in Oyo State , Nigeria," vol. 2020, pp. 1–6, 2020.

**[9]** T. Ahmad, L. A. L. I. Khan, N. Khan, F. Khan, I. Khan, and S. Uddin, "Urinary Tract Infection and Antibiotic Sensitivity to Culture Most Commonly to Nitrofurantoin and Fosfomycin," vol. 16, no. 12, pp. 651–653, 2022.

**[10]** I. Haq *et al.*, "Multi-Drug Resistance of Escherichia coli (E.coli) Isolated from Clinical Isolates in District Peshawar Kp Pakistan," *Pakistan Journal of Medical and Health Sciences,* vol. 16, no. 1, pp. 830–835, 2022, doi: 10.53350/pjmhs22161830.

**[11]** B. Das, N. Mittal, R. Goswami, D. Adhana, and N. Rathore, "Prevalence of multidrug resistance ( MDR ) and extended spectrum beta- lactamases ( ESBLs ) among uropathogenic Escherichia coli isolates from female patients in a tertiary care hospital in North India," vol. 7, no. 12, pp. 5031–5036, 2018.

**[12]** I. Anwar, S. Rafiq, K. Ahmad, M. U. L. Mubeen, A. Mudassar, and M. Kamran, "Antimicrobial Susceptibility Pattern of E . Coli in Patients with Urinary Tract Infection at a Tertiary Care Hospital , Rawalpindi," vol. 16, no. 1, pp. 967–969, 2022.