Comparison of Etiological Agents and Resistance Patterns of the Pathogens Causing Community Acquired and Hospital Acquired Urinary Tract Infections

Sir,

Urinary tract infections (UTIs) are one of the most common infections encountered by physicians. The study was carried out to know the common bacteria causing UTI and their resistance pattern to commonly prescribed antibiotics at our hospital.

Patients were assigned into two categories: one group comprising of urine samples from patients admitted in the hospital for at least 48 h (hospital acquired urinary tract infection or HA-UTI), and another group comprising of urine samples from patients visiting the hospital on an outpatient basis or admitted for lesser than 48 h (community acquired urinary tract infection or CA-UTI).[1]

Urine samples (1,378) were collected between 1st January 2012 and 30th June 2012 from cases suspected of having CA-UTI and HA-UTI. Patients were instructed to submit first morning mid stream clean catch urine (CCMS) samples; from catheterized indoor patients samples were collected by healthcare workers after disinfecting the port with 70% alcohol and then aspirating urine through the port with a sterile needle and syringe. The samples were processed as per standard procedures; antibiotic susceptibility testing was performed by the Kirby Bauer disc diffusion method as per Clinical and Laboratory Standards Institute (CLSI) recommendations.[2,3] Statistical analysis was done using Fisher's exact test. *P* value lesser than 0.05 was considered as statistically significant.

Results obtained in this study are shown in Tables 1 and 2. Of the 1,378 urine samples processed during the study period, 340 (24.7%) yielded urinary pathogens, of which 324 had significant bacteriuria and 16 had Candiduria. Gram-negative bacilli accounted for 281 (82%), gram-positive cocci for 43 (13%) and *Candida* sp. for 16 (5%) of the total pathogens. *Escherichia coli* was the predominant pathogen in both CA-UTI and HA-UTI cases. The next top 5 uropathogens after *E. coli*, causing HA-UTI in our

Table 1: Frequency, percentage, and *P*-value of resistant gram-negative bacteria isolated from CA-UTI versus HA-UTI patients

Bacteria	Group of antibiotic (as per CLSI Guidelines)	Antibiotic	*Escherichia coli*	*Citrobacter* sp.	*Klebsiella* sp.	*Enterobacter* sp.	*Proteus* sp.	*Pseudomonas aeruginosa*
CA/HA number of isolates			132/48	18/10	17/11	9/2	7/1	4/21
Percentage of total isolates (*P* value)			61/40 (0.04)	8/8 (1.00)	8/9 (0.92)	4/2 (0.40)	3/1 (0.97)	2/17 (0.02)
Percentage of CA/HA bacteria resistant to (*P* value)	First line drugs (group A and U)	AMP	85/100 (0.02)	83/100 (0.02)	65/91 (0.02)	89/100 (0.03)	86/100 (0.02)	—
		GEN	51/71 (0.04)	56/70 (0.08)	41/82 (0.009)	33/67 (0.01)	71/67 (0.59)	50/90 (0.008)
		OFL	77/94 (0.03)	56/80 (0.02)	53/91 (0.009)	33/67 (0.01)	71/67 (0.59)	50/86 (0.01)
		NOR	80/94 (0.04)	72/90 (0.04)	59/91 (0.01)	33/67 (0.01)	71/67 (0.59)	50/86 (0.01)
		NIT	27/33 (0.34)	22/50 (0.02)	59/55 (0.63)	44/100 (0.004)	100/100 (1.00)	—
	Second line drugs (group B)	AMK	5/23 (0.02)	33/60 (0.02)	18/45 (0.02)	11/33 (0.02)	43/33 (0.15)	50/86 (0.01)
		AMC	84/100 (0.02)	78/100 (0.01)	82/91 (0.09)	89/100 (0.03)	86/100 (0.02)	—
		CEP	72/90 (0.03)	67/100 (0.008)	53/82 (0.02)	44/67 (0.03)	43/67 (0.03)	75/90 (0.04)
		CET	78/94 (0.03)	72/100 (0.009)	59/91 (0.01)	44/67 (0.03)	57/67 (0.15)	—
		CIP	78/94 (0.03)	67/90 (0.02)	59/91 (0.01)	33/67 (0.01)	86/67 (0.03)	50/86 (0.01)
		ERT	8/23 (0.04)	39/50 (0.13)	6/64 (0.004)	0/33 (0.008)	43/33 (0.15)	—
		IMP	4/4 (1.00)	17/10 (0.15)	6/18 (0.05)	0/33 (0.008)	29/33 (0.59)	0/62 (0.004)
		MER	15/23 (0.15)	44/40 (0.63)	24/55 (0.02)	0/33 (0.008)	29/33 (0.59)	50/76 (0.02)
		COT	54/69 (0.07)	72/70 (0.88)	35/73 (0.01)	56/67 (0.12)	86/67 (0.03)	—
		SAM	56/67 (0.12)	78/90 (0.06)	100/91 (0.03)	56/67 (0.12)	86/67 (0.03)	—
		TZP	31/33 (0.88)	67/70 (0.75)	59/64 (0.48)	33/67 (0.01)	43/67 (0.03)	50/71 (0.04)
		PIP	79/100 (0.01)	61/80 (0.04)	53/91 (0.009)	12/67 (0.005)	43/67 (0.03)	50/76 (0.02)
	Third line drugs (group C)	AZT	76/92 (0.03)	56/100 (0.006)	59/91 (0.01)	44/67 (0.03)	29/67 (0.01)	75/90 (0.04)
		CAZ	80/94 (0.04)	72/100 (0.009)	59/100 (0.006)	44/67 (0.03)	57/67 (0.15)	75/90 (0.04)
		TCY	46/72 (0.02)	39/100 (0.004)	41/82 (0.009)	67/67 (1.00)	71/67 (0.59)	—
		†TIG	12/6 (0.14)	6/10 (0.27)	12/0 (0.03)	0/33 (0.008)	14/33 (0.03)	—

