Czech
Journal of Multidisciplinary Innovations
Volume 52, April 2026.
Website: www.peerianjournal.com
ISSN (E): 2788-0389
Email: editor@peerianjournal.com

Study of Bacterial Aetiology of Urinary Tract Infection in Hospitalized Patients with Urinary Catheters in Afaq Hospital

Dhulfiqar Nidhal mutar
Ministry of Education, Al-Qadisiyah Education Directorate
fqaraljbwry3@gmail.com

Abstracts
Urinary catheterisation is a method sometimes used by doctors (in abnormal cases) to remove the largest amount of urine, such as during childbirth operations, especially when the back needle is taken, or in the case of a congenital defect in the structure of the urinary system or in the case of tumours or bladder dysfunction, and involves inserting a tube inside the urinary system, sometimes certain bacteria are present on the parts of the catheter, which causes urinary tract infections. Sometimes certain bacteria are present on the parts of the catheter, which makes them cause urinary tract infections, and one of these bacteria is E. coli, which is considered a normal flora in the intestine, but it maybe pathogenic if it is present elsewhere and is one of the most common bacteria causing urinary tract infections, and is a mobile, gram negative, lactose fermenting, methyl red and indole positive bacterium.

Keywords: Urinary catheterisation

Introduction
Urine, which is made up of waste and excess fluid, is removed from the body through the urinary tract. Normal urination requires the proper coordination of all bodily components in the urinary tract, including the bladder, which temporarily stores urine, the ureters, which are two muscular tubes that carry urine from each kidney, like all other organ systems in the body, germs can assault the urinary tract and cause bacterial illnesses. Several locations throughout the urinary system may get infected, including the Bladder infections or cystitis are other names for bladder infections. Kidneys an infection of one or both kidneys is called pyelonephritis or a kidney infection. Ureters The tubes that take urine from each kidney to the bladder are rarely the only site of infection. Urethra define as urethritis is an infection of the tube that drains urine from the bladder to the outside.

• Urinary catheter-associated bacteria are a major source of infections. Urinary catheterization is classified as either short-term (insitu less than 28 days) or long-term (insitu greater than 28 days), and it is characterized as an intervention to assist bladder emptying by inserting a catheter in dwindling E. coli is an example of a bacterium that induces inflammation. E. Coli is a facultative, anaerobic, gram-negative coliform bacterium that does not produce spores. Usually rod-shaped, the cells measure 0.6 to 0.7 μm² and are about 2.0 μm long and 0.25 to 1.0 μm in diameter. It can be a pathogenic agent or normal flora.

1. Urinary catheter

Czech
Journal of Multidisciplinary Innovations
Volume 52, April 2026.
ISSN (E): 2788-0389
Website: www.peerianjournal.com
Email: editor@peerianjournal.com

Semi-rigid, flexible tubes are called indwelling urinary catheters, or IUCs. They obstruct the urethra yet empty the bladder. IUCs have two lumens, or independent channels, that extend longitudinally. By connecting to a drainage bag, one of the lumen's open ends permits urine to drain. (Beutner K, Jahn P., Langer G2012, Issue 10) The balloon is filled with sterile water when it is inside the bladder, allowing for retention in the bladder. The other lumen has a valve on the outside end and attaches to a balloon at the tip. We call these two-way catheters.

The inventor of the Foley catheter, Frederic Foley, a surgeon practicing in Boston, Massachusetts in the 1930s, is credited with giving it its name. C. R. Bard, Inc. took his original idea, produced the first prototypes, and gave them the surgeon's name (Switzerland: Springer International Publishing, 2018, 47-77).

