www.jmscr.igmpublication.org
Impact Factor (SJIF): 6.379
Index Copernicus Value: 71.58
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: https://dx.doi.org/10.18535/jmscr/v6i3.152

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Research Article

Bacteriological Profile of Urinary Tract Infections in General Medicine Ward in a Tertiary Care Hospital and its Antibiotic Sensitivity

Authors
Ananta Kumar Datta[1], Sattik Siddhanta[2], Rajeev Ranjan[3]
[1]Associate Professor, [2]Assistant Professor, [3]Resident
Department of General Medicine, IPGME&R, Kolkata, West Bengal, India
Corresponding Author
Sattik Siddhanta
Email: *drcalmed@gmail.com*

Abstract
Urinary tract infections(UTI) is the most common bacterial infection prevalent in both males and females and contribute to second most common nosocomial infection raising the hospital stay, morbidity and mortality. Urethral catheters serve as a niche for proliferation and multiplication of bacteria and biofilm produced by them provide resistance to antimicrobials and they spread elsewhere. This cross sectional study was conducted among 1008 adult patients admitted to general medicine ward in Kolkata. The age of patients ranged from 14 to 102 years. Our study revealed that among the 1008 patients, the prevalence rate of UTI was 23.4 percent. Among total uropathogens isolated Escherichia coli was most prevalent in both sex and all age groups independent of risk factors, followed by Klebsiella, Enterobacter and Citrobacter .Gram negative organisms were 87.7% and Gram positives were 12.29%. The antibiotics sensitive to gram negative organisms were Imipenem (20.3%), Piperacillin-Tazobactum (12.8%), Amikacin (12.6%), Polymyxin (10.4%) and Nitrofurantoin(8%). Gram positive organisms showed maximum sensitivity to Vancomycin (25.24%), followed by Linezolid (21.3%) and Teicoplanin (21.3%). Although the results show the development of UTI does not rely solely on health professionals' practices, the authors conclude these professionals can have an important role in the prevention of UTI reducing the number of risk factors.

Keywords: *Bacteria, catheterization, Escherichia coli, urinary tract infection, antibiotics.*

Introduction

Urinary Tract Infection is the most common bacterial infection prevalent in both male and female patients, causing discomfort in elderly patients, thus representing bacteraemia, septic shock, respiratory disease syndrome and death. There are number of factors that increase the risk of developing UTI. Between 15% and 25% of hospitalized patients may receive short-term indwelling urinary catheters. Virtually all healthcare-associated UTIs are caused by instrumentation of the urinary tract. Catheter-associated urinary tract infection (CAUTI) has been associated with increased morbidity, mortality, hospital cost, and length of stay. Therefore, investigating epidemiology of UTIs

(prevalence, risk factors, bacterial isolates and antibiotic sensitivity) is fundamental for care givers and health planners to guide the expected interventions. Thus, the aim of this study was to determine bacterial etiologic agent of uropathogens.

Objectives

1. Determine the prevalence of urinary tract infection (UTI) in medicine ward in a tertiary care hospital.
2. To study its bacteriological profile.
3. To study antibiotic sensitivity.

Materials and Methods

Study Design: The study was an observational and cross sectional study. The study protocol was approved by the Institutional Ethical committee.

Study Setting: The study was conducted at medicine ward in a tertiary level teaching hospital.

Study Period: One and half years.

Inclusion Criteria*:* All patients above 14 years old.

Exclusion Criteria: Patients aged less than14 years and those who refused to participate in the study.

Study Subjects: The study population comprised of all the patients admitted in General medicine ward, both from emergency and outpatient department, with or without urethral catheter. The patients were included in the study group by using consecutive sampling technique.

Study Design: The nature of the study was explained to each patient or their relatives and informed consent were taken from all patients who fulfilled the inclusion criteria and were willing to participate in the study. A thorough detailed history was taken from each patient with special symptoms and signs leading to diagnosis, history of urinary catheter placement along with its duration and any comorbid conditions present or not. A meticulous general survey and systemic examination including genitourinary, respiratory, cardiovascular, gastrointestinal, nervous system was done to detect any subtle finding. General examination included pulse, BP, pallor Icterus, Clubbing, Cyanosis, and Edema.

General Investigations: Complete Haemogram, Sugar (Fasting And Postprandial / HbA1c), Serum Urea Creatinine, Liver Function Test, Urine for routine and microscopic examination and Urine Culture & sensitivity report, Ultrasound Whole Abdomen & KUB Screening, Chest X-ray(P/A) view.

Results and Analysis

Prevalence of UTI (Significant Bacteriuria):

Total 1008 patients were enrolled for the study out of which 236 (23.4%) had significant bacteriuria. 772 (76.6%) patients were having either normal urine or insignificant bacteriuria.

Table 1: Frequency of UTI (Significant Bacteriuria) in General Medicine Ward

UTI (SIG. BACTERIURIA)	FREQUENCY	PERCENT
ABSENT	772	76.6%
PRESENT	236	23.4%
Total	1008	100.0%

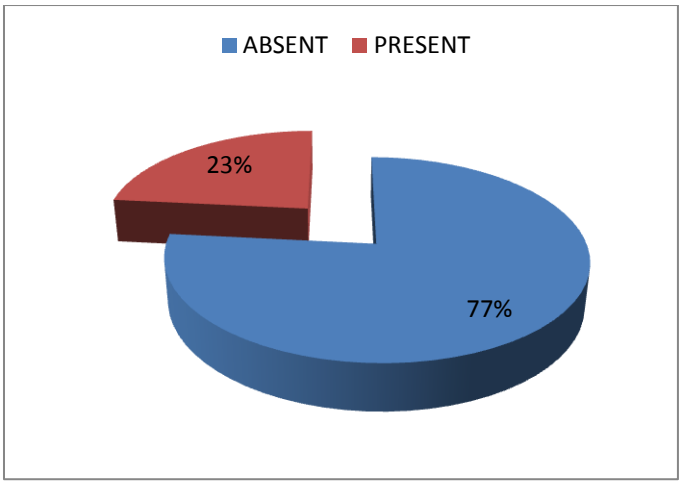

Fig 1: Prevalence of UTI (Significant Bacteriuria)

Table 2: Frequency of Isolation of Bacterial Uropathogens

URINE C/S	TOTAL samples	Only positive sample
ACINETOBACTER SP. ROW % COL %	8 100.0 0.8	8 100.0 3.33%
CITROBACTER SP. ROW % COL %	17 100.0 1.7	17 100.0 7.20%
COAGULASE -VE STAPH ROW % COL %	2 100.0 0.2	2 100.0 0.84%
E. COLI ROW % COL %	104 100.0 10.3	104 100.0 44.06%
ENTEROBACTER SP. ROW % COL %	23 100.0 2.3	23 100.0 9.74%
ENTEROCOCCUS SP. ROW % COL %	14 100.0 1.4	14 100.0 5.93%
KLEBSIELLA SP. ROW % COL %	33 100.0 3.3	33 100.0 14.0%
MRSA ROW % COL %	9 100.0 0.9	9 100.0 3.81%
PROTEUS SP. ROW % COL %	10 100.0 1.0	10 100.0 4.23%
PSEUDOMONAS SP. ROW % COL %	12 100.0 1.2	12 100.0 5.1%
STAPH. AUREUS ROW % COL %	4 100.0 0.4	4 100.0 1.7%
CONTAMINATED ROW % COL %	121 100.0 12.0	Not included
INSG GR ROW % COL %	39 100.0 3.9	Not included
NG ROW % COL %	612 100.0 60.7	Not included
TOTAL ROW % COL %	1008 100.0 100.0	236 100.0% 100.0%

