IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 24, Issue 8 Ser. 2 (August. 2025), PP 59-65
www.iosrjournals.org

Bacterial Detection InCathrter-Related To Urogenital Infections

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Abstract
Background: *One of the most mutual contagions attained in the hospital setting is urinary tract infections (CUTI) associated with catheterisation. Indwelling urinary catheters are used recurrently in older people. The pathogens that most commonly cause CAUTIs are Staphylococcus auras. Staphylococci are spherical, gram-positive bacteria that belong to the Staphylococcaceae family.*
Objective*: Isolation and identification of bacterial infection from different inflammatory.*
Material and Method:*Throughout the retro between December-2024 to April-2025, an entire number of 200 specimens were collected from diwaniyah teaching hospitals with different genders and ages. Either the mid-stream method or a disinfected urine stayed used to collect urine samples. Within 30 minutes of being collected, the samples were analyzed. The samples were subjected to culturing as well after straight urine culture (physical attendance, infected urine dipstick, and microscopic inspection).*
Results:*According to the results of culture, Gram stain, biochemical tests, and the Vatek2 system, 53 isolates relevant to S. aureus were recognized.*
Conclusion: *Our study showed a upper occurrence of Catheter related urinary tract contagions (CAUTIs) in men than in women.*
Keywords: *gene expression ,16 srRNA gene,****cathrter-related to urogenital infections.***

Date of Submission: 01-08-2025 Date of Acceptance: 11-08-2025

I. Introdaction:

A catheterized sick curiously great urine bacterial count has stayed designated as a catheter-related urinary tract infection (CAUTI). A urinary catheter can allow bacteria or other microorganisms to enter the urinary tract and cause CAUTI. CAUTIs have been linked to higher rates of morbidity, mortality, length of stay, and medical expenses. Catheter-associated asymptomatic bacteriuria (CA-ASB), which lacks urinary tract-related expression or declaration, and CAUTI with urinary tract-related manifestations are the two categories into which it can be broadly divided. UTI acquired through medical devices account for up to 40% of hospital-acquired infections, making them one of the most prevalent infections acquired in healthcare settings[1].

Alternatively, [2] stated that certain symptoms I. e. CAUTIs are characterized by chills, fever, urine leakage around the catheter, pressure on the catheter, and pain and discomposure in the lesser posterior or stomach. If the patient is not treated and the catheter is left in place for an extended period of time, kidney damage, pyelonephritis, and even septicemia may result. Miriam and associates. [3]revealed that a living microbe (M. O) such as Lactobacillus, Enterococcus, Bifid bacteria, and Saccharomyces cerevisiae, which are common human flora, are thought to have positive health effects when taken or applied topically; this is known as probiotic. Humans benefit from probiotic M.O, which can inhibit Staphylococcus species. and other human infections through a variety of mechanisms, such as enhancing the function of the uro-epithelial barrier and boosting the immune response by communicating with immune system cells through a small number of antigen-presenting cells. Additionally, there is proof that probiotics can stop pathogens from colonizing. This can be accomplished through mechanisms like inhibiting pathogen adherence and downregulating Staphylococcus virulence factors that cause biofilm formation[4].

The pathogens that most commonly cause CAUTIs are *Staphylococcus aureus* [5]. It is impossible to rule out the presence of gram-positive bacteria in connection with the infection; S. aureus is one such pathogen

of scientific importance. However, 0–5–6% of infections are caused by S. aureus [6]. It should not be undervalued because an infection left untreated can cause serious, life-threatening illnesses. Scientific researchers have shown instances of S. aureus colonization and infection, despite research studies considering S. aureus isolation from urine samples to be secondary. The extent of S. aureus contagions in the urinary tract is increased by medical devices like indwelling catheters. Researchers have shown the importance of bacteremia leading to bacteriuria in patients following urological procedures involving urinary catheters, and numerous trainings have shown the occurrence of S. aureus contagion among patients at an increasing rate [7].

On urinary tract catheters and other indwelling devices, the staphylococci use four steps to form biofilm: adhesion, microcolony formation, maturation, and dispersion. Polysaccharide intercellular adhesin (PIA), whose synthesis is facilitated by ica-operon, which involves icaABCD genes and is responsible for its pathogenicity, is one of the virulence genes that helped staphylococci form biofilms. In biofilm, cells exchange more genetic material than they do with other cells, which leads to an increase in genes that resist antibiotics and other traits[8].