1.2 Indications for catheterisation.

There is a large variety of diagnoses that may lead to the need for catheterisation. Sometimes catheters are only needed temporarily during hospitalisation. More often they are used permanently when the bladder does not function normally or when the bladder cannot be controlled. Catheterisation can be used as a solution for bladder retention (inability to empty the bladder) or urinary incontinence (inability to control the bladder) (] Lapides J, Diokno AC, Silber SJ, Lowe BS (1972)

1.3 Catheterised pathology's.

One of the urinary system's defences against bacteria is the flow of acidic urine, which kills bacteria in the urinary tract and catheters prevent this. In addition, bacteria may be present on the urinary catheters, causing them to enter directly into the urinary tract (nosocomial infections).(Maki Dj 2001)

2.4 risk factor of catheter

1. Duration of catheterisation
2. Underlying neurological disease
3. Female gender
4. Diabetes mellitus (saint 5,chenwith2003)

When it affects the upper urinary tract it is known as a kidney infection (pyelonephritis)(Lane DR, Takhar SS (August 2011

2. urinary tract infection.

Common infections known as UTIs occur when bacteria, frequently from the rectum of the skin, enter the urethra and infect the urinary system. The most prevalent kind of infection is bladder infection (cystitis), though it can affect other areas of the urinary tract as well. Another kind of UTI is pyelonephritis, or kidney infection. It is referred to as a kidney infection (pyelonephritis) when it affects the upper urinary tract and as a bladder infection (cystitis) when it affects the lower urinary tract (Lane DR, Takhar SS, August 2011).

Czech
Journal of Multidisciplinary Innovations
Volume 52, April 2026.
ISSN (E): 2788-0389
Website: www.peerianjournal.com
Email: editor@peerianjournal.com

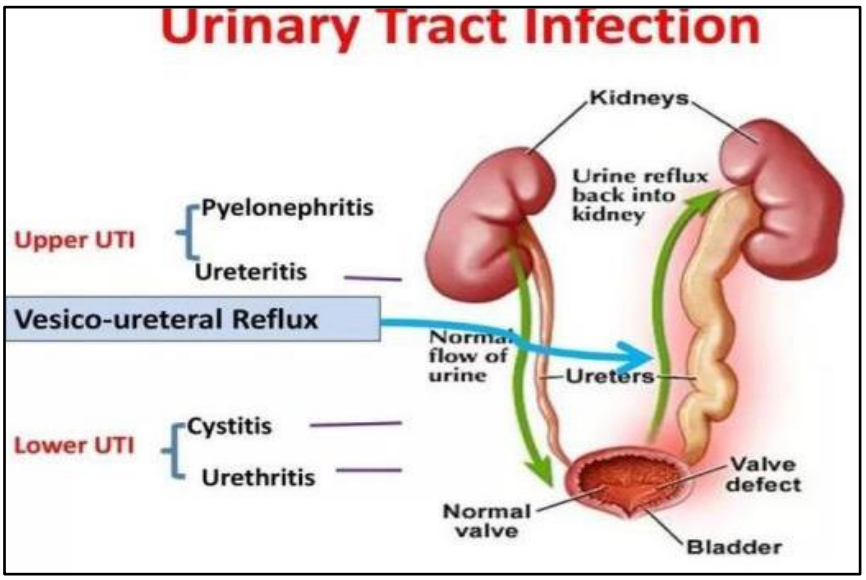

Figure1. Urinary tract infection

Urinary tract infections are the most frequent bacterial infection in women. This is due to the shorter urethra compared to men. Note fig -2- where women affected at four times the rate of men (Colgan R, Williams M (October 2011).

