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Corresponding Author
A. Syed Ali,
Department of Microbiology, Government Medical College, Thiruvananthapuram, India

Author Designation
[1-4]Assistant Professor
[5]Lab technician
[6]Associate Professor

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Prevalence of Escherichia Coli And Its Antibiotic Susceptibility Pattern From Various Samples In A Tertiary Care Hospital

[1]Kiran Gopal, [2]R.G. Ragi, [3]Neethu Kishor, [4]L. Cicili, [5]A.S. Aiswarya and [6]A. Syed Ali

[1,2,3,6]Department of Microbiology, Government Medical College, Thiruvananthapuram, India
[4]Department of M.L.T, Government Medical College, Thiruvananthapuram, India
[5]SMCSI Medical College, Karakonam, India

ABSTRACT

Escherichia coli can cause urinary tract infection, appendicular abscess, peritonitis, cholecystitis and septic wounds; they cause bacteremia and endotoxic shock and occasionally meningitis in neonates, also related to surgical site infections. A hospital-based study on Prevalence of Escherichia coli isolates from various samples and its antibiotic susceptibility pattern was conducted in Microbiology laboratory at Govt. Medical college hospital, Thiruvananthapuram. A total of 102 strains were isolated from different samples including urine, pus, blood, double swab, aspirates, bile. The predominant sample from which Escherichia coli was isolated is urine followed by pus. No Escherichia coli was isolated from CSF sample. The isolates show high resistance to ampicillin. Most of the Escherichia coli isolates were resistant to ampicillin followed by 1st generation cephalosporins. Cefoperazone + sulbactam was found to be the most effective drug. Cotrimoxazole and Amikacin were also effective.

INTRODUCTION

Escherichia coli is a normal inhabitant of the gastrointestinal tract of humans and animals and most strains are non-pathogenic. However there are many pathogenic strains of E. coli that have acquired various combinations of virulence genes that cause diseases ranging from urinary tract infections and gastrointestinal illness, septicaemia, meningitis, pneumonia, pericarditis. Illness caused by E. coli have a significant burden on patient health care system, so prompt recognition and appropriate treatment are necessary[1].

Antimicrobial resistance in E. coli has been reported worldwide and increasing rates of resistance among E. coli is a growing concern in both developing and developed countries. E. coli is generally susceptible to almost all clinically relevant antimicrobial agents, but this bacterial species has a great capacity to accumulate resistance genes. A rise in bacterial resistance to antibiotics complicates treatment of infection. Moreover, a tendency towards higher prevalence rates of resistance in recent years was observed[2,3].

This study was aimed at the prevalence of E. coli that cause human illness and describes the antibiotic susceptibility in clinical samples

Aims and Objectives:

Primary Objective: To study the prevalence of Escherichia coli isolates from all
the clinical samples processed in the Government medical college, Thiruvananthapuram for a period of three months.

Secondary Objective: To study the antibiotic susceptibility of the Escherichia coli isolates.

MATERIALS AND METHODS

A hospital based study on Prevalence of Escherichia coli isolates from various samples and its antibiotic susceptibility pattern was conducted in Microbiology laboratory at Govt. Medical college hospital, Thiruvananthapuram. For that samples received in Microbiology laboratory over a period of three month were processed as per the Standard Opening Procedure (SOP). Samples were received in the microbiology laboratory along with request form. The request forms were observed and checked for the patients details like name, sex, age, IP/OP
number, date, ward, unit, clinical conditions, nature of specimen and time of collection. Then these were entered in to corresponding register and processed

Study Design: Descriptive

Settings: Microbiology laboratory, Govt. Medical college Thiruvananthapuram

Period of Study: Three months

Data Collection: Data were collected from lab records and appropriate descriptive status is used to describe the salient features of the study.

Procedures:

Sample Collection: Pus, urine, sputum, endotracheal aspirate, ascitic fluid and blood samples were collected under standard and aseptic procedures.

Collection of Urine: Urine is one of the most easily obtained specimens examined in the laboratory. It is important to instruct the patient clearly regarding the type of specimen required, especially if its 24hr urine specimen. The early morning urine specimen is discarded and then all the urine voided in the next 24hr including the early morning specimen the next day is collected. Patient should be instructed about the proper cleaning of glans penis or vulva with soap and water. Specimen bottle should be clean and dry and labelled clearly. Containers must be sterilized and have to be quite large, sufficient to hold at least 2L.

Collection of catheterization (insertion of a sterile tube or catheter through the urethra into bladder) into sterile containers is best when urine is needed for culture. Most often urine for bacteriological examination is collected in midstream urine after the glans penis in the male or anterior vulva in the female have been carefully collected without touching the lip of the container to skin surface. This is called clean catch specimen[4,5].

Processing: The samples were processed according to the standard operating procedures of the lab[6,7].

Macroscopy: The colour, odour and appearance of sample were noted.

Microscopy:

- Pus and Exudates
- Gram stain
- Sputum
- Gram stain
- Urine
- Wet film
- Culture

The specimens were inoculated on following media as per standard guidelines[6,7].

- Blood agar
- MacConkey Agar

Identification is Done by:
- Direct microscopy
- Cultural characteristics
- Biochemical tests

Direct Microscopy:
- Gram negative bacilli

Cultural Characteristics:
- Blood agar

Large, Circular, Gray, Moist and Occasionally β Haemolytic
- MacConkey agar

Lactose fermenting, circular, moist, smooth with entire margin, flat and pink.

Antimicrobial Susceptibility:
- It was performed on Muller Hinton Agar by standard disc diffusion method (Kirby Bauer Method) as per CLSI guidelines[8].

First Line Antibiotics:
- Ceftriaxone 30µg
- Gentamicin 10µg
- Cefazolin30µg
- Nitrofurantoin 300 µg
- Amikacin 30µg

Second Line Antibiotics:
- Cotrimoxazole 25 µg
- Piperacillin+Tazobactam(100/10 µg)
- Cefoperazone + Sulbactam (75/30 µg)
- Ciprofloxacin 5µg.

Third Line Antibiotics:
- Imipenem 10µg
- Meropenem 10 µg
- Tigecycline 15 µg
- Cefepime 30 µg

RESULT AND DISCUSSIONS

The present study which was conducted in Department of Microbiology, Govt. Medical College, Thiruvananthapuram. During the study period, culture and sensitivity reports of all samples received in the laboratory were analyzed.
- A total of 102 strains were isolated from different samples including urine, pus, blood, double swab, aspirates, bile.
- The predominant sample from which Escherichia coli was isolated is urine followed by pus.
- No Escherichia coli was isolated from CSF sample.
- The isolates show high resistance to ampicillin.

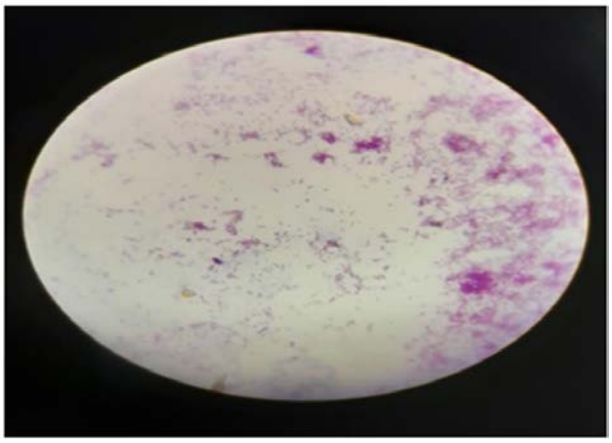

Fig. 1: Gram stain

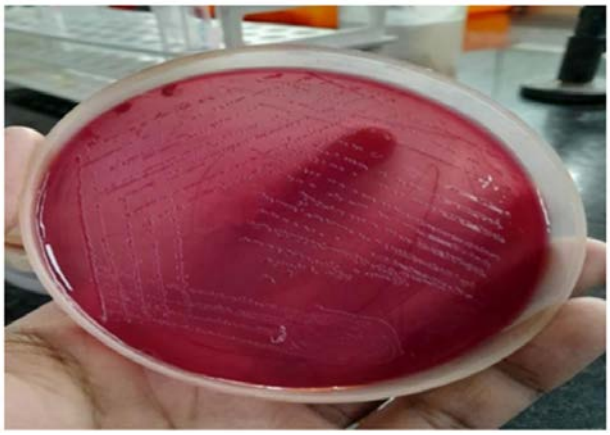

Fig. 2: Blood agar

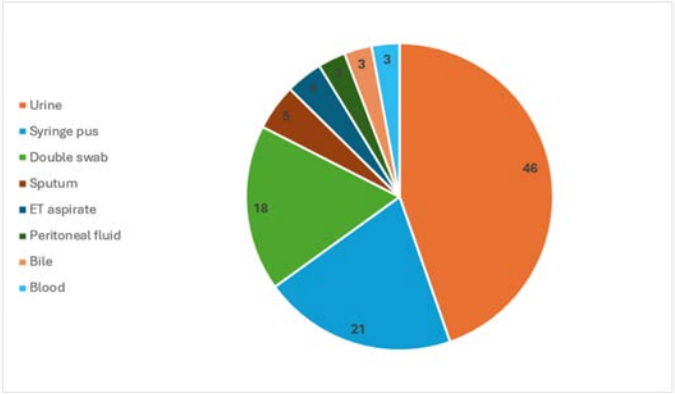

Fig. 3: Escherichia coli in different clinical specimens

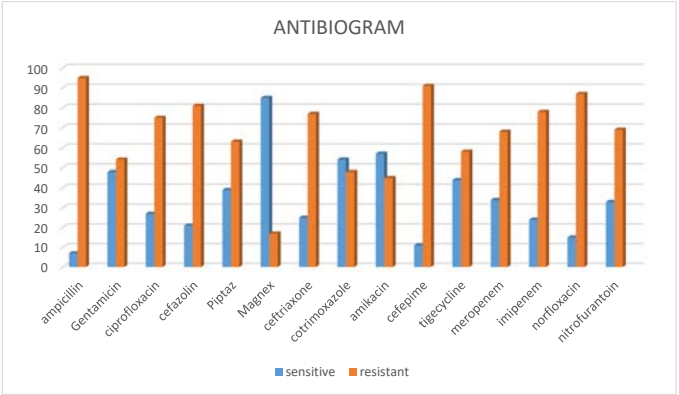

Fig. 4: Profile of sensitivity and resistance of drugs

Biochemical tests		
Catalase tests	**-**	**Presence of catalase enzyme**
Oxidase tests	-	Absence of oxidase enzyme
Nitrate reduction tests	-	Nitrate reduced
Triple sugar iron agar tests	-	Acid/acid, gas produced, no H2S
Mannitol motility tests	-	Motile, fermented
Citrate utilization tests	-	Citrate not utilized
Urease test	-	Urea not hydrolysed
Indole tests	-	Indole produced

Table 1: Distribution of Escherichia coli in different clinical specimens.

Sample	No. of samples containing E.coli
Urine	46
Syringe pus	21
Double swab	18
Sputum	5
ET aspirate	4
Peritoneal fluid	3
Bile	3
Blood	3

Table 2: Antibiogram of E. coli

Antibiotics	Sensitive	Resistant
Ampicillin	7	95
Gentamicin	48	54
Ciprofloxacin	27	75
Cefazolin	21	81
Piperacillin + Tazobactam (Piptaz)	39	63
Cefoperazone+Sulbactam(Magnex)	85	17
Ceftriaxone	25	77
Cotrimoxazole	54	48
Amikacin	57	45
Cefepime	11	91
Tigecycline	44	58
Meropenem	34	68
Imipenem	24	78
Norfloxacin	15	87
Nitrofurantoin	33	69

- Most of the Escherichia coli isolates were resistant to ampicillin followed by 1stgeneration cephalosporins.
- Cefoperazone + sulbactam (Magnex) is the most effective drug.

Cotrimoxazole and Amikacin are also effective drugs next to Magnex.

This study has demonstrated that out of 106 samples analysed, 46 (43%) of urine specimens yielded growth of

Escherichia coli. People belonging to age between 20-60 years recorded the highest prevalence rate. Females were commonly affected than males.

A study during the period of 2019-2020 at King Fahd Medical City, Riyadh, 2250 samples collected, mostly E.coli were isolated from the urine samples. 67.27% of which were recovered from women and 33.7% of which were recovered from men[9].

E.coli were resistant to cephalosporins (ceftriaxone, cefotaxime, cefepime, cefuroxime, cephalothin) and Penicillin (Ampicillin), whereas the majority of the isolates were sensitive to several carbapenems (Imipenem, Meropenem) , Aminoglycosides (amikacin) and Nitrofurantoin.

In present study, most of isolates shows high resistance to ampicillin and first generation and third generation of cephalosporins.

Overall resistance towards Ampicillin 93.7%, ciprofloxacin 75%, cefazolin 81.2%, ceftriaxone 81.2% and cefepime 84.3% respectively.

The isolates were sensitive to Magnex (cefoperazone+ sulbactam) about 81.25%.

The second most sample which yielded E.coli was pus predominantly seen in people above the age of 60.

Study on prevalence of bacterial isolates from pus samples collected from patients in a tertiary care hospital of Punjab, India, Escherichia coli was the most prevalent pathogen followed by Staphylococcus aureus 21%[10].

CONCLUSION

This study highlights the prevalence of Escherichia coli in all clinical samples at Govt. Medical College Thiruvananthapuram and the susceptibility pattern of bacterial isolates. The present study reveals that Escherichia coli was most commonly isolated from the urine samples of patients with urinary tract infections followed by pus and swabs. The infections were predominantly seen in the people belonging to age between 20 to 60 especially in females.

The antibiotic sensitivity pattern of the Escherichia coli was studied. Isolates show maximum susceptibility to cefoperazone + sulbactam about 81.25%. Susceptibility to Cotrimoxazole was 53.1% and Amikacin 53%. About 54.3% E.coli were Multi Drug Resistant (MDR).

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