Section: Microbiology

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BACTERIOLOGICAL PROFILE OF CATHETER ASSOCIATED URINARY TRACT INFECTION AND THEIR ANTIMICROBIAL SUSCEPTIBILITY PATTERN IN A TERTIARY CARE HOSPITAL

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Abstract

Background: Catheter associated urinary tract infections (CA-UTI) are the most frequent nosocomial infections caused by multidrug resistant uro-pathogens posing a challenge in treatment. The aim of the present study was to identify uro-pathogens causing UTI in patients with indwelling catheter and to assess their antibiotic susceptibility profile in a tertiary care hospital. **Materials and Methods:** Inpatients with indwelling urinary catheter for >48 hours with suspicion of CA-UTI at Government Mohan Kumaramanagalam Medical College Hospital, Salem, during the period from February 2020 to March 2020, were included in the study. Urine samples collected from those patients were processed microbiologically and antibiotic sensitivity test was performed. **Result:** Among 710 catheterized patients, urine samples were collected from 55 patients with suspicion of CA-UTI. On processing 24 samples yielded growth with 19(79.17%) gram- negative bacteria and 5 (20.83%) gram- positive bacteria.CA-UTI rate were 3.55 per 1000 catheter days over a period of 2 months. Incidence of CA-UTI was 3.38% in the present study. Most common microorganism isolated were Escherichia coli with 9 (37.5%) isolates followed by Klebsiella spp. 7(29.16%) isolates, Enterococcus spp. 3(12.5%) isolates, Acinetobacter spp. 2(8.33%) isolates, Staphylococcus aureus 2(8.33%) isolates and Pseudomonas aeruginosa 1(4.16%) isolate. Gram-negative isolates were sensitive predominantly to meropenem 17(89.47%) and imipenem14 (73.68%). Highest resistance was reported to ciprofloxacin14 (73.68%) and cotrimoxazole13 (72.22%). Gram -positive cocci showed 100% sensitivity to linezolid and vancomycin and completely resistant to ciprofloxacin, nitrofurantoin and gentamicin. **Conclusion:** Among the identified uro-pathogens Escherichia coli was the dominant pathogen. Gram-negative bacilli were highly sensitive to imepenem, meropenem and nitrofurantoin while Gram-positive cocci were highly sensitive to vancomycin and linezolid. Remarkable increase in multi-drug resistance for routinely prescribed antibiotic was noted in microorganisms causing CAUTI.

INTRODUCTION

Urinary tract infection (UTI) can be either community-acquired (Com-UTI) or catheter-associated (CA-UTI) in hospitals.CA-UTI is responsible for 80 % of all nosocomial UTIs.[1] Com-UTI is defined as urinary tract infection occurring in the community or in patients less than 48 hours of admission in the hospitals.[2] Next to ear infections, children are affected by UTI commonly and in elderly it accounts for 10–14% of infections. The term CA-UTI implies urinary tract infection where an indwelling urinary catheter is in situ for more than two calendar days from the day of device placement and manifesting symptoms.[3] The term catheter associated asymptomatic bacteriuria (CA-ASB) refers to individuals having symptomless urinary catheter captured infection which may be present in

2-10% of pregnancy, 10-15% of elderly, diabetes and spinal injuries.[4] The causative organisms of both Com-UTI and CA-UTI are Escherichia coli, Klebsiella spp., Proteus spp., Acinetobacter spp., Enterococci spp., Staphylococcus spp., and Pseudomonas aeruginosa. Treating complications of CA-UTI like meningitis, pyelonephritis, endocarditis and bacteremia is a mere challenge because of ESBL producing and carbapenem resistant organisms on the planes of indwelling catheters. Plethora of antimicrobial resistance leads to treatment failure and adds to financial burden of patients by lengthening their stay in hospitals.[5]

MATERIALS AND METHODS

This Descriptive, cross-sectional study was conducted in Microbiology Department, Mohan Kumaramanagalam Medical CollegeHospital, Salem, TamilNadu for a period of 2 months from February 2020 to March 2020.The study commenced after clearance from the Institutional Ethical Committee of GMKMCH Salem, Tamil Nadu, India (Ref. No. GMKMC&H/4341/1EC/2019-247) and informed consent was obtained.