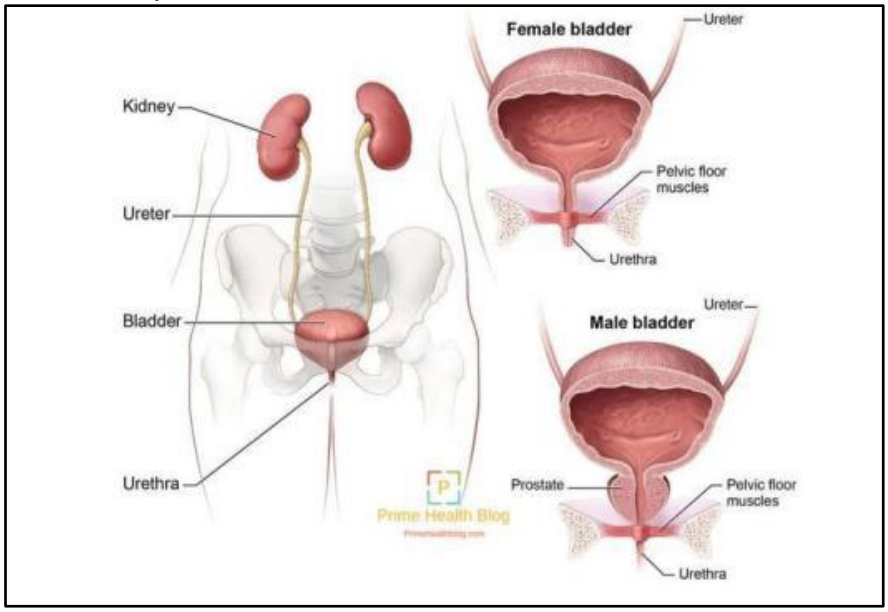

Figure 2. women affected at four times the rate of men

2.1 Symptoms

The symptoms of a bladder infection include:

1. Bloody or murky urine with a strong or unpleasant odor.
2. Some patients have low-grade fever.

Czech
Journal of Multidisciplinary Innovations
Volume 52, April 2026.
ISSN (E): 2788-0389
Website: www.peerianjournal.com
Email: editor@peerianjournal.com

3. Burning or pain when urinating.
4. Back or lower abdominal pressure or cramps.
5. An intense urge to urinate frequently, even immediately after emptying the bladder.
6. The following signs could appear if the infection spreads to your kidneys.
7. Shaking, chills, or sweats at night.
8. Weariness and an overall sense of unwellness.
9. A fever higher than 101°F (38.3°C).
10. Back, groin, or side pain.
11. Reddened, heated, or flushed skin.
12. Mental alterations or disorientation (these symptoms are frequently the only indications of a UTI in older adults).
13. Nausea and vomiting.
14. Severe abdominal pain (sometimes(Nicolle LE, Drekonja D.Elsevier; 2020:chap 268.).

2.3 BACTRIA THAT CAUSE URINARY TRACT INFECTION

Though the overall percentage for each category varied, Escherichia coli was the most common infection across all categories. The next three pathogens of importance were Enterococcus faecalis, Klebsiella pneumoniae and Proteus mirabilis which varied in prevalence slightly from category to category'(Brill JR (April 2010).

2.3.1 Enchrishia coli

Enchrishia coli is a normal bacterium found in the intestines of humans and animals; yet, it can be opportunistic, causing several disorders such as diarrhea, Bacteraemia, septicaemia, and meningitis. It is one of the most prevalent forms of bacteria that cause urinary tract infections. Generating around 90% of urinary tract infections around the world (Hadi et al, 2014) and is a member of the Gram-negative intestinal family, bacilliform, motile or non-motile, aerobic or anaerobic, optionally lactose-fermenting and predominantly rhamnose and sorbitol-fermenting, producing the enzyme g B-glucolomidas at the appropriate temperature for their growth (36-37) Wagner et al., 2016.

2.3.1.1 Types of E.coli

1_shiga_toxin producing E.coli (STEC) or Entrohemoragic E.coli (EHEC).
2_Entropathogenic E.coli(EPEC).
3_Entrotoxiogenic E.coli(EAEC).
4_Diffusely Adhering E.coli(DAEC).
(Melema et al 2018 Rivas et al 2015).

2.3.1.2 E. Coli resistance to antibiotics.

Static phase microorganisms create secondary or synthetic compounds called antibiotics, which can suppress other germs without harming the host (cumes_florens et al., 2011). Antibiotics are divided into narrow-spectrum antibiotics that affect a specific type of microorganism, broad-spectrum antibiotics that are effective on Gram-positive and Gram-negative bacteria (Tortora et al., 2010) and others that have an inhibitory effect (Ali et al., 2018; 2001),

Antibiotics have caused bacteria to develop antibiotic resistance, which can be innate or acquired by gene alterations (chromosomal mutations) or by genetic material being transferred from one bacterium to another in a number of ways, either directly such as plasmid or mutant genes, or by transformation and genetic information is transferred by phages (Laird, 2016),2016). Mutations

Czech
Journal of Multidisciplinary Innovations
Volume 52, April 2026.
ISSN (E): 2788-0389
Website: www.peerianjournal.com
Email: editor@peerianjournal.com

have led to increased resistance in bacteria and one of the most resistant bacteria is E. coli (Afzal, 2017, Shariff et al.3013

Resistance is produced through.

