"Antibiotic susceptibility pattern of Escherichia coli isolated from various clinical samples at a tertiary care Hospital in Kanpur"

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Abstract:

Introduction: Escherichia coli (E. coli) is one of the most common causative agents of bacterial infections E. coli is the leading cause of urinary tract, ear, wound and other infections in humans. Increasing rates of antimicrobial resistance among E. coli is a growing concern worldwide.

Objective: The aim of this study was to determine antimicrobial susceptibility pattern of E. coli from various clinical samples.

Material and Methods: A retrospective study was done on results of cultures of urine, pus, sputum, semen, central line, and foley's tip that had been performed from April 2022- March 2023 at the Department of Microbiology, Rama medical college, Kanpur. A total of 159 samples were analysed for isolation and identification of bacteria and antimicrobial susceptibility testing.

Result: The prevalence of Escherichia coli isolates were more common in females (60%) than in males (40%). The most affected age group belongs to 25-35 years of age. Among all the various clinical samples E.coli was most prominent pathogen in the urine sample and in pus sample. In the case of various samples, E. coli was found to be highly susceptible to Polymyxin B (100%) colistin (100%), nitrofurantoin (100%), imipenem (98%),meropenem (94%) and gentamycin (88%) .

Conclusion: Escherichia coli isolated from various clinical specimens showed differences in antibiotic sensitivity patterns, with highly sensitive to commonly used antibiotics where Nitrofurantoin, Polymyxin B, colistin, imipenem, meropenem and gentamycin were considered appropriate for treatment of E. coli. Regular monitoring of antimicrobial susceptibility is recommended.

Keywords: E. coli, Clinical Samples, Antibiotics, Susceptibility

Introduction

Escherichia coli are a Gram-negative, rod-shaped bacterium that typically resides in the lower intestinal tract of humans. It is also found in hospital environments and can cause nosocomial infections [1]. Escherichia coli is one of the most frequent causes of urinary tract infection [2, 3] and is among the most important pathogens causing bloodstream infections [4], otitis media, wound infections, neonatal meningitis, and nosocomial pneumonia [5,6].E. coli is also the most common cause of food and water-borne human diarrhoea worldwide and in developing countries, causing many deaths in children under the age of five years[7].

Antimicrobial resistance in E. coli has been reported worldwide and increasing rates of resistance among E. coli is a growing concern in both developed and developing countries [8]. A rise in bacterial resistance to antibiotics complicates treatment of infections. The prevalence and susceptibility profile of clinical isolates of E. coli show substantial variations in geographical locations, as well as significant differences in various populations, clinical samples, and environments [9].

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However, investigating antimicrobial susceptibility patterns of E. coli isolated from various clinical samples in our region is spares. The routine monitoring of antibiotic sensitivity patterns of E. coli from different specimens could help develop E. coli empirical treatment guidelines in the region. Therefore the present study was undertaken to study the Antibiotic susceptibility pattern of Escherichia coli isolated from various clinical samples at a tertiary care Hospital in Kanpur"

Aim & Objective

The aim of this study was to determine antimicrobial susceptibility pattern of *E. coli* from various clinical samples.

Material and methods

A retrospective study was done on results of cultures of urine, pus, sputum, semen, central line, and foley's tip that had been performed from April 2022- April 2023 at Department of Microbiology, Rama medical college, Kanpur. A total of 159 samples were collected from both genders. The age of the participants ranged from 0 to 85 years. As well as *E. coli* isolates and antimicrobial susceptibility data were collected from the registration record.

Specimen Collection

A Clean-catch midstream morning urine specimens are collected using sterile wide mouth glass containers.

Urine samples were plated on Cystine Lactose Electrolyte-Deficient medium (CLED), MacConkey agar and, Blood agar using calibrated wire loops and then incubated aerobic atmosphere at 37°C for 24 hours. From positive cultures, uropathogens were identified according to the standard operational procedures as per the standard microbiological methods. A significant bacterium was considered if urine culture yield $\leq 10^5$ colony-forming unit (CFU/ml).

Antimicrobial susceptibility tests:

Antimicrobial susceptibility testing was performed on Mueller-Hinton agar using the disk diffusion (Kirby Bauer's) technique following the CLSI guideline 2022 [10]. Reference strains of *E. coli* ATCC 25922 and *S. aureus* ATCC 25923 were used for quality control for tests.

Statistical Analysis

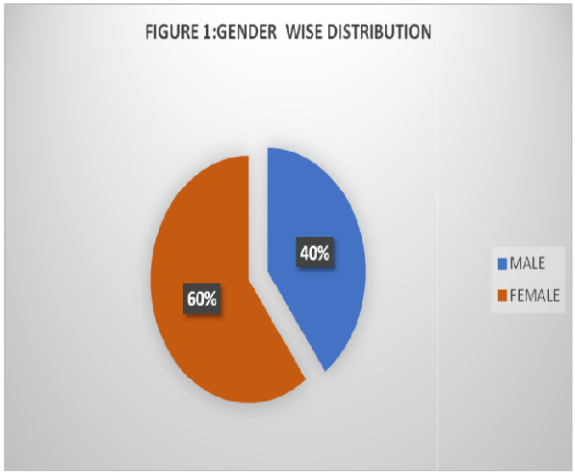
Data recorded on the case report from and structured proforma were subsequently entered into a spreadsheet. Data management and analysis were performed using Microsoft Excel.