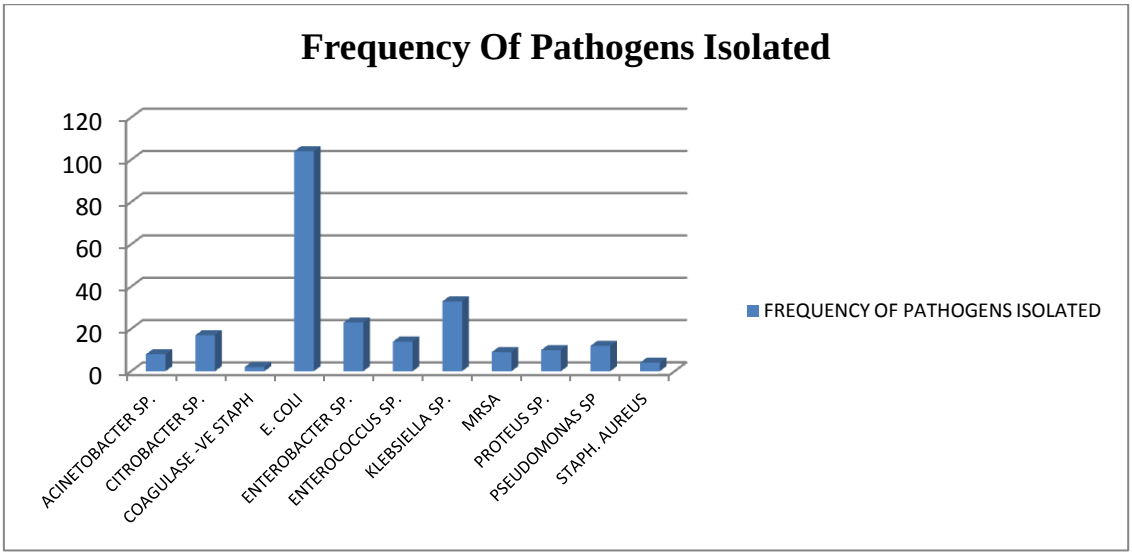

Fig 2: Frequency of Isolation of Bacterial Uropathogens

In our study we found such distribution of uropathogens as depicted in above table and chart. In total 236 UTI patients single pathogen found on urine culture report amounting to bacteria 236 isolates from each patient. In them E.coli was most frequently isolated from 104 patients, which is 44% of the total isolates, second most frequently isolated is Klebsiella 33(14%), then Enterobacter, Citrobacter, Enterococcus, Pseudomonas, Proteus, MRSA ,Acinetobacter, Staph aureus And Least Is CONS. Out of total urine C/S report 121 samples were contaminated (12%), 39 (3.9%) had insignificant growth and no growth in 612 samples.

Table 3: Antibiotic Senitivity of Different Organisms

ORGANISMS	*GR. STAIN*	*IPM*	*MRP*	*CAZ*	*CAT*	*ZN*	*PIT*	*AK*	*GEN*	*NIT*	*AZM*	*LZ*	*VA*	*AMC*	*PB*	*LE*	*TEI*	*COT*	*C*	*CD*	*CPM*	*CTR*	*CTX*	*NET*	*PRU*
Acenobacter sp.	*N*	*6*	*1*				*4*	*3*		*1*				*1*	*2*	*1*		*1*							
Citrobacter sp.	*N*	*8*	*2*	*1*		*1*	*7*	*3*			*1*				*6*	*3*		*3*							
E. coli	*N*	*74*	*21*	*1*		*1*	*52*	*57*	*3*	*31*	*8*			*1*	*44*	*20*	*1*	*9*			*12*		*4*	*1*	
Enterobacter sp.	*N*	*1*							*5*	*10*		*17*	*20*		*1*		*16*	*1*	*11*			*1*			
Klebsiella sp.	*N*	*23*	*6*	*1*			*13*	*9*	*2*	*6*	*4*				*22*	*3*	*1*	*6*			*7*		*1*	*1*	*1*
Proteus sp.	*N*	*8*	*3*			*1*	*9*	*5*		*1*	*1*					*1*									
Pseudomonas sp.	*N*	*4*	*1*	*3*	*3*		*3*	*1*	*1*						*7*			*2*			*4*				
Coagulase -ve staph	*P*		*1*				*1*					*1*	*2*				*2*								
Enterococcus sp.	*P*	*1*							*4*	*1*	*1*	*9*	*11*			*1*	*10*		*7*						
MRSA	*P*			*1*						*6*		*8*	*9*			*1*	*7*			*1*					
Staph. aureus	*P*				*1*				*1*	*2*		*4*	*4*	*1*			*3*			*2*					