1. Change in the location of the target.
2. Change in cell membrane permeability.
3. Production of enzymes.
4. Changing metabolic pathways.

2.3.1.3 E. coli UTI pathogenesis

The complicated process of UTI pathogenesis is impacted by the characteristics of the infecting pathogen, including VFs, as well as a number of host biological and behavioral variables. The confounding influence of host variables makes it difficult to determine the function of particular VFs in UTI development in epidemiological research.

Urine flow, tissue-associated and secreted antibacterial agents, and the bactericidal actions of effector immune cells keep external germs from entering the urinary system, which is generally sterile in the majority of noncompromised persons. The infecting E. coli strain is often derived from the host fecal flora and travels through the periurethral, vaginal, and perineal regions to the lower urinary system (i.e., urethra and bladder), where it may colonize.[Sebta M, Perez T, 2006}

Infection occurs according to the following mechanics

The complicated process of UTI pathogenesis is impacted by the characteristics of the infecting pathogen, including VFs, as well as a number of host biological and behavioral variables. The confounding influence of host variables makes it difficult to determine the function of particular VFs in UTI development in epidemiological research.

Urine flow, tissue-associated and secreted antibacterial agents, and the bactericidal actions of effector immune cells keep external germs from entering the urinary system, which is generally sterile in the majority of noncompromised persons. The infecting E. coli strain is often derived from the host fecal flora and travels through the periurethral, vaginal, and perineal regions to the lower urinary system (i.e., urethra and bladder), where it may colonize.[Sebta M, Perez T, 2006}

Urethritits;is the iflamation of the urethra that's the tube that carres the urin from the blader to outside the body.

Cystitis;is the iflamation of the blder usually caused by blader infection.Pyelonephritis; inflation of kidney.,

Lipopolysaccharides (LPSs), polysaccharide capsules, flagella, outer-membrane vesicles, fimbriae, curli, non-fimbrial adhesins, outer-membrane proteins (OMPs), and iron acquisition receptors are some of the UPEC components that frequently play a significant part in these events. Additionally, by taking the next six steps(Gribaudo, G.; Terlizzi, M.E.; 2017: 8, 1566).

- The first step is UPEC-induced periurethral and vaginal invasion and colonization.
- The second step is ascension into the bladder lumen and growth as planktonic cells in the urine.
- The third step is adherence to the surface and interaction with the defensive system of the bladder epithelium
- The third step adherence to the surface and interaction with the defensive system of the bladder epithelium

Czech
Journal of Multidisciplinary Innovations
Volume 52, April 2026.
ISSN (E): 2788-0389
Website: www.peerianjournal.com
Email: editor@peerianjournal.com

- The fourth step is biofilm formation.
- The fifth step is invasion and replication via the formation of IBCs in the bladder, where quiescent intracellular reservoirs (QIRs) arise in the underlying urothelium. The sixth step is kidney colonization(Dhakal, B.K.; Kulesus, R.R.;2008, 38, 2-11.)note