S. aureus can be a more useful example of the adaptive development of bacteria in the era of antibiotics than any other human disease because of its remarkable capacity to rapidly develop resistance to antibiotics, beginning with penicillin and methicillin[9]. Penicillin-compulsory protein 2a of methicillin resistant S. aureus is a remarkable example of a target altered with lower antibiotic affinity, in addition to enzymatic antibiotic inactivation (aminoglycoside-modification and enzymes penicillinase), efflux pumps and antibiotic trapping for tetracycline and fluoroquinolones are some examples of resistance mechanisms. *Staphylococci* stay currently single of the biggest communal health issues in all nations. Drug-resistant straining stayed chosen and disseminated as a consequence of mistakes in anti-staphylococcal therapy methods. Single of the greatest mutual reasons of nosocomial contagions, particularly in hospital sick and immunocompromised sick, stays multi-drug resistant staphylococc[10].

II. Material And Methods

Study design and population:

Throughout the retro between December-2024 to April-2025,200 urine samples were collected from patients with diabetes surgery with renal failure . The participants in this study reached in age from (15 -80) years and attended the hospitals of the AL-dwiayniah Health Directorate . Either the mid-stream methodused to collect urine samplesWithin 30 minutes of being collected, the samples were analyzed. The samples were subjected to culturing as well after straight urine culture onmanitol salt agar and incubated at 37°C ,then colonies were Gram stained and biochemical test are used and also the VITEK- 2 system and Bacterial Susceptibility to Antibiotics and molecular assay are used.

Moral agreement

The research was carried out in compliance with ethical standards, and consent was obtained from the patient or the patient's family before taking the sample. The study was conducted confidentially; moreover, this study was not disclosed, and the participation of patients was optional. The study system and approval form were reviewed by the Ethics Committee at the system and agreement formula were revised via the Ethics Commission at the College of medicine, University of Al-Qadisiyah).

III. Results And Discussion:

Isolation and Recognition:

During the study period, 200 urine samples were collected from patients with diabetes surgery with renal failure . The participants in this study reached in age from (15 -80) years and attended the hospitals of the AL-dwiayniah Health Directorate.

Sex and Ages Group:

All 200 sample were distributed between males 161 (80.5%) and females 39 (19.5%). In addition to that, they were distributed into five groups according to age: (15) years (20) patients, (16-30) years (25) patients, (31-45) years (30) patients, (46-60) years (75) patients, (61-80) years (50) patients. The results shown that the maximum ratio of contagion in the age (46-60) years in the rate of 75 (37.5%), followed by the age group (61-80) years in the rate of 50 (25%), (31-45) years in the rate of 30 (15 %), (16-30) years in rate of 25 (12.5%) , and finally (6-15) years in the rate of 20 (10%).

The results show that the infection in catheter patients in rate is high in the aged group 46-60 years, and the infection with bacteria *S. aureus* rate in males with a ratio of 39(73.5 %) is higher than females with a ratio of 14 (26.4%), asignificancedifferences between males and females (p=0.001),this study agrees with [11], and close to [12] with rate (67.7%) were male and (32.3%) were female. This result is not consistent with previous studies [13]. According to gender shown that males had a tendency to get burns, sputum, urine, and

wound infections with *S. aureus* more than females. This is due to the fact that males are more susceptible to environmental conditions in their lives than females, as well as the nature and type of work specified for males over females, and this result is agreed with [14].

Bacterial Cultural Results:

A total of 200 different clinical specimens (urinary catheters swabs) were gained as of Al-Diwaniyah Teaching Hospital as of December-2024 to April-2025 and cultured after addition and elimination principles.Out of whole cultured testers 49.5% (99 of 200) stayed positively for culturing, this proportion stood slightly lower than the proportion of negatively culture that stayed 50.5% (101 of 200) as indication in figure (1). This confirmation was seen after tests that showed the shape, size, color and surface structure were distinguished by conventional different types of media.