(IPM-Imipenem,MRP-Meropenem,CAZ-Ceftazidime,CAT-Ceftazidime-Tazobactum,ZN-Ofloxacin,PIT-Piperacillin-Tazobactum,AK-Amikacin,GEN-Gentamicin,NIT-Nitrofurantoin,AZM-Azithromycin,LZ-Linezolid,VA-Vancomycin,AMC-Coamoxiclav,PB-PolymyxinB,LE-Levofloxacin.TEI-Teicoplanin,COT-Cotrimoxazole,C-,Chloramphenicol,CD-Clindamycin,CPM-Cefepime.CTX-Cefotaxime,CTR-Ceftriaxone,NET-Netilmycin,PRU-Prulifloxacin)

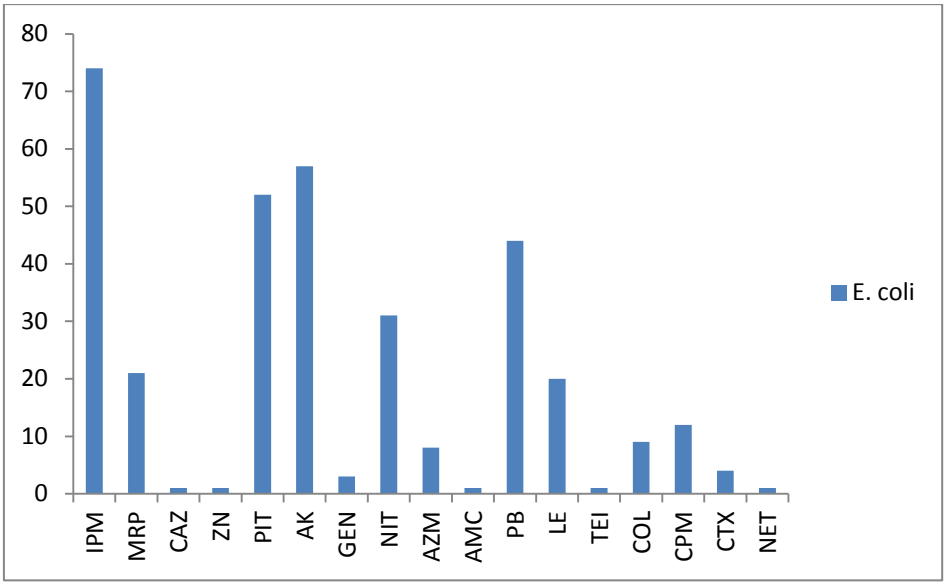

Fig 3: Antibiotic Senitivity of E.Coli

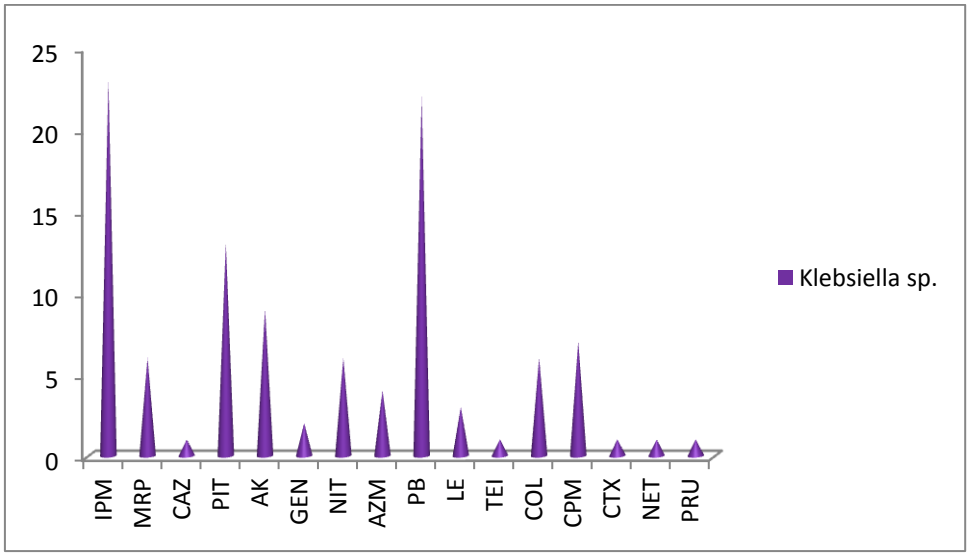

Fig 4: Antibiotic Senitivity of Klebsiella Sp.

Table 4: Antibiotic Resistance of Different Organisms

ORGANISMS	GR STAIN	IPM	MRP	CAZ	CAT	ZN	PIT	AK	GEN	NIT	AZM	LZ	VA	AMC	LE	TEI	COT	C	CD	CPM	CTR	CTX	NET	PRU
Acenobacter sp.	N	2		1		1	3	4	2	6		1		2	3					6	5			
Citrobacter sp.	N	3	1	6		2	8	10	4	14		1		6	10			1		9	7		2	