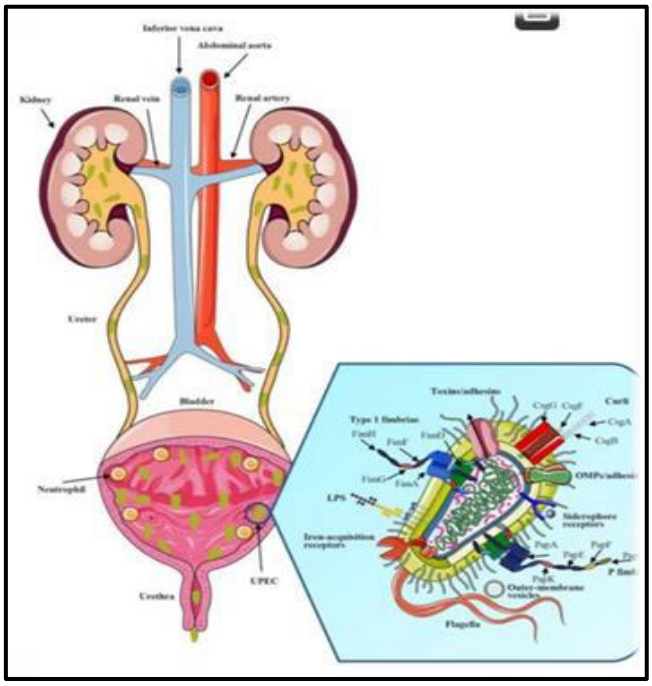

Figure 3. Steps of e-coli infection

Materials and methods

E. coli colonies appear pink on the MacConkey Agar plate, due to their ability to ferment lactose into lactic acid, thus changing the pH of the medium (the pH of the medium decreases) and the pink colour is formed due to the presence of phenol red indicator.

Between December 2024 and February 2025, 42 samples were collected from Afak General Hospital Samples include all ages and both gender

Table 1. laboratory equipement,dayes and chemicals used in the search

No	Name of device
1	Autoclave
2	Sensitive balance
3	Digital camera
4	Light microscope
5	Hot plate
6	Water bath

Czech
Journal of Multidisciplinary Innovations
Volume 52, April 2026.
ISSN (E): 2788-0389
Website: www.peerianjournal.com
Email: editor@peerianjournal.com

7	Distiller
8	Incubator
9	Vortex mixer
10	Laminar flow cabent
11	Refrigerator
12	Standard wire loop
13	Conical flask
14	Disposable petri dishs
15	Slide and cover slide
16	Test tube
17	glycerol
18	Methyled
19	Agar-agar
20	Gram stain
21	Indol test

3.4 Preparation of bacterial culture media.

3.4.1 MacConkey agar medium

Prepared according to the preparation method at Diwaniyah Teaching Hospital and the company's instructions as follows, dissolve 50 g of medium in 950 ml of water using (Autoclave) at a temperature of 121 C for 20 minutes was used to isolate Gram-negative bacteria, and differentiate between lactose-fermenting and non-fermenting isolates.

3.4.2 Blood Aggar

This medium was prepared according to the company's instructions, by dissolving 40 g of blood base in 950 ml of distilled water, adjusting the pH to 7.4, then completing the volume to 1000 ml and autoclaving at 121C for 20 minutes, and the medium was used to incubate aerobic and anaerobic isolates to test their ability to analyse blood.

3.4.3 Mueller Hinton Agar

It was prepared in accordance with the guidelines provided by the company and the laboratories of Afaq Teaching Hospital. To test the sensitivity of isolates to certain antibiotics using the disc diffusion method, 38g of the medium was dissolved in 950ml of distilled water, the pH was adjusted to 7.4, the volume was increased to 1000ml, and the autoclav was placed at 121C for 20 minutes.

3.4.4 Cysteine Lactose Electrolyte Deficient (CLED) agar

Cysteine Lactose Electrolyte Deficient (CLED) agar is a non-inhibitory growth medium used for isolation and differentiation of bacteria that cause urinary tract infections. Since CLED agar is electrolyte (salt) deficient, it can be used to prevent the swarming.