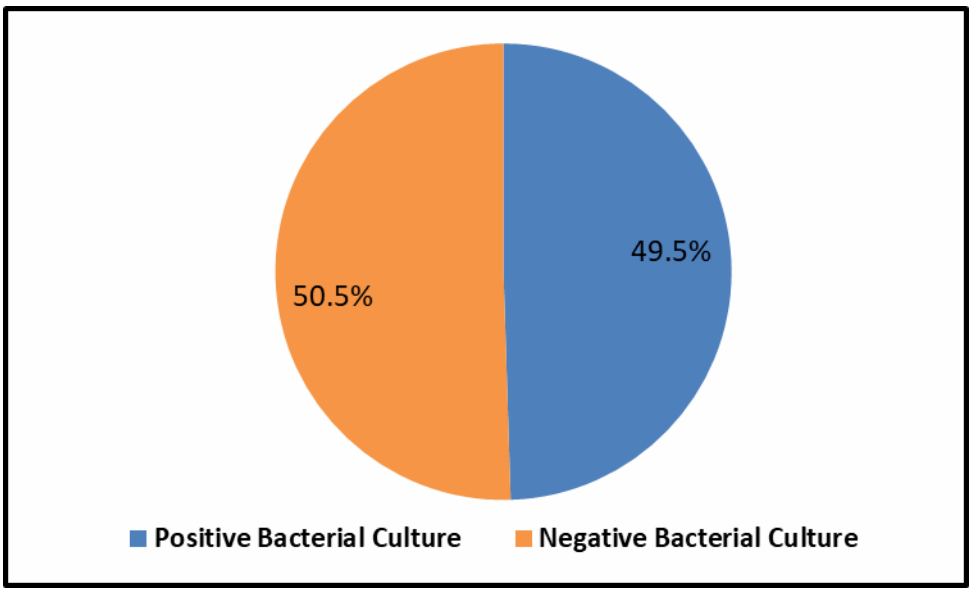

Figure (1): The occurrence proportion of positively and negatively outcomes of culture

Manual Identification of bacteria:

Manual identification of bacterial isolates were first made by bacteriological methods including Gram stain was conducted for all positive cultures (Gram positive and Gram negative bacteria). The conventional biochemical tests were used to characterize the isolated bacteria. All isolates showed catalase positive except GBS showed negative result and Coagulase test preformed for distinguishing between *Staphylococcuc spp., S. aureus* give positive result while other *Staphylococcus spp*. showed negative result. The other biochemical test shows in table

Laboratory culture showed that (99) showed growth of bacteria, and the reason for obtaining this percentage may be The total number of samples examined or the socioeconomic status of the individuals from whom the samples were selected. There were 101 samples that did not exhibit "bacteria" growth; this could be because other pathogens, such as viruses, parasites, or chlamydia, were present but could not be identified in this study, or it could be because antibiotics were effective in curing bacterial diseases and were able to kill bacteria, which resulted in their disappearance [15].In the study of [16] 65% of the isolates tested were positive for bacterial growth, which is compatible with the results of the bacterial isolation in this study. These findings largely concur with those of [17]in which the rate of bacterial isolation was 62%, however they disagree with those of [18]. 81% of the samples, according to his study. Blood has been added into the blood agar, It is a differential enrichment medium that is employed to grow microorganisms. A golden yellow tint denotes the appearance of S. aureus bacteria on the mannitol salt agar medium.

The findings of growth on this medium were generally consistent with the results of other research and with the results expected for the growth of S. aureus bacteria on this medium [19]. The word "golden" is the etymological origin of the name of the bacterium *S.aureus,* which refers to some strains' colonies. On a blood agar media, *S. aureus* normally produces a beta-hemolytic.

Table (1): Manual Identification of Bacteria .

Bacteria / Test	*S. aureus*
Gram stain	Positive

Oxidase	Nagtiv
Catalase	Positive
Indole	Nagtive
Citrate	Postive
Urease	Positive
Methyl red	Positive
Voges–Proskauer	Positive
Production H2S	Nagtive
Coagulase	Positive

All *S. aureus* isolates identified by manual biochemical tests were confirmed by the VITEK2 system. According to the findings, compared to isolates isolated from blood, *S. aureus* collected from urine appears to be more frequently antibiotic-resistant and to have more virulence genes [20].