E. coli	N	8	1	10		32	38	35	20	48				27	36			22		48	63			4
Coagulase -ve staph	P								1						1				1	1	1			
Enterobacter sp.	N	1				4	2	2	11	6	2	3	1	1	14	3		5		1	1	10		
Enterococcus sp.	P			1		1		2	6	4		3		1	9			3		1	1			
Klebsiella sp.	N	1	1	4		6	16	19	8	22				9	17			1		17	14			
MRSA	P				1				2	1				3	6				6	2	1			
Proteus sp.	N			5		5	1	5		5				4	2		1	1		5	6			
Pseudomonas sp.	N	5		4	1	1	6	7	4	7				1	4			1	2	4	4			
Staph. Aureus	P								1	1					3				1	1				2

(IPM-Imipenem,MRP-Meropenem,CAZ-Ceftazidime,CAT-Ceftazidime-Tazobactum,ZN-Ofloxacin,PIT-Piperacillin-Tazobactum,AK-Amikacin,GEN-Gentamicin,NIT-Nitrofurantoin,AZM-Azithromycin,LZ-Linezolid,VA-Vancomycin,AMC-Coamoxiclav,PB-PolymyxinB,LE-Levofloxacin.TEI-Teicoplanin,COT-Cotrimoxazole,C-,Chloramphenicol,CD-Clindamycin,CPM-Cefepime.CTX-Cefotaxime,CTR-Ceftriaxone,NET-Netilmycin,PRU-Prulifloxacin)