P value of less than 0.05 is considered as significant; *The grouping is not applicable for *Pseudomonas aeruginosa;* †Tigecycline is not a group C drug as per CLSI guidelines; AMP: Ampicillin; GEN: Gentamicin; OFL: Oflaxacin; NOR: Norfloxacin; NIT: Nitrofurantoin; AMK: Amikacin; AMC: Amoxycillin–Clavulanic acid; CEP: Cefepime; CET: Cefotaxime; CIP: Ciprofloxacin; ERT: Ertapenem; IMP: Imipenem; MER: Meropenem; COT: Cotrimoxazole; SAM: Ampicillin-sulbactam; TZP: Piperacillin-tazobactam; PIP: Piperacillin; AZT: Aztreonam; CAZ: Ceftazidime; TCY: Tetracycline; TIG: Tigecycline

Table 2. Frequency, percentage and *P*-value of resistant gram-positive bacteria isolated from CA-UTI versus HA-UTI patients

Bacteria	Group of antibiotic (as per CLSI Guidelines)		Enterococcus sp.	Staphylococcus sp.	Staphylococcus aureus
CA/HA number of isolates			16/8	14/5	5/3
Percentage of total isolates (*P* value)			7/7 (1.00)	6/4 (0.55)	2/3 (0.75)
Percentage of CA/HA bacteria resistant to (*P* value)	First line drugs (group A and U)	PEN	87/100 (0.02)	86/100 (0.02)	100/0 (0.002)
		NOR	25/100 (0.003)	29/60 (0.02)	0/67 (0.003)
		NIT	75/62 (0.08)	64/40 (0.03)	60/33 (0.02)
		COT	—	36/40 (0.62)	40/67 (0.02)
		OXA	—	21/60 (0.01)	40/67 (0.02)
		FOX	—	21/60 (0.01)	40/67 (0.02)
		AMP	62/62 (1.00)	—	—
		CIP	81/100 (0.02)	—	—
	Second line drugs (group B)	LIN	0/0 (1.00)	0/0 (1.00)	0/0 (1.00)
		VAN	6/0 (0.05)	0/0 (1.00)	0/0 (1.00)
	Third line drugs (group C)	GEN	75/62 (0.08)	71/40 (0.02)	60/33 (0.02)
		CIP	—	71/60 (0.12)	60/67 (0.28)
		*TIG	0/12 (0.03)	14/20 (0.24)	20/33 (0.07)
		*TCP	44/12 (0.01)	—	—

P value of less than 0.05 is considered as significant; *Tigecycline and Teicoplanin are not group C drugs as per CLSI guidelines PEN: Penicillin; NOR: Norfloxacin; NIT: Nitrofurantoin; COT: Cotrimoxazole; OXA: Oxacillin; FOX: Cefoxitin; AMP: Ampicillin; CIP: Ciprofloxacin; LIN: Linezolid; VAN: Vancomycin; GEN: Gentamicin; CIP: Ciprofloxacin; TIG: Tigecycline; TCP: Teicoplanin

hospital were *Pseudomonas aeruginosa* 21(17%); *Candida* sp. 14 (11.0%); *Klebsiella* sp. 11 (9%); *Citrobacter* sp. 10 (8%); and *Enterococcus* sp. 8 (7%), while those causing CA-UTI were *Citrobacter* sp. 18(8%); *Klebsiella pneumoniae* 17(8%); *Enterococcus* sp. 16(7%); *Staphylococcus* sp. 14 (6%) and *Enterobacter* sp. 9 (4%). *E. coli* was statistically associated more with CA-UTI and *P. aeruginosa* was statistically associated more with HA-UTI.

Resistance to ampicillin was more significantly associated with HA-UTI than CA-UTI among all the gram-negative pathogens. In case of *P. aeruginosa*, resistance to ceftazidime, cefepime, and aztreonam were more significantly associated with HA-UTI than CA-UTI. Among *Staphylococcus aureus* isolates, resistance was more significantly associated with HA-UTI than CA-UTI against cefoxitin, co-trimoxazole, and norfloxacin.

Our data indicates that *E. coli* is still the most frequent uro-pathogen causing UTI in the community and hospital settings, which is consistent with the literature.[4] The resistance rates of the isolates were significantly lower in outpatients than those of inpatients, a finding which is consistent with observations all over the world.[5]

Ampicillin, amoxicillin-clavulanic acid, TMP-SMX and ciprofloxacin did not have good *in vitro* coverage for many of the uro-pathogens isolated in this study. Nitrofurantoin is the only oral agent that remains relatively active against most uro-pathogens. Carbapenems, piperacillin-tazobactam, and amikacin showed good *in vitro* coverage of the uro-pathogens isolated in this study.

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