Inclusion Criteria

Patients above 18 years of age, admitted in various wards with indwelling urinary catheter for >48 hours with clinical suspicion of CA-UTI were included.

Exclusion Criteria

Patients under 18 years of age, Patients who were treated with antibiotics previously, Patients on suprapubic and condom catheter were excluded. Also, excluded urine samples in which candida spp. and polymicrobes were isolated.

On clinical suspicion of CA-UTI from patients, urine samples were collected from foley's catheter under sterile aseptic technique under standard guidelines and transferred to a sterile leak-proof urine container. Samples were immediately transported to the microbiology laboratory. Using standard calibrated (4 mm diameter) wire loop, fixed 0.01ml of urine was inoculated into Macconkey agar, blood agar and Cysteine Lactose Electrolyte Deficient agar (CLED)and incubated at 37°C for 24 hours. A concentration of $\geq 10^5$ colony forming unit (CFU)/ml in pure culture was considered as significant bacteriuria.[6] Bacterial colonies were identified by Gram staining, motility, catalase test, coagulase test, oxidase test, indole test, citrate, urease and triple sugar iron tests. Antibiotic susceptibility testing was done by Kirby Bauer Disk diffusion method on Mueller Hinton agar as per Clinical and Laboratory Standards Institute (CLSI) guidelines.[7] Antimicrobial susceptibility of gram-positive organisms were tested with linezolid (30µg), vancomycin (30µg), cefoxitin (30µg), penicillin (10u), ciprofloxacin (5µg), co-trimoxazole (25µg), nitrofurantoin (300µg) and gentamycin (high level gentamycin 300µg for Enterococcus spp.). Antimicrobials tested for gram-negative organisms were amikacin (30µg), gentamicin (10µg), nitrofurantoin (300µg), imipenem (10µg), meropenem (10µg), ciprofloxacin (5µg), cefotaxime (30µg), doxycycline (30µg), cotrimoxazole (25µg), piperacillin-tazobactam (100/10µg), ceftazidime (30µg), cefoperazone-sulbactam (75/30µg), amoxicillin-clavulanate (20/10µg) and cefepime (30µg).Results were observed and documented. The CA-UTI rate per 1000 urinary catheter days was calculated by dividing the number of CA-UTIs by the number of catheter days and multiplying the result by 1000.[8] Incidence rate of CA-UTI was calculated by dividing the number of CA-UTIs by the number of catheterized patients.[9] Staphylococcus aureus ATCC 25923, Escherichia coli ATCC 25922 and Pseudomonas aeruginosa ATCC 27853 were used as quality control.

RESULTS

Among 710 catheterized patients, urine samples were collected from 55 patients having clinical signs or symptoms of UTI during 2months period. Out of 55 processed urine samples 24 cultures turned to be positive, 4 showed candida species and the 27 showed no growth.CA-UTI rate was 3.55% derived from 710 catheterized patients with 6750 catheter days. Incidence of CA-UTI was 3.38% in the present study. Among 24 CA-UTI cases, 19(79.17%) gram negative bacteria and5 (20.83%) gram-positive bacteria were recorded as in [Table 1]. Most common microorganisms isolated in CAUTI were Escherichia coli 9(37.5%) isolates, followed by Klebsiella spp.7(29.16%) isolates, Enterococcus spp.3(12.5%) isolates, Acinetobacter spp.2(8.33%) isolates, Staphylococcus aureus 2 (8.33%) isolates and Pseudomonas aeruginosa1 (4.16%) isolate as depicted in [Table 2]**.**

As illustrated in [Table 3], on wardwise analysis of CA-UTI cases, highest percentage of microorganisms were reported from Intensive Medical Care Unit, obstetrics& gynecology ICU and urology ward with 5 isolates (20.83%) each followed by surgical ward with 3 isolates (12.5%), nephrology ward, hybrid ICU and medicine ward with 2 isolates (8.33%).