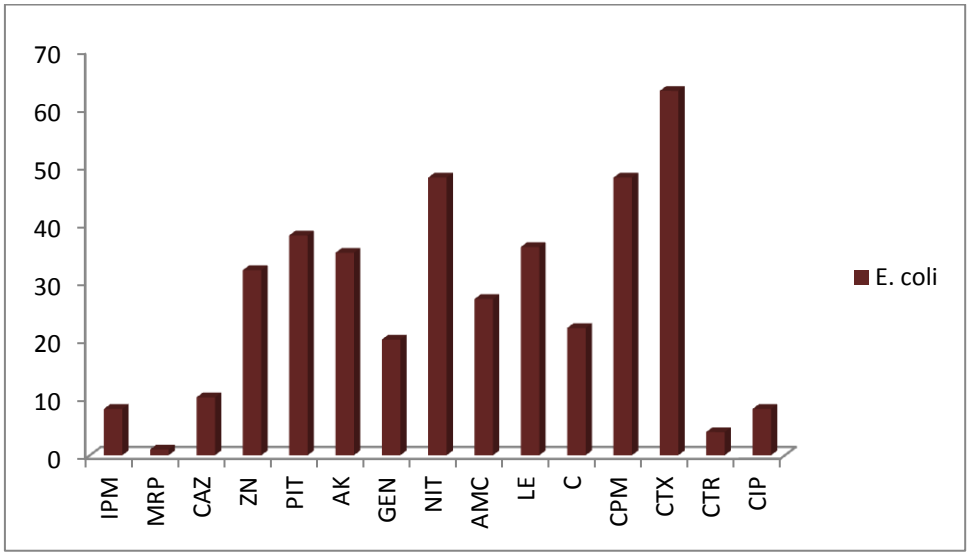

Fig 5: Antibiotic Resistance of E.Coli

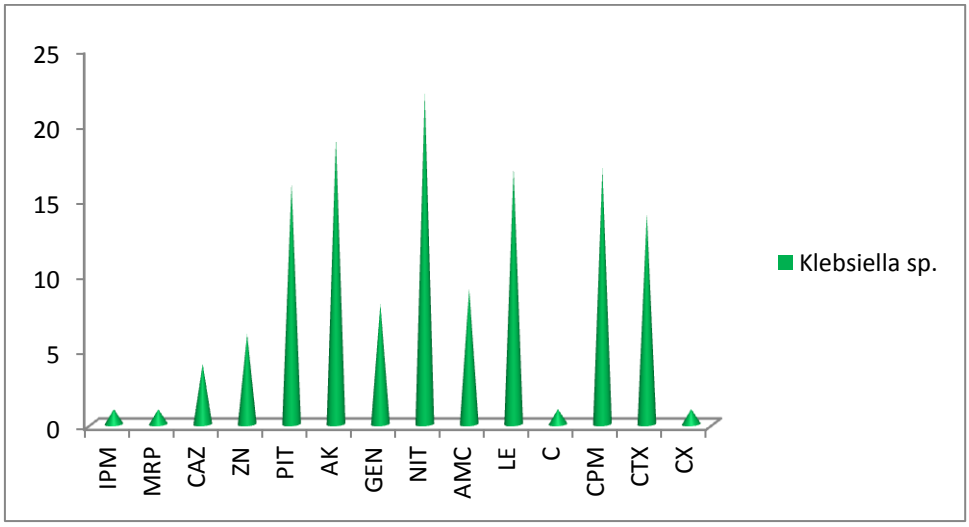

Fig 6: Antibiotic Resistance of Klebsiella Sp.

Table 5: Comparision of Antibiotic Sensitivity of Gram Positive and Gram Negative Bacterias

ANTIBIOTICS	GRAM NEGATIVE	GRAM POSITIVE
NIT	49 (8%)	9(8.73%)
IPM	125(20.3%)	1(0.97%)
MRP	34(4.8%)	1(0.97%)
CAZ	6(0.9%)	1(0.97%)
CAT	3(0.48%)	1(0.97%)
ZN	3(0.48%)	
PIT	79(12.8%)	1(0.97%)
AK	78(12.6%)	
GEN	11(1.78%)	5(4.85%)
AZM	14(2.27%)	1(0.97%)
LZ	17(2.76%)	22(21.3%)
VA	20(3.25%)	26(25.24%)
AMC	2(0.32%)	1(0.97%)
LE	28(4.55%)	2(1.9%)
PB	64(10.4%)	
TEI	18(2.92%)	22(21.3%)
COL	21(3.4%)	
C	11(1.78%)	7(6.79%)
CD		3(2.91%)
CPM	23(3.73%)	
CEP	1(0.1%)	
CTX	5(0.8%)	
NET	20(3.2%)	
PRU	1(0.1%)	
TOTAL	615(100%)	103(100%)

(IPM-Imipenem,MRP-Meropenem,CAZ-Ceftazidime,CAT-Ceftazidime-Tazobactum,ZN-Ofloxacin,PIT-Piperacillin-Tazobactum,AK-Amikacin,GEN-Gentamicin,NIT-Nitrofurantoin,AZM-Azithromycin,LZ-Linezolid,VA-Vancomycin,AMC-Coamoxiclav,PB-PolymyxinB,LE-Levofloxacin.TEI-Teicoplanin,COT-Cotrimoxazole,C-,Chloramphenicol,CD-Clindamycin,CPM-Cefepime.CTX-Cefotaxime,CTR-Ceftriaxone,NET-Netilmycin,PRU-Prulifloxacin)