Table 2. the media and their used

Agricultural media	purpose
Peoten water	Use to detect the indole ring
Mack conky agar	Was used as a selective medium for gram negative bactia and to differentiate

Czech
Journal of Multidisciplinary Innovations
Volume 52, April 2026.
ISSN (E): 2788-0389
Website: www.peerianjournal.com
Email: editor@peerianjournal.com

	between reddish and nonreddish colonies of lactose
Blood agar	Used to measure the betalactamase enzyme's capacity to degrade blood
Mular –henton agar	Use to observe how antibiotics affect bacteria.
Cled agar	Cysteine Lactose Electrolyte Deficient (CLED) agar is a non-inhibitory growth medium used for isolation and differentiation of bacteria that cause urinary tract infections. Since CLED agar is electrolyte (salt) deficient, it can be used to prevent the swarming of

Results

• The eye was turbid in colour and after separation, the image under the microscope showed the presence of mobile structures indicating the presence of bacteria, as well as ethylene glycol and leukocytes, and some specimens with advanced cases showed haematuria.

• After confirming that it was a bacterium, we stained it to appear pink under a light microscope after the blue dye had disappeared.

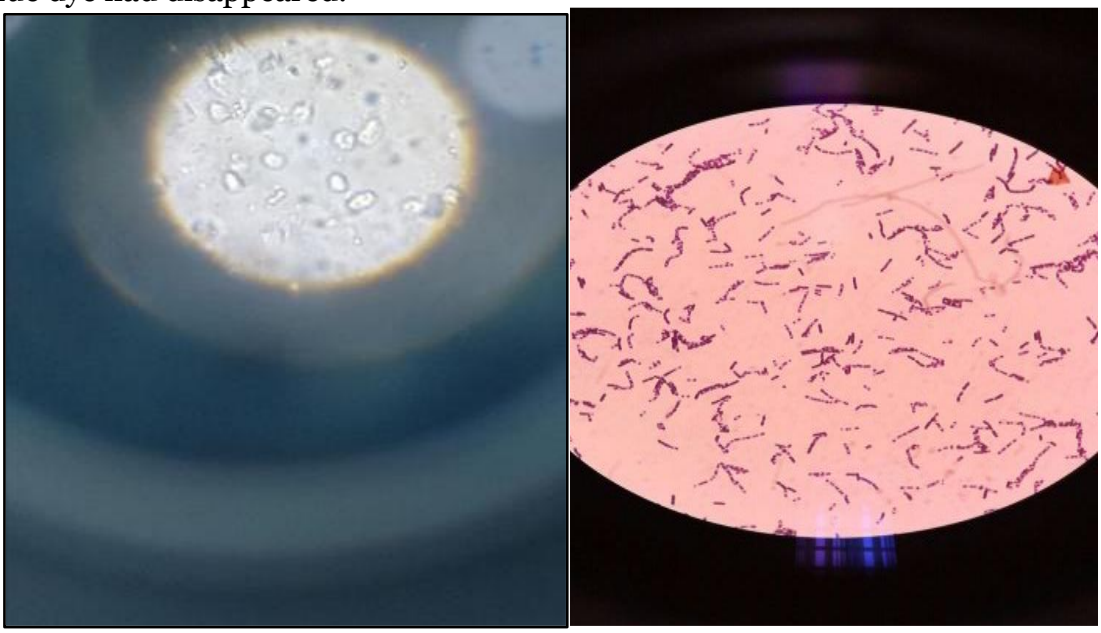

Fig 4 Urin sample of painting with UTI under microscope

Czech
Journal of Multidisciplinary Innovations
Volume 52, April 2026.
ISSN (E): 2788-0389
Website: www.peerianjournal.com
Email: editor@peerianjournal.com

4.1.2 staining

Note that the purple pigment first disappears and then the bacteria emerge with the pink pigment Note fig 7and the reason why the bacteria did not retain the dye is because the cell wall of gram negative bacteria consists of three layers: a mucopeptide layer known as peptidoglycan, a lipid layer, lipo polysaccharides, and a lipo protein layer.

Identification of E.coli

• growth on mack conkey agar

• E. coli colonies appear pink on the MacConkey Agar plate, due to their ability to ferment lactose into lactic acid, thus changing the pH of the medium (the pH of the medium decreases) and the pink colour is formed due to the presence of phenol red indicator, also E. coli colonies are characterised by being dry colonies on the MacConkey Agar plate.

