Local survelance study on etiology of community-and hospital-acquired urinary tract infections (UTI) and antimicrobial susceptibility of uropathogens

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SUMMARY

This study was conduced during October 2010-March 2011 with the collaboration of the microbiology laboratory of International Evangelical Hospital (Voltri division) to identify the most frequent pathogens isolates from Urinary Tract Infections (UTI) and to evaluate their antibiotics susceptibility patterns. Overall, 780 consecutive, non duplicate strains were collected and sent to the coordinating laboratory. 143 strains were from Healthcare settings and 637 from comunity acqueired infections. The most rappresented pathogens was *E. coli.* In our region the epidemiological community landscape in terms of resistance, is getting closer to the nosocomial setting.

INTRODUCTION

Urinary tract infections (UTIs) are one of the most common infectious diseases (3, 4). UTIs rappresented a rilevant clinical problem because of their frequency and morbidity even if they are associated with a lethality rather low. There is general agreement that, in absence of concomitant risk factors, such as for example advanced age and diabetes, *E. coli* is the organism most frequently rappresented.

The etiology of non complicated urinary tract infections is frequently attributed to other Gram negative strains such *Proteus* spp., *Klebsiella* spp. and *Enterobacter* spp.. Gram positive strain such *Enterococcus* spp. and *Staphylococccus* spp. are rarely isolated (5, 7).

In recent years has seen a steady increase in levels of resistance to antibiotics most commonly used in the treatment of UTI.

The aim of this local survellance study was to determine the distribuition of bacterial strains isolated from outpatients and inpatients with UTIs and antibiotic susceptibility patterns to antimicrobial agents currently used in the treatment of pathogens causing these infections.

MATHERIAL AND METHODS

Bacterial isolates

This study was conduced during October 2010 and March 2011 with the collaboration of the clinical microbiology laboratory of International Evangelical Hospital (Voltri division), Genoa.

Overall, 780 consecutive urinoculture isolates were collected and sent to the co-ordinating laboratory(Microbiology Section, DISC, University of Genoa). Strains isolates from in and out-patients were studied, with the exception of duplicate strains from the same patient. Partecipating laboratory also provided susceptibility data obteined by their routine methods.

RESULTS

Table 1 summaries the complete list and the distribuition of the pathogens collected in this study. A total of 780 isolates were found, including 143 and 637 helthcare setting or nosocomial and comunity aquired infections respectively.

Nosocomial sample

A total of 143 nosocomial sample were collected mainly from patients hospitalized in general medicine wards (47, 32.9%), helth care settings (HCS) (33, 23%), neurology (12, 8.4%), neuromotory rehabilitation and ortopedic wards (7, 4.9%), ICU (6, 4.2%), cardiology (5, 3.5%) and other wards (26, 18.2%).

The most rappresented nosocomial pathogens were: *E. coli* (71, 49.6%), *P. mirabilis* (17, 11.9%), *Klebsiella* spp. (12, 8.4%), other Gram negative (1 *C. freundii*, 1 *C. koseri*, 1 *E. aerogenes*, 2 *E. cloacae*, 3 *M. morganii*, 3 *P. stuartii*, 1 *A. baumanii*, 3 *P. aeruginosa*) (15, 10.5%), *Enterococcus* spp.(5 *E. faecium*, 13 *E. faecalis*).

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Carbapenems were the most active molecule against *E. coli* (100% susceptible strains) followed by amikacin (98.6%), piperacillin-tazobactam (74.6%), third generation cephalosporins (62%), amocillin-clavulanate, trimethoprim-sulfametoxazole (53.5%), amoxicillin-clavulanate (50.7%) and ciprofloxacin (46.5%).
All *P. mirabilis* were susceptible to carbapenems, amikacin and piperacillin-tazobactam. 52.9% were susceptible to amocillin-clavulanate.
The other molecule (third generation cephalosporins, trimethoprim-sulfametoxazole and ciprofloxacin) showed rate of resistance higher than 80%.
The most active molecule against *Klebsiella* spp. were carbapenems and amikacin (58.3% susceptible strains), followed by piperacillin-tazobactam and third generation cephalosporins and amoxicillin-clavulanate (50%).
The other molecule (trimethoprim-sulfametoxazole and ciprofloxacin) shown rate of resistance higher than 58%.
The most active molecule against *P. aeruginosa* were carbapenems (100% susceptible strains) followed by amikacin and piperacillin-tazobactam (66.7%). Ciprofloxacin shown rate of resistance of 66.7% and the other molecule (third generation cephalosporins and trimethoprim-sulfametoxazole) were inactive against this pathogens.
The level of vancomicin resistance between *Enterococcus* spp. was 22.2%.
Between 9 nosocomial staphylococcus 7 (77.8%) were resistant to methicillin.

Comunity acquired

A total of 637 comunity acquired pathogens were collected. The most rappresented pathogens were: *E. coli* (399, 62.6%), *E. faecalis* (57, 8.9%), *P. mirabilis* (52, 8.2%), *Klebsiella* spp. (436.7%). The other pathogens influence less than 2%.
The most active molecule against *E. coli* were carbapenems (100% susceptible strains), followed by amikacin (99%), piperacillin-tazobactam (91% suscetible strains), third generation cephalosporins (84.5%).
Trimethoprim-sulfametoxazole, ciprofloxacin and amoxicillin-clavulanate shown rate of susceptibility of 69.4%, 64.2% and 67.4% respectively.
Carbapenems and amikacin were the most effective molecule against *P. mirabilis,* followed by piperacillin-tazobactam (96.3%), third generation cephalosporins (63%) and amoxicillin-clavulanate (59.3%). The other rmolecule (trimethoprim-sulfametoxazole and ciprofloxacin) shown a rate of resistence low than 50%.
The most active molecule agains *Klebsiella* spp. were carrbapenems (100% susceptibility), followed by amikacin (97.7%), piperacillin-tazobactam (93.2%), amocillin-clavulanate (86.4%), trimethoprim-sulfametoxazole and ciprofloxacin (84%) and third generation cephalosporins (81.8%).
All *Pseudomonas* spp. were susceptible to carbapenems and piperacillin-tazobactam, 86.6% were susceptible to amikacine and 84.6% were susceptible to third generation cephalosporins. Ciprofloxacin and trimethoprim-sulfametoxazole shown rate of resistance of 53.9% and 92.4% respectively.
The level of vancomicin resistance between *Enterococcus* spp. was 6.3%.
Between 18 comunity staphylococcus 12 (66.7%) were resistant to methicillin.

DISCUSSION

This report described the epidemiology of UTIs isolates in Liguria and their antibiotic susceptibility patterns, evaluating samples from over 780 patient recluited from International Evangelical Hospital (Voltri division) in Genoa.
The majority of pathogens were isolated from women (76.5%). It has been extensively reported that adult women have a higher prevalence of UTI

Table 1. *Distribuition of the strains collected in this survey according to the origin*

	Nosocomial		Comunity		
	Num	%	Num	%	Tot
E. coli	71	15.1	399	84.9	470
C. freundii	1	33.3	2	66.7	3
C. koseri	1	50	1	50	2
E. aerogenes	1	8.3	11	91.7	12
E. cloacae	2	22.2	7	77.8	9
K. pneumoniae	9	22.5	31	77.5	40
K. oxytoca	3	20	12	80	15
K. ornithinolytica	0	0	1	100	1
M. morganii	3	37.5	5	62.5	8
P. mirabilis	17	24.6	52	75.4	69
P. rettgeri	0	0	2	100	2
P. stuartii	3	42.8	4	57.2	7
R. ornithinolytica	0	0	1	100	1
R. planticola	0	0	1	100	1
A. baumanii	1	25	3	75	4
P. aeruginosa	3	20	12	80	15
P. fluorescens	0	0	1	100	1
S. aureus	7	50	7	50	14
S. epidermidis	1	20	4	80	5
S. haemolyticus	1	33.3	2	66.7	3
S. hominis	0	0	1	100	1
S. saprophyticus	0	0	2	100	2
S. simulans	0	0	2	100	2
S. agalactiae	1	8.3	11	91.7	12
E. faecium	5	45.5	6	54.5	11
E. faecalis	13	18.6	57	81.4	70
Total	**143**	**18.6**	**630**	**82**	**780**

than men, principally owing to anatomic and physical factors (8).