VITEK-2 System for Detection of bacteria:

The VITEK-2 system has been used for the automatic documentation of ID-G^{+ve} chips (ID-GP cards) and ID-G^{-ve} chips (ID-GN cards) in accordance with the instructions of the constructer. This detection system is effective, fast and far from contaminated areas, which would complicate recognition of the pathogens. VITEK-2 ID-GP recognizes 124 types of staphylococcus, streptococcus, enterococcus and certain groups of G^{+ve} bacteria in 8 hours or fewer. A VITEK-2 ID-GN card recognizes within 10 hours 154 Enterobacteriaceae species and a select group of Gram-negative glucose-producing bacteria.The results showed that 53 isolates belonged to *S. aureus*, 10 belonged to *staphylococcus epidermidis*, 10 belonged to .The manufacturer defined the results as follows: excellent identification (97–99 percent); very good identification (94–96 percent); good identification (90–93 percent); and acceptable identification (85–89 percent). Completely the examination outcomes of the vitek-2 system stayed elucidated in table (2) and appendages (III).

Bacterial types	*N*	%	P value
S. aureus	53	26.5	< 0.001 HS
staphylococcus epidermidis	10	5.0	
staphylococcus haemolyticus	10	5.0	
staphylococcus hominies	7	3.5	
staphylococcus saprophyticus	6	3.0	
staphylococcus intermedius	6	3.0	
Streptococcus spp	4	2.0	
Proteus spp	3	1.5	
Total	99	49.5	

Bacterial Susceptibility to Antibiotics

Antibacterial susceptibility testing was performed with selected antibiotics that common used recommended by WHO (WHO., 2023).The Antibiotic susceptibility test stayed assessed through disc diffusion technique for in vitro antibiotic susceptibility tests.

The results showed in table (3) and represent the antibiogram profile of *Staphylococcus aureus*, indicate that isolates varied in their susceptibility to the antibiotics.*S. aureus* isolates revealed various resistance levels to antimicrobial agents as follows: Cefoxitin 94.3%, Penicillin 92.5%, Ofloxacin 77.4%, Erythromycin 69.8%, Moxifloxacin 66.0%, Norfloxacin 60.4%, Ciprofloxacin 56.6%, Levofloxacin 49.1%, Amikacin 35.8%, Gentamycin 30.2%, and Chloramphenicol only 7.5%.

Table (3): Percentage of S. aureus isolates fighting to antibiotics.

Antimicrobial categories	Antimicrobial agents	Interpretation		
		Sensitive	Intermediate	Resistance
Staphylococcus aureus				
Penicillin	Penicillin G	4 (7.5%)	0	49 (92.5%)
Cephems	Cefoxitin	3 (5.7%)	0	50 (94.3%)
Aminoglycosides	Gentamycin	32 (60.4%)	5 (9.4%)	16 (30.2%)
	Amikacin	23 (43.4%)	11 (20.8%)	19 (35.8%)
Macrolides	Erythromycin	8 (15.1%)	8 (15.1%)	37 (69.8%)
Fluoroquiolone	Ciprofloxacin	23 (43.4%)	0	30 (56.6%)
	Levofloxacin	21 (39.6%)	6 (11.3%)	26 (49.1%)
	Norfloxacin	21 (39.6%)	0	32 (60.4%)
	Moxifloxacin	15 (28.3%)	3 (5.7%)	35 (66.0%)

	Ofloxacin	12 (22.6%)	0	41 (77.4%)
Phenicols	Chloramphenicol	41 (77.4%)	8 (15.1%)	4 (7.5%)
X2	61.580			
P value	0.0001			

The test revealed a distinct difference in how the bacterial isolates responded. According to the findings, cefoxitin, a drug related to cephalosporins, had the highest prevalence of resistance (94.3%). This result was close to that of the study[21], by a rate of (94.3%).

The second highest rate to resistance was penicillin (92.5%), this results were compatible with researchers[22] ,where it was 90% of bacteria were penicillin-resistant, it was lowest than the ratio showed in the research [23], which was 93,5% . usage that is irregular or wrong to this antibiotics , which increases the stimulating bacteria more resistant. in addition to output of She hydrolyzed penicillinase enzyme by S. aureus bacteria .

While the lowest rate of resistance was 7.5% for chloramphenicol, this result very agrees with the study conducted by [24] and [25], when the resistant rate to chloramphenicol was 8.7%, while [26] found the resistance to chloramphenicol was 80% . These differences in results may be due to variations in geographic areas.

The findings showed that S.aureus resistance to erythromycin withrate (69.8%) which it is belongs to the macrolides antibiotic class, which is very closed to with study [27], Where was the resistance of bacteria to antibiotic with rate (67%), The fact that these antibiotics are frequently used to treat staphylococcal infections in Iraq is the cause of the high rate of resistance.