According to [Table 4] among CA-UTI patient's male predominance was noted in 14 isolates (58.33%) and patient's belonging to 51-60 years of age predominated with 7 isolates (29.16%).

As illustrated in [Table 5] highest resistance was observed to ciprofloxacin in Klebsiella spp.2 (28.57%) isolates, and cotrimoxazole in E.coli 2(22.22%) isolates. Klebsiella spp., E.coli, and Acinetobacter spp. were highly sensitive to meropenem with 8(88.88%) isolates, 6(85.71%) isolates and 2(100%) respectively. Pseudomonas aeruginosa showed 100% sensitivity to meropenem and imipenem whereas Acinetobacter spp. showed 100% sensitivity to meropenem 50% sensitivity to imipenem and cefoperazone-sulbactam. Non-

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fermenters involved in CA-UTI showed complete resistance to amikacin, gentamicin, ciprofloxacin, piperacillin-tazobactam, cefepime, ceftazidime, nitrofurantoin. Acinetobacter spp. showed resistance to cotrimoxazole and cefotaxime in addition.

As depicted in [Table 6] gram-negative isolates were sensitive predominantly to imipenem 14(73.68%) and meropenem17 (89.47%). On overall analysis of antibiogram of gram-negative isolates CA-UTI causing organisms showed high multidrug resistance. Highest resistance reported to ciprofloxacin in 14(73.68%) isolates, cotrimoxazole 13 (72.22%) isolates followed by gentamicin and ceftazidime 12(63.16%) isolates. Resistance of9(56.25%) isolates to amoxicillin-clavulanate, 10(55.55%)isolates to cefotaxime,10(52.63%) to cefepime, 9(47.37%) isolates to amikacin, 8(42.11%) isolates to piperacillin-tazobactam, 8(42.11%)isolates to cefoperazone- sulbactam, 5(31.25%) isolates to nitrofurantoin, 5(26.32%) isolates to imipenem and 2(10.53%) isolates to meropenem as documented in [Table 6].

According to [Table 7] both MRSA and Enterococcus spp. causing CA-UTI, showed100% sensitivity to linezolid and vancomycin and highest resistance to ciprofloxacin, nitrofurantoin and gentamicin. MRSA were resistant to penicillin but Enterococcus spp. showed moderate sensitivity to the same**.** MRSA were completely resistant to cotrimoxazole. On overall analysis gram-positive isolates causing CA-UTI, showed high level of multidrug resistance as revealed in [Table 8].

Table 1: Organism wise distribution in CA-UTI

Organism	No of cases N=24	Percentage
Gram negative bacteria	19	79.17%
Gram positive bacteria	5	20.83%

Table 2: Diversity of bacteria isolated from CA-UTI*

No	Organisms	CA-UTI n=24
1	Escherichia coli	9(37.5%)
2	Klebsiella spp.	7(29.16%)
3	Enterococcus spp.	3(12.5%)
4	Acinetobacter spp.	2(8.33%)
5	Staphylococcus aureus	2(8.33%)
6	Pseudomonas aeruginosa	1(4.16%)
*CA-UTI-Catheter associated urinary tract infection		

Table 3: Distribution of CA-UTI patients in wards

WARD	Escherichia coli N=9	Klebsiella spp. N=7	Enterococcus spp. N=3	Acinetobacter spp. N=2	Staphylococcus aureus N=2	Pseudomonas aeruginosa N=1	Total number of isolates and percentage N=24
IMCU	2	1		1	1		5(20.83%)
OG ICU	2	1	1		1		5(20.83%)
Urology	2	2				1	5(20.83%)
Surgery	1		2				3(12.5%)
Nephrology	1	1					2(8.33%)
Hybrid ICU		2					2(8.33%)
Medicine	1			1			2(8.33%)

Table 4: Age and Gender wise distribution of CA-UTI patients

Age in years	Escherichia coli N=9		Klebsiella spp. N=7		Enterococcus spp. N=3		Acinetobacter spp. N=2		Staphylococcus aureus N=2		Pseudomonas aeruginosa N=1		Total number of isolates and percentage N=24
	M*	F†	M*	F†	M*	F†	M*	F†	M*	F†	M*	F†	
20-30	-	2	-	1	-	2	-	-	-		-	-	5(20.83%)
31-40	-	-	-	-	-	-	1	-	-	1	-		2(8.33%)
41-50	1	1	1	-	-	-	-	-	-	1	-		4(16.66%)
51-60	1	1	2	-	1	-	-	1	1	-	-	-	7(29.16%)
61-70	1	-	2	-		-	-	-	-	-	-	1	4(16.66%)
>70	2	-	1	-	-	-	-	-	-	-	-	-	3(12.5%)
*Male† Female													

Table 5: Susceptibility pattern of gram-negative isolates in CA-UTI patients

Antibiotics tested	E. coli n=9	Klebsiella spp. n=7	Pseudomonas aeruginosa n=1	Acinetobacter spp. n=2
Amikacin	6(66.66%)	4(57.14%)	0(0%)	0(0%)
Gentamicin	4(44.44%)	3(42.85%)	0(0%)	0(0%)
Ciprofloxacin	3(33.33%)	2(28.57%)	0(0%)	0(0%)
Cotrimoxazole	2(22.22%)	3(42.85%)	*NT	0(0%)

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Nitrofurantoin	7(77.77%)	4(57.14%)	*NT	*NT
Cefotaxime	4(44.44%)	4(57.14%)	*NT	0(0%)
CFS†	5(55.55%)	5(71.42%)	0(0%)	1(50%)
Imipenem	7(77.77%)	5(71.42%)	1(100%)	1(50%)
Meropenem	8(88.88%)	6(85.71%)	1(100%)	2(100%)
AMC‡	4(44.44%)	3(42.85%)	*NT	*NT
PIT§	6(66.66%)	5(71.42%)	0(0%)	0(0%)
Ceftazidime	3(33.33%)	4(57.14%)	0(0%)	0(0%)
Cefepime	4(44.44%)	5(71.42%)	0(0%)	0(0%)
Abbreviation: NT*- Not tested-†, CFS: Cefoperazone– sulbactam, ‡AMC: Amoxicillin-clavulanate, §PIT: Piperacillin-Tazobactam				

Table 6: Antibiotic susceptibility of gram-negative isolates in CA-UTI

Antimicrobial agent	Sensitive N=19	Resistant N=19
Amikacin	10(52.63%)	9(47.37%)
Gentamicin	7(36.84%)	12(63.16%)
Ciprofloxacin	5(26.31%)	14(73.68%)
Cotrimoxazole‖	5(27.78%)	13(72.22%)
Nitrofurantoin**	11(68.75%)	5(31.25%)
Cefotaxime††	8(44.44%)	10(55.55%)
Cefoperazone sulbactam	11(57.89%)	8(42.11%)
Imipenem	14(73.68%)	5(26.32%)
Meropenem	17(89.47%)	2(10.53%)
Amoxicillin-clavulanate‡‡	7(43.75%)	9(56.25%)
Piperacillin-Tazobactam	11(57.89%)	8(42.11%)
Ceftazidime	7(36.84%)	12(63.16%)
Cefepime	9(47.37%)	10(52.63%)
Cotrimoxazole-18isolates, **Nitrofurantoin-16 isolates, †† Cefotaxime -18 isolates, ‡‡Amoxicillin-clavulanate -16 isolates.		

Table 7: Susceptibility profile of gram-positive organism in CA-UTI

Antimicrobial agent	Enterococcus spp.(n=3)	Staphylococcus aureus(n=2)
Penicillin	1(33.33%)	0(0%)
Linezolid	3(100%)	2(100%)
Vancomycin	3(100%)	2(100%)
Ciprofloxacin	0(%)	0(0%)
Gentamicin§§	0(%)	0(0%)
Nitrofurantoin	0(%)	0(0%)
Cotrimoxazole	NT‖	0(0%)
Cefoxitin	NT‖	0(0%)
Abbreviation: §§In enterococcus spp., High level gentamycin used, ‖NT-Not tested		

Table 8: Antibiotic susceptibility of gram-positive isolates in CA-UTI

Antimicrobial agent	CAUTI n=5	
	Resistant	Sensitive
Penicillin	4(80%)	0(0%)
Linezolid	0(0%)	2(100%)
Vancomycin	0(0%)	2(100%)
Ciprofloxacin	5(100%)	0(0%)
Gentamicin***	5(100%)	0(0%)
Nitrofurantoin	5(100%)	0(0%)
Cotrimoxazole†††	2(100%)	0(0%)
Cefoxitin‡‡‡	2(100%)	0(0%)
***Including high level Gentamicin in *Enterococcus spp.*,††† Cotrimoxazole (two isolates), ‡‡‡ Cefoxitin (two isolates).		

DISCUSSION

Main risk factor for CA-UTI is catheterization for more than six days and usage of latex catheters and poor hygiene. Procedures involving estimation of urine output by catheterization, urinary stenting and unsterile catheter insertion techniques could lead to colonization of microorganisms. People with diabetes mellitus usually have incomplete bladder emptying due to neuropathy and hyperglycemia which results in glycosuria favoring growth of pathogenic organism. Moreover, these patients have immunosuppression.

The endogenous urinary tract infections can occur by the patient's intestinal flora on urinary catheters. In normal active people the urine flows from renal pelvis to the bladder by gravity whereas in bedridden patients with catheter in situ for longtime, impeded urine flow causes microbial growth. Faecal incontinence in neurological conditions and poor maintenance of catheter are also some of the factors contributing to CAUTI.[10]

Innate immunity of epithelium of urinary tract prevents microbial adhesion but insertion of catheter results in mechanical injury of epithelium and colonization of different spectrum of pathogens. Mode of spread of bacteria could also be from the contaminated bags to the bladder by intraluminal ascend by reflux of urine or extraluminally especially in females having short urethra who are likely to have microbial contamination from periurethral and rectal areas.[11] Fibrinogen deposits on the surface of catheter as an immune response leading to biofilm formation of uropathogens causing epithelial damage of urinary tract.[12]

Similar to present study, Hanumantha S et al 2014 has documented incidence of CA-UTI as 3.65 per 1000 catheter days.[13] Kalaivani Ramakrishnan et al 2019 has determined CA-UTI rate as 2.9%.[14] M. Aravind et al 2014 as 1.47%,[15] Vishwajith et al 2021 as 1.74%,[5] and Podder et al 2000 as 1.9 %.[3] per 1000 urinary catheter days. Oumer Y et al 2021 reported overall prevalence of symptomatic CAUTI as 16.9%.[16] Overall variation in prevalence of CA-UTI could be attributed to difference in study protocols, sample size, methodological variation and duration of study. Strict adherence to infection control programmes, frequent training of hospital personnel about catheter care and hand hygiene could have lowered the CA-UTI rate in the present study. Exclusion of samples from patients with asymptomatic bacteriuria could be another factor for low CAUTI rate.

Present study documented 19 gram-negative isolates and 5 gram-positive isolates which was in concurrence with the Bizuayehu et al 2019 who has reported50 (63.3%) gram-negative isolates and 29 (36.7%) gram-positive isolates out of 79 bacterial isolates.[17] Oumer Y et al 2021 has reported 33 (78.57%) gram-negative bacilli and 9 (22.5%) gram-positive cocci out of 42 bacterial isolates [16]

This study revealed dominance of Escherichia coli 9((37.5%) isolates followed by Klebsiella spp., 7(29.16%) isolates. Similarly Poddar N et al 2020 has documented, 19(25%)isolates of Escherichia coli along with Klebsiella spp.14(19%), Proteus spp.8 (11%) isolates, Pseudomonas 6(8%) isolates, Acinetobacter spp.4(8%) isolates, Enterococcus spp.17(22%) isolates and Staphylococcus 3 (4%)isolates causing CA-UTI.[3] In concordance to our study, Kalaivani Ramakrishnan et al 2019 disclosed that Escherichia coli and Klebsiella pneumoniae were found to be the most common bacterial pathogen to cause CA-UTI.[14] Oumer Y et al has reported E. coli (40.47%) isolates followed by Klebsiella spp. (21.43%) isolates as uro-pathogens causing CA-UTI. Since these bacteria are predominant normal flora of gut, during catheter insertion they ascend into urinary tract causing UTI.[16] In contrary Bizuayehu Het al reported Acinetobacter spp. as the predominant one with 30.0% of bacterial isolates followed by Pseudomonas spp. (24.0%), Klebsiella spp. (22.0%), and E. coli (16.0%).[17]

In the current study Methicillin Resistant Staphylococcus aureus and Enterococcus spp. were most commonly isolated from CA-UTI. Similar to our study Podder et al 2000 has concluded, common gram- positive cocci in CAUTI as Enterococcus spp. 17(22%) followed by Staphylococcus spp. 3(4%).[3] In contrast to present study Bardoloi et al 2017 reported S. aureus as the most common gram-positive cocci isolated from CA-UTI.[1] Bizuayehu et al 2019 reported Enterococcus species as a dominant gram-positive bacterial isolates 62.1% of the total followed by S.epidermidis with 37.9%.[17]

As summarized in [Table 3] in the present study CAUTI was reported mainly from IMCU, OG ICU, and urology ward, each with 5(20.83%) isolates. Bizuayehu H etal2022 has reported CAUTI mainly from emergency ICUwith62.3%.[17] Najla A. Obaid 2023 also documented 106 (64.2%) isolates in ICU.[19] According to [Table 4] male predominance noted in CA-UTI. Similarly. Kalaivani Ramakrishnan 2019 reported that majority of CAUTI patients were found to be male gender 69% and followed by 31% of females,[14] and Bizuayehu Het al2022 reported 65.5% males affected by CAUTI.[17] The reason for males affected more than females could be due to benign prostatic hypertrophy in males.

Present study reported patient's belonging to 51-60 years of age predominantly with 7 isolates (29.16%) followed by 20-30 years with 5(20.83%) organisms. As recorded by Oumer Y et al 2021, 25 (66.6%) in the age group of more than 60 years were more affected by CAUTI.[16] Anggi A et al 2019hasdocumented less than 50 years old were more affected by CAUTI in their study.[18] M. Aravind et al 2014 has reported CAUTI in 18-29 year and 60-69 year.[15] Since CAUTI is more common in elderly patients, special catheter care and treatment must be guaranteed in them.

In the current study, highest resistance in gram negative bacilli was reported in ciprofloxacin 14(73.68%) isolates, cotrimoxazole 13(72.22%) isolates followed by gentamicin and ceftazidime 12(63.16%) each. Similar to the current study Najla A. Obaid et al 2023reported most frequently observed antibiotic resistance in gram negative bacilli was to ciprofloxacin (16.5%) and trimethoprim or sulfamethoxazole (16.1%) gentamycin 13.2%.[19]

Sunzida Arina S et al 2021 has documented ceftazidime resistance as 77.89% in E. coli, 71.79% in Pseudomonas spp, 66.66% in Klebsiella spp. Similarly, Podder et al 2020 has documented high resistance of gram-negative bacilli to ciprofloxacin (E. colim28%, Pseudomonas aeruginosa 38%, Acinetobacter spp.36%) and gentamycin (Pseudomonas aeruginosa45%, Acinetobacter spp. 32%).[3] ESBL encoding plasmids encodes resistance to cotrimoxazole and fluoroquinolones. Since fluoroquinolones resistance is rising to a great extent, it is no more empirically prescribed for treating Gram negative bacilli.[4]

Present study revealed in gram negative bacilli a resistanceof5(26.32%)with imipenem, 2(10.53%) meropenem, 9(47.37%) amikacin,5(31.25%) nitrofurantoin, 10(55.55%)cefotaxime, 8(42.11%) piperacillin-tazobactam, 8(42.11%) cefoperazone-sulbactam, 9(56.25%) amoxicillin-clavulanate, 10(52.63%) cefepime. Similar to this study Najla A. Obaid et al 2023 reported low resistance of 6.9%to imipenem and 8.4% meropenem.[19] Sunzida Arina S et al 2021 has documented that in gram negative bacilli, resistance of23.80% to 36.84% with nitrofurantoin, 33.33% to 75.78%with cefotaxime, 80.95% to 100% amoxyclavulanate, 33.33% to 57.89% gentamicin.[6] Dr Akshay Karyakarte, et. al. 2023 has documented resistance of 73.2% to piperacillin - tazobactam and 86.1% to cefepime.[20] According to Bardoloi et al 2017among the Gram-positive cocci causing CAUTI, the isolates were most resistant to penicillin and least resistant to nitrofurantoin and gentamicin with 100% sensitivity for vancomycin and linezolid.[1] Panjwani DM et al 2021 has recorded that Enterococcus spp. showed 80% sensitivity to linezolid and least sensitivity to fluoroquinolone group of drugs and 40% vancomycin-resistant.[21]

Designing preventive measures are necessary to reduce CA-UTI rate. Before device insertion, hands should be washed and sterile solution for periurethral cleansing, and a single-use packet of lubricating jelly is needed. Closed catheter system, in which the drainage bag and collecting tube are joined is necessary and must be ensured that urine drains according to gravity. Catheter to be removed as soon as possible. Silicone based urinary catheters also cause decline of incidence in CA-UTI. Condom catheters are potential substitutes for indwelling urinary catheters.[10]

Regular bacteriological surveillance of catheterized patient is essential. Commercially available Multiplex PCR and MALDI-TOF identifies microbes causing CAUTI and detects antibiotic resistance genes. Biosensors, real-time microscopy systems, sequence-based diagnostics and microfluidics are some of the imminent technologies for rapid antimicrobial susceptibility testing.[4] Implementation of continuous education to health care workers plays a vital role in reducing the CA-UTI rates.

CONCLUSION

CA-UTI has become a great threat to hospitalized patient safety and a challenge to the infection control team. Among uro-pathogens identified, Escherichia coli was the dominant pathogen and other isolates were Klebsiella spp., Enterococcus spp., Acinetobacter spp., Staphylococcus aureus and Pseudomonas aeruginosa. Gram-negative bacilli were highly sensitive to imepenem, meropenem and nitrofurantoin. Gram-positive cocci were highly sensitive to vancomycin and linezolid. Remarkable increase in multi-drug resistance for routinely prescribed antibiotic was revealed in uro-pathogens. Preventive measures like meticulous intervention with weekly maintenance bundle audits in the ICU and wards like urology to be conducted. CA-UTI competency session to evaluate urinary catheter technique with health personnels is mandatory. Updated comprehension on antimicrobial resistance in each region is absolutely necessary to treat patients as it differs in geographical area.

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