ORIGINAL ARTICLE

AFRICAN JOURNAL OF CLINICAL AND EXPERIMENTAL MICROBIOLOGY JAN 2015 ISBN 1595-689X VOL16 No.1
AJCEM/1501
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NOSOCOMIAL URINARY INFECTIONS AT THE UROGOLY UNIT OF THE NATIONAL UNIVERSITY HOSPITAL (YALGADO OUEDRAOGO), OUAGADOUGOU: FEB.-SEPT. 2012

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ABSTRACT

Objective: The aim of this study was to identify the risk factors and the microorganisms susceptibilities of nosocomial urinary infections at the urology unit of the national university hospital of Ouagadougou in Burkina Faso.

Method: From February to September 2012, two bacteriological analyzes have been performed for any of the 75 in-patients in the urology unit of the national university hospital of Ouagadougou in Burkina Faso.

Results: During the study period, 43 cases of nosocomial urinary infection were identified (57.3%) and we found no statistically significant associated risk factors with age groups, sex, arterial blood pressure, kidney illness and urinary obstructive pathologies.

The most frequently isolated bacteria were *Escherichia coli* (30.9%), *Klebsiella spp* (26.9%) and *Staphylococcus spp* (15.4%). The yeasts strains were very sensitive to antifungal but the bacteria susceptibility rate to antibiotics was very variable. Thus, the cocci were rather sensitive to association clavulanic acid + amoxicilline and ceftriaxone and enough sensitive to gentamicine ; the bacilli were enough sensitive to gentamicin and very sensitive to imipenem.

Conclusion: From the antibiogram results, we recommend gentamicin in combination with penicillin or metronidazole as the first antibiotics to be used in the treatment of nosocomial urinary tract infections.

Keywords: urinary infection, nosocomial infection, bacteria, antibiotics

INFECTIONS URINAIRES NOSOCOMIALES AU SERVICE D'UROGOLIE DU CENTRE HOSPITALIER UNIVERSITAIRE (YALGADO OUEDRAOGO), OUAGADOUGOU (de février à septembre 2012)

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RÉSUMÉ

Titre : Infections urinaires nosocomiales au service d'urologie du centre hospitalier universitaire (Yalgado Ouédraogo), Ouagadougou (de février à septembre 2012).

Objectif : Identifier les facteurs de risque et la sensibilité aux antimicrobiens des germes responsables d'infection urinaire nosocomiale dans le service d'urologie du CHU-YO.

Matériel et méthode : Entre février et septembre 2012, des facteurs de risque d'infection urinaire ont été recherchés chez des patients hospitalisés dans le service d'urologie du CHU-YO. Pour chaque patient, un examen cytobactériologique des urines a été réalisé et la sensibilité aux antimicrobiens des germes éventuellement responsables a été déterminée.

Résultats : Sur 75 patients hospitalisés, 43 ont présenté au moins un épisode d'infection urinaire (57,3%). Bien que présentant des risques d'infection plus importants, des variables comme l'âge avancé, le sexe, l'hypertension artérielle, l'insuffisance rénale et les uropathies obstructives n'étaient pas statistiquement plus associés aux infections urinaires nosocomiales.

Les germes isolés étaient dominés par *Escherichia coli* (30,9%), les Klebsielles (26,9%) et les staphylocoques (15,4%). Les levures étaient très sensibles aux antifongiques mais les bactéries ont montré des taux de sensibilité très variables. Ainsi, les cocci étaient assez sensibles à l'association amoxicilline-acide clavulanique, à la ceftriaxone et assez sensibles à la gentamicine ; les bacilles étaient assez sensibles à la gentamicine et très sensibles à l'imipénème.

Conclusion : A partir de ces résultats, nous recommandons la gentamicine en association avec une pénicilline ou le métronidazole dans le traitement en première intention des infections urinaires nosocomiales.

Mots clés : infection urinaire, infection nosocomiale, bactéries, antibiotiques

INTRODUCTION

Nosocomial infections are the most undesirable among the hospital care events with more than 50% of the cases [1, 2]. Their incidence rates are related to the medical development level of the country; and to the hygienic level at the hospital unit. A study carried out in France hospitals showed the national prevalence of nosocomial infection at 1% approximately [3]. This phenomenon is largely studied in the developed countries through the national committees against nosocomial infections, is not well documented in developing countries.

Among the nosocomial infections, those of urines are the most frequent with 34 to 40% of the cases [4, 5, 6]. They are supported by the urinary catheterization during long periods, the use of large spectrum antibiotics and the hygienic deficit during the nursing [2, 7, 8].

In Burkina Faso, a study conducted at the national university hospital "Yalgado Ouédraogo" indicated a nosocomial urinary infection rate of 14.8% and 67.3%¨respectively in the medicine ward and in the urology unit [9, 10]. The contamination occurs by ascension along urethra of endogenous or exogenous microorganisms and the more incriminated bacteria are *Escherichia coli, Staphylococcus aureus* and *Pseudomonas aeruginosa* [6, 11, 12]. Usually, these bacteria are characterized by their antibiotics resistance due to the selection pressure existing in hospital [9, 11, 12].

The purposes of this study is to identify the risk factors related to nosocomial urinary infections among patients hospitalized in the urology unit of the national university hospital "Yalgado Ouédraogo" and to determine the antimicrobials susceptibilities of implicated agents.