Figure 5 .E. Coli colonies on the MacConkey Agar plate

4.3 .1 Results of bacterial isolation and culture

Table 3. the isolathion result statistics

Age	Male	Female	Total
1_10	_____	16%	16%
11_20	8%	4%	12%
21_30	4%	20%	24%
31_40	4%	4%	8%
41_50	12%	8%	20%
51_60	_____	8%	8%
61_70	4%	4%	8%

Czech
Journal of Multidisciplinary Innovations
Volume 52, April 2026.
ISSN (E): 2788-0389
Website: www.peerianjournal.com
Email: editor@peerianjournal.com

Total	32%	68%	52%

Blueprint 1 total infection and its divsion

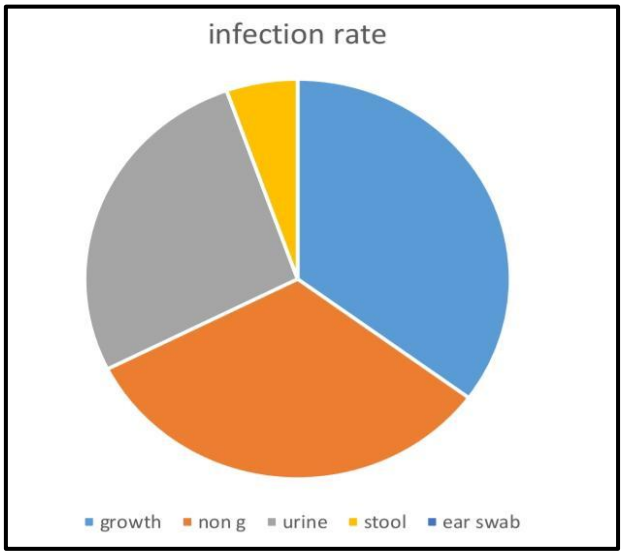

Figure 6. total infection and its divsion

4.3.2. 2 e coli on blood agar

On blood agar medium, the tested isolates formed colonies variable sizes ranging from 2 4mm after 24 hours of incubation. Depending upon conventional cultural procedures, the expected E.coli isolates were further tested for their he molytic activity on blood agar medium. After 24 hours of incubation the appearance of the colony varied between relatively large and opaque mucoid colonies which indicated a probable development of a capsule whereas others had transparent convex colonies. The ability of certain E.coli strains to lyse human. erythrocytes was termed as hemolysis as determined.

Czech
Journal of Multidisciplinary Innovations
Volume 52, April 2026.
ISSN (E): 2788-0389
Website: www.peerianjournal.com
Email: editor@peerianjournal.com

Figure 7. Growth of e coli on blood agar

4.3.2.3 E coli on CLED AgaR

Is a valuable non inhibitory growth medium used in the isolation a nd differentiation of urinary microbes. It contains cystine and lactoseWhen tested for E. coli, it shows a yellow colour as a result of [analytical ,fluka. Lactose fermenters produce colonies that appear as yellow, whereas colonies of non-lactose fermenters appear blue on CLED agar. E. coli forms colonies, which appear as yellowish, because the agar will turn yellowish.

FIgure 8. E Coli on CLE agar

4.3.2.4 E coli on mullar henton agar

The E. coli bacteria on Hinton Agar molar pla te showed a response to:

- Meropene
- Levofloxacin
- Amikacin
- Ciprofloxacin
- Amoxicillin_ clavulanate

The median response to:

- Nitrofuratoin

and resistant to:

- Tri methoprim
- Tetracycline
- Erythromycin

Note fig 9. E. Coli bacteria on Hinton Agar.