Ethical clearance

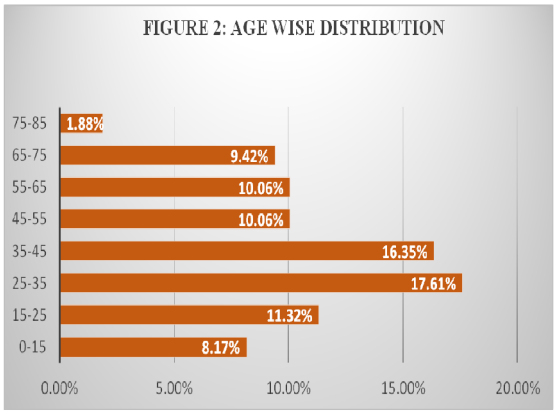
The ethical committee clearance certificate was taken before starting of study by institutional medical ethical committee.

Results

Between April 2022 to April 2023, a total of 159 samples were analyzed for isolation and identification of bacteria and antimicrobial susceptibility testing. Of these positive cases of Escherichia coli isolates were more prevalent in female (60 %) than in males (40%) shown in Figure1.



Age wise distribution of E. coli isolates in which maximum number was found in age group of 25-35 years shown in Figure no 2



The highest number of isolates [71%] were obtained from the urine samples, pus sample [23%], sputum [0.60%], semen [0.66%], central line[0.78%] and foley's tip [3.14%]shown in Figure .3 and table no.1

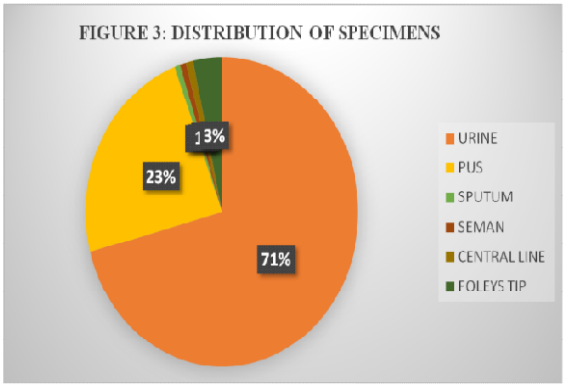
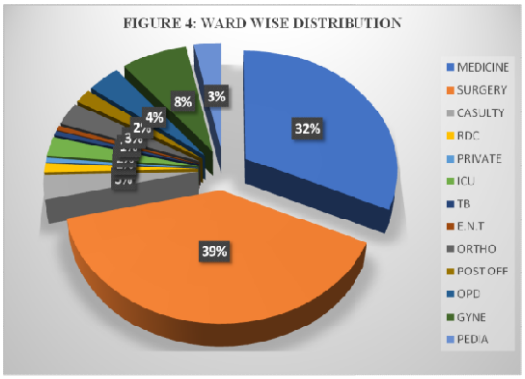


Table no. 1: Escherichia coli Isolated from Various Clinical Specimens.

Source of isolation	Percentage (%)
Urine	71%
Pus	23%
Sputum	0.60%
Semen	0.66%
Central line	0.78%
Foley's tip	3.14%

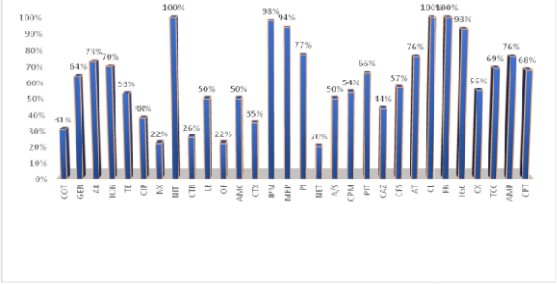
Figure 4 shows ward wise distribution of the patients. In which surgery and medicine ward



Shows maximum number of samples followed by other ward

The overall susceptibility patterns of E.coli isolates from various clinical samples (Figure 5). Significantly high sensitivity rates to Polymyxin B (100%) colistin (100%), nitrofurantoin (100%) and imipenem (98%), meropenem (94%) and gentamycin (88%).

FIGURE 5: ANTIMICROBIAL SUSCEPTIBILITY PATTERN OF E. COLI ISOLATES



Discussion

In our study, a total of 159 E. coli isolates were collected from various clinical specimens. The frequency of clinical isolates of E. coli in urine samples was higher in female (60%) than in male (40%). The finding is in accordance with karkeePrahamsa et al [11] (51.47% and 35%) and Ibrahim A. Naqidet al [12] (females 70.7% and males 29.3%) respectively.

In our study, the age group commonly affected was 25-35years (17.61). The finding is in accordance with R. Gautam et al.[13](21-30) respectively.

In our study, the distribution of urine sample (71%), pus sample (23%), sputum (0.06%) others samples are similar to the study of R. Gautam et al [13] (urine 85.9%, pus 8.4%, sputum 5.6%) and M.kibret et al [14](urine 45.5%) respectively.

In our study, Antibiotic sensitivity pattern of gram-negative bacilli revealed that maximum sensitivity was seen for Polymyxin B (100%) colistin (100%), nitrofurantoin (100%) and imipenem (98%), meropenem (94%) and gentamycin (88%). The finding is in accordance with R.Gautam et al [13](100%,90.3%) ,M.kibret at al [14] (100%) and Ibrahim A. Naqid et al[12](100%,88%) respectively.

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