Table 6: Comparision of Antibiotic Resistance of Gram Positive and Gram Negative Bacterias

ANTIBIOTICS	GRAM NEGATIVE	GRAM POSITIVE
NIT	108(13.6%)	6(6.81%)
IPM	20(2.52%)	
MRP	3(0.37%)	
CAZ	30(3.73%)	1(1.14%)
CAT	1(0.1%)	1(1.14%)
ZN	51(6.43%)	1(1.14%)
PIT	54(6.80%)	
AK	82(10.34%)	2(2.27%)
GEN	49(6.18%)	10(11.36%)
AZM	2(0.25%)	
LZ	5(0.63%)	3(3.41%)
VA	1(0.13%)	
AMC	50(6.30%)	4(4.54%)
LE	86(10.84%)	19(21.59%)
CTR	4(0.50%)	2(2.27%)
TEI	3(0.38%)	

COL	1(0.1%)	
C	31(3.90%)	3(3.41%)
CD	2(0.25%)	8(9.09%)
CPM	90(11.35%)	5(5.68%)
CIP	17(2.14%)	2(2.27%)
CTX	100(12.61%)	3(3.14%)
COT	20.25%)	
CX	1(0.1%)	8(9.09%)
T	10(1.26%)	
TOTAL	793(100%)	88(100%)

(IPM-Imipenem,MRP-Meropenem,CAZ-Ceftazidime,CAT-Ceftazidime-Tazobactum,ZN-Ofloxacin,PIT-Piperacillin-Tazobactum,AK-Amikacin,GEN-Gentamicin,NIT-Nitrofurantoin,AZM-Azithromycin,LZ-Linezolid,VA-Vancomycin,AMC-Coamoxiclav,PB-PolymyxinB,LE-Levofloxacin.TEI-Teicoplanin,COT-Cotrimoxazole,C-,Chloramphenicol,CD-Clindamycin,CPM-Cefepime.CTX-Cefotaxime,CTR-Ceftriaxone,NET-Netilmycin,PRU-Prulifloxacin)

Discussion

The placement of urethral catheter is one of the most common invasive procedures performed in hospital settings. In the present study, among the total study population of 1008 subjects, 556 (55.2%) females were and 452 (44.8%) were males. The age of patients ranged from 14 yrs to 102 yrs. In our study the prevalence of UTI (significant bacteriuria) was 23.4% (236 patients).Among the total 236 UTI patients, 134 were females(56.8%) and 102 were males (43.2%); (p=0.567, not significant) Out of total 1008 patients, 236 (23.4%) had significant bacteriuria, in which 12 (5.1%) patients were aged less than 20 yrs, 51 (21.6%) patients were in the age group 21-40 yrs , 110(46.6%) patients were in the age group 41-60 yrs were and 63 (26.7%) of patients were aged more than 60 years. In total 236 isolates from patient Escherichia .coli was most frequently isolated microorganism from 104(44%)patients of the total isolates, followed by Klebsiella 33(14%) and then Enterobacter 23(9.74%), Citrobacter (7.20%), Enterococcus, Pseudomonas,, Proteus, MRSA, Acinetobacter, Staph aureus and least is Coagulase negative staphylococcus. Among the total isolates, gram negatives were 87.7% and gram positives were 12.29%. The antibiotics sensitive to gram negative organisms were Imipenem (20.3%), Piperacillin-Tazobactum (12.8%), Amikacin (12.6%), Polymyxin (10.4%) and Nitrofurantoin (8%). Gram positive organisms showed maximum sensitivity to Vancomycin (25.24%), followed by Linezolid (21.3%) and Teicoplanin (21.3%). Among total isolated organisms in the ground of antibiotic resistance for gram negatives, it was maximum for Nitrofurantoin (13.6%) followed by Cefotaxime (12.6%), Cefepime (11.35%), Levofloxacin (10.84%) and Amikacin (10.34%). Gram positive organisms were found to be most resistant to Levofloxacin (21.59%) Least resistance among antibiotics for gram negative organisms was Colistin (0.1%) followed by Clindamycin (0.25%) and Meropenem (0.37%) and for gram positive organisms Ceftazidime (1.14%) and Ceftazidime – Tazobactum (1.14%) followed by Linezolid(3.4%).