Similarly to what reported in literature, *Enterobacteriaceae* dominate in the etiology of UTI also in our region. *E. coli* was the most rappresentative pathegens isolated from positive UTI (60.3%), with a higher percentage in samples from comunity patients (62.6%).

Antibiotic resistance is a major clinical problem in treating infections caused by these microorganisms. The resistance to the antimicrobials has increased over the years. Resistance rates vary from country to country (1, 6).

For nosocomial *E. coli* were found percentage of resistance in excess of 20% against third generation cephalosporins, trimethoprim-sulfametoxazole, ciprofloxacin and amocillin-clavulanate. Only carbapenems were completely effective against this pathogens.

In community is alarmingly the high incidence of *E. coli* resistant to fluoroquinolones (more than 30% of resistant strains) and the spread of methicillin resistance in staphylococci (66.7%).

In our region the epidemiological community landscape in terms of resistance, is getting closer to the nosocomial setting.

Table 2. *Distribution of nosocomial strains according to the different clinical settings.*

	TOT	CAR	ICU	MED	NEU	ORT	RIAB	HCS	OTH
E. coli	71	3	2	23	4	4	5	18	12
Other *Enterobacteriaceae*	40	1	1	14	5	3	1	9	6
Non *Enterobacteriaceae*	4		1	1	1			1	
Steptococcus spp.	1								1
Staphylococcus spp.	9	1	1	5				1	1
Enterococcus spp.	18		1	4	2		1	4	6
Total	143	5	6	47	12	7	7	33	26

CAR, Cardiology; ICU, Intensive Care Units; MED, Medicine; NEU, Neurology; ORT, Ortopedy, RIAB, Rehabilitation; HCS, Healthcare settings, OTH, Other wards(Surgery, Oncology, Pulmonary, Genecology, Nephrology, Infectious desease).

Table 3. *Percentage of susceptibility in Gram-negative strains to major classes of antibiotics.*

	CAR		AMK		PZT		CEF III		SXT		CIP		AMC	
	Nos	Com	Nos	Com	Nos	Com	Nos	Com	Nos	Com	Nos	Com	Nos	Com
E.coli	100	100	98.6	99	74.6	91	62	84.5	53.5	69.4	46.5	64.2	50.7	67.4
Proteus spp.	100	100	100	100	100	96.3	17.6	63	17.6	42.6	17.6	50	52.9	59.3
Klebsiella spp.	58.3	100	58.3	97.7	50	93.2	50	81.8	33.3	84	41.7	84	50	86.4
Enterobacter spp.	100	100	66.7	94.4	0	83.3	0	50	66.7	72.2	33.3	77.8	0	0
M.morganii	100	100	100	100	100	100	100	80	66.7	60	100	100	0	0
Citrobacter spp.	100	100	100	100	100	100	100	100	100	33.3	100	66.6	50	33.3
Providencia spp.	100	100	100	100	66.7	100	100	50	0	0	33.3	25	0	0
Raoutella spp.	-	100	-	100	-	100	-	100	-	100	-	100	-	100
Pseudomonas spp.	100	100	66.7	86.6	66.7	100	0	84.6	0	7.6	33.3	46.1	0	0
A.baumannii	0	0	100	100	0	0	0	0	0	0	0	0	0	0

CAR: carbapenems; AMK: amikacin; PZT: piperacillin-tazobactam; CEF III: third generation cephalosporins; SXT: trimethoprim-sulfametoxazole; CIP: ciprofloxacin; AMC amoxicillin-clavulanate.

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