Czech
Journal of Multidisciplinary Innovations
Volume 52, April 2026.
ISSN (E): 2788-0389
Website: www.peerianjournal.com
Email: editor@peerianjournal.com

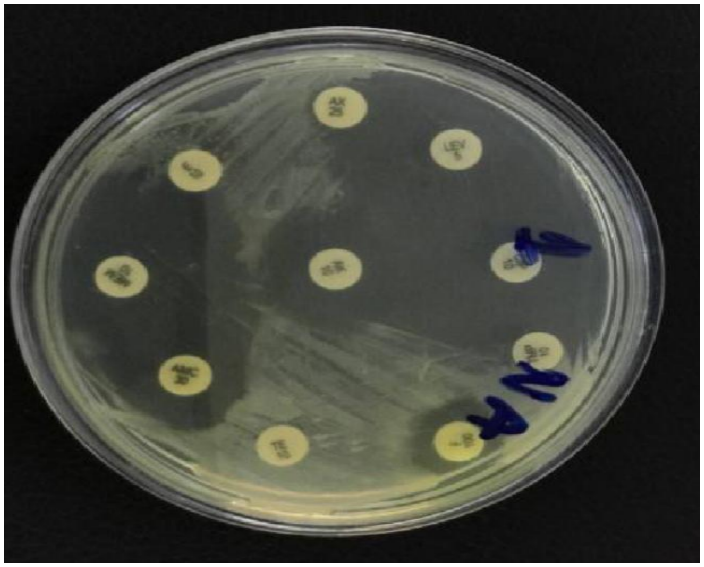

figure 9. E. Coli bacteria on Hinton Agar

Table 4, Illustration of antibiotic concentrations and response

NO	ANTIBOTICS	SYMBOL	CONCERATION	RESPONS
1	MEROPENEM	MEM	10	S
2	LEVOFLOXACIN	LEV	5	S
3	AMIKACIN	AK	10	S
4	CIPROFLOXACIN	CIP	10	S
5	AMPXICILINE	AMC	30	S
6	CEFERIAXON	AX	25	R
7	NITROFURANTOIN	F	100	I
8	TETRACYCLINE	TE	10	R
9	TRIMETHPRIN	TMP	10	R

Recommendations and conclusions

Conclusions

- Any medical instrument can be a route for bacterial infection if it is not properly sterilised.
- The use of alternative methods for bioprocesses has side effects as well as benefits.
- Normal flora can be harmful if it is not in its original location, one of the risk factors for this is the immunity of the human body.
- Bacteria in the bloodstream can lead to serious complications such as bacteraemia or septicaemia.

Czech
Journal of Multidisciplinary Innovations
Volume 52, April 2026.
ISSN (E): 2788-0389
Website: www.peerianjournal.com
Email: editor@peerianjournal.com

• The efficiency of the action of bacterial virulence factors can be influenced by a person's immunity or the use of antibiotics.
• Bacteria may be resistant to antibiotics as a result of mutations or excessive use of antibiotics.
• UTI can lead to serious complications if left untreated.

Recommendations

1. Patients should pay attention to personal hygiene.
2. Staff should pay attention to the cleanliness of medical instruments used in the catheter to avoid nosocomial infections.
3. Patients should take appropriate and calculated amounts of antibiotics to avoid antibiotic resistance that may be caused by taking larger amounts than necessary.
4. Patients should work to support their immune system to avoid any type of infection or to minimise the virulence of the bacteria that infect the body.

References

1. Jahn P. Beutner K, Langer G2012, Issue 10).
2. (Switzerland: Springer International Publishing, 2018, 47-77.
3. Frederic Foley, a surgeon working in Boston, Massachusetts, in the 1930s.
4. (Lapides J, Diokno AC, Silber SJ, Lowe BS (1972).
5. .(Maki Dj 2001).
6. pyelonephritis)(Lane DR, Takhar SS (August 2011)
7. Colgan R, Williams M (October 2011).
8. Elsevier; 2020:chap 268.
9. '(Brill JR (April 2010)
10. Wagner et al., 2016.
11. Melema et al 2018 Rivas et al 2015.
12. Ali et al., 2018; 2001
13.)Laird, 2016(
14.)Afzal, 2017, Shariff et al.3013
15. Perez t,sebta m,2006{
16.)Nielubowicz, G.R.; Mobley,Urol. 2010, 7, 430–441
17. Terlizzi, M.E.; Gribaudo, G.;2017, 8, 1566(
18. Dhakal, B.K.; Kulesus, R.R.;2008, 38, 2-11