Conclusion

The predisposing factors for UTI are the catheterization, patient's profile (female sex, children and old age, high levels of dependency). Although the results show the development of UTI does not rely solely on health professionals' practices, the authors conclude these professionals can have an important role in the prevention of UTI reducing the number of risk factors along with antimicrobials susceptibility knowledge in their locality.

Limitations

This is a cross sectional study where patients symptoms, signs and urinary parameters were assessed for a single time. A longitudinal study with a baseline follow up of the patients with UTI and catheters would have been more suitable. It is a single centre study; hence the results may not be applicable to other settings. The study being hospital based, there is always a chance of selection biasing and study population might not be ideally representative of population.

References

1. Naeem Akhtar., 2000. Urinary tract bacterial pathogens; their antimicrobial Susceptibility patterns at Bahawalpur. The Professional, 7(2):131-137.
2. Nadia Gul, Talat Y. Mujahid And Samia Ahmad, Isolation,Identification And Antibiotic Resistance Profile Of Indigenous Bacterial Isolates From Urinary Tract Infection Patients; Pakistan Journal Of Biological Sciences 7(12); 2051-2054, 2004; ISSN 1028-8880.
3. CDC January 2015; Urinary Tract Infection (Catheter-Associated Urinary Tract Infection [CAUTI] and Non-Catheter-Associated Urinary Tract Infection [UTI]) and Other Urinary System Infection [USI]) Events.
4. Savitha, T., International Journal of Current Research Vol. 2, Issue, 1, pp. 067- 072, January, 2011
5. Higgins, C., 1995. Microbial examination of urine in urinary tract infection. Nurs – Times. 91(11); 32-35.
6. Acharya, VN, 1992. Urinary Tract infection – a dangerous & unrecognized foreunder of systemic sepsis. J. Post Grad Med., 38: 52-54. 4.
7. Sklar, A H, Caruana , R J, Lammers, J E. and Strauser, G O., 1987. Renal infections in Autosomal polycystic kidney diseases. Am. J.Kidney Dis., 10: 81-88.3.
8. Warren JW. Catheter-associated urinary tract infections. Int J Antimicrob Agents. 2001;17(4):299-303.
9. Weinstein JW, Mazon D, Pantelick E, Reagan-Cirincione P, Dembry LM, Hierholzer WJ,Jr. A decade of prevalence surveys in a tertiary-care center: Trends in nosocomial infection rates, device utilization, and patient acuity. Infect Control Hosp Epidemiol. 1999;20(8):543-548.
10. Munasinghe RL, Yazdani H, Siddique M, Hafeez W. Appropriateness of use of indwelling urinary catheters in patients admitted to the medical service. Infect Control Hosp Epidemiol. 2001;22(10):647-649.
11. Jain P, Parada JP, David A, Smith LG. Overuse of the indwelling urinary tract catheter in hospitalized medical patients. Arch Intern Med. 1995;155(13):1425-1429.
12. Saint S, Wiese J, Amory JK, et al. Are physicians aware of which of their patients have indwelling urinary catheters? Am J Med. 2000;109(6):476-480.
13. Platt R, Polk BF, Murdock B, Rosner B. Mortality associated with nosocomial urinary-tract infection. N Engl J Med. 1982;307(11):637-642.
14. Givens CD, Wenzel RP. Catheter-associated urinary tract infections in surgical patients: A controlled study on the excess morbidity and costs. J Urol. 1980;124(5):646-648.
15. Tambyah PA, Knasinski V, Maki DG. The direct costs of nosocomial catheter-associated urinary tract infection in the era of managed care. Infect Control Hosp Epidemiol. 2002;23(1):27-31.