The results showed that S.aureus was resistant to Moxifloxacin at (66.0%),this result is so close to that of the researchers [28], when the resistance to Moxifloxacin was (64%), and close to that of the study [29], with a rate (55%).

The rate of resistance to levofloxacin was 49.1% against S. aureus; this finding agrees with the researchers [30] and is the same result as that shown in the study [31], with a rate (50%).

The resistance of S.aureus isolates to Norfloxacin with a rate 60.4% and ciprofloxacin with rate 56.6% , It is agree with the result [32] was 55% for ciprofloxacin and 59.6% for Norfloxacin while the results disagree with the study [33], where there is decrease in antibiotic resistance is Ciprofloxacin was rate 42.23% and Norfloxacin was rate 45.19%. This is the average rate of resistance to S.aureus comes from reduce taking these treatment, namely Ciprofloxacin, allowed for the treatment of infections caused by S. aureus strains, which quickly developed resistance to these drugs, and this might be accounted for by the fact that isolates did become highly resistant to this antibiotic as a result of its extensive use in compared to other antibiotics.

Amikacin and gentamicin are effective against clinically significant staphylococci and have a lethal effect on bacteria. The rate of resistance against S.aureus by using Gentamicin antibiotic was 30.2%, which is the same result that was shown to researchers [34]. The Amikacin resistance was 35.8% in our study, which is close to research [35].

Ofloxacin antibiotics showed resistance with a rate of 77.4% in our study,While this is a high percentage from research [36], the result was a ratio (85%).

Molecular detection of *S. aureus* bacteria in urinary catheters

The occurrence dissemination of sick with urinary catheters rendering to the fallouts of PCR for recognition *16SrRNA* genes of diverse bacterial types stood exposed in figure (2). The extant fallouts presented that the 16S ribosomal RNA gene for recognition *S. aureus* species stayed stated in 53 (100.0%) of the cases.

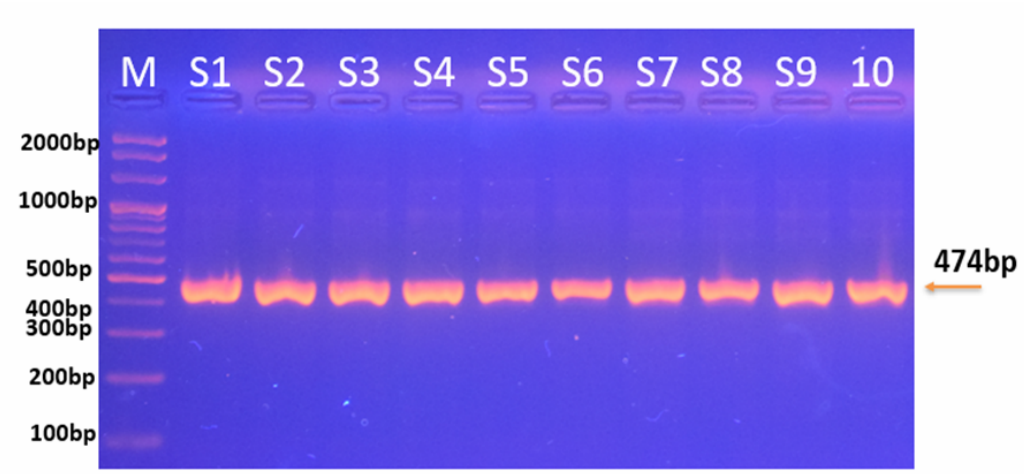

Figure (2): PCR creation investigation of the 16S ribosomal RNA gene in Staphylococcus aureus isolates was displayed in an agarose gel electrophoresis image. Lanes (1–10) and (M) of the marker ladder (2000–100 bp) demonstrated a positive detection of the Staphylococcus aureus 16S ribosomal RNA gene at a PCR product size of 474 bp.

IV. Conclusion:

Our study showed a upper occurrence of Catheter related urinary tract contagions (CAUTIs) in men than in women,The results showed that the maximum proportion of *S. aureus* antibiotic fighting to cefoxitin was found at 94.3%. And The outcomes indicated that the lowest proportion of *S. aureus* antibiotic fighting to chloramphenicol was 7.5%. Also the study results were indicative of the presence of 16s rRNA genes among the clinical isolates of *S. aureus*

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