MATERIAL AND METHODS

This study conducted from February to September 2012 in the urology unit of the national university hospital "Yalgado Ouédraogo" included all in-patients who stayed at least one week in the urology unit, who performed at least two bacteriological analyses of urines during their staying and who gave their consent to be enrolled in the study.

For each patient, the first morning urines collected in sterile bottles have been subjected to:

- A bacterial count using immersed blade method (Uriline*, France)
- Leucocytes count with a Malassez calibrated cell
- Microscopic examination after centrifugation at 3,000 rounds/min x 5 minutes to look for red blood cells, parasites, yeasts, crystals and over elements
- Gram stain to appreciate bacteria morphologies
- Culture on usual agar plates (Bromocresol pourpre, Eosin methylen Blue [Biomèrieux, France]) and another culture medium chosen according to the microscopic examination results. For example Chapman agar for selecting Gram positive cocci evoking Staphylococcus genus; blood agar plate for cocci evoking Streptococcus genus; Eosine methylen blue agar for Gram negative bacilli; and Sabouraud agar for yeasts.

After 18 to 24 hours of incubation in 37°C the isolated microorganisms have been identified on the basis of their morphological, cultural, and metabolic nature. For each identified germ, the antimicrobial profile has been determined by the diffusion method in Müller-Hinton plate agar as recommended by the "European Committee on Antimicrobial Susceptibility Testing Version (2.0, valid from 2012-01-01). The obtained results have been confirmed with the automat "MicroscanWalkAway 40 IF" (Siemens, Germany) and the quality control has been done with bacteria of the American Type Culture Collection (ATCC) *E. coli* 25922, *Pseudomonas aeruginosa* 27853 and *Staphylococcus aureus* 25923. The statistical analysis was done with "Epi-Info 7".

The operational definitions used for this study were:

- urinary infection : when bacteria count ≥ 10^4 bacteria/mL of urine.
- nosocomial urinary infection : when the first bacteriological analysis of urine is negative and the second positive or when both (first and second) are positive with different germs.

RESULTS

Characteristics of the studied population

During the study period, 243 in-patients have been recorded in the urology unit of the national university hospital of Ouagadougou of whom 75 (30.9%) have been enrolled in the study. Among these 75 patients:

- 61 (81.3%) were male,
- 32 (42.7%) were 60 years old and more,
- 17 (22.7%) have an antecedent of urinary infection,
- 58 (77.3%) presented an obstructive urologic pathologies, 43 (57.3%) presented a nosocomial urinary infection among whom six did two episodes of urinary infection.

Nosocomial urinary infection and studied risk factors

The sex, the age-groups, the renal insufficiency, high arterial blood pressure, obstructive urologic pathologies and bladder washing are not risk factors of nosocomial urinary infection (Table I).

TABLE I: NOSOCOMIAL URINARY INFECTIONS ACQUISITION AND RISK FACTORS STUDIED

Risk factors		Number	Infected patients n	%	Chi–square	P-value
Sex	Male	61	35	57.4	0.00	0.987
	Female	14	8	57.1		
Age groups	<40 years	26	13	50.0	5.152	0.076
	[40-60[	17	7	41.2		
	≥60 years	32	23	71.9		
Kidney deficiency	Yes	11	5	45.5	0.744	0.389
	No	64	38	59,4		
High blood pressure	Yes	19	14	73,7	2,781	0,095
	No	56	29	51,8		
Origin of patient	Health-care facil	19	13	68,4	1,279	0,258
	Home	56	30	53,6		
Urologic pathologies	Obstructive	58	36	62,1	2,346	0,126
	no obstructive	17	7	41,2		
Bladder cleaning	Yes	20	14	70,0	1,789	0,181
	No	55	29	52,7		
Surgery act	Yes	63	37	58,7	0,314	0,575
	No	12	6	50,0		
Urinary catheterization	Yes	66	40	60,6	2,408	0,120
	No	9	3	33,3		

Bladder cleaning= Bladder washing ; Origin of patient= where patient comes from ; Health-care facil =Health care facilities

Identified micro-organisms

A total of 52 microbial strains were identified, generally in mono-microbial culture. Microbial association was found in three samples: *Klebsiella pneumoniae* + Candida not albicans; *Acinetobacter baumanii* + *Candida albicans;* and *Escherichia coli* + *Staphylococcus aureus*. The most frequently isolated germs were *Enterobacteria* (76.7%) and Staphylococcus (15.4%) (Table II).

TABLE II: THE 52 MICRO-ORGANISMS ISOLATED FROM THE NOSOCOMIAL URINARY INFECTIONS

Groups	Genus	Species	Number	(%)
Enterobacteria (35)	*Escherichia*	*E. coli*	16	30,8
	Klebsiella	*K. pneumonia*	12	23,1
		K. ozenae	2	3,85
	Enterobacter	*E. cloacae*	1	1,9
		E. sakazakii	1	1,9
	Proteus	*P. mirabilis*	2	3,85
	Providencia	*P. stuartii*	1	1,9
Non-fermentative Gram negative bacilli (5)	*Pseudomonas*	*P. aeruginosa*	4	7,7
	Acinetobacter	*A. baumanii*	1	1,9
Gram positif cocci (8)	*Staphylococcus*	*S. aureus*	5	9,6
		S. epidermidis	3	5,8
Yeasts (4)	*Candida*	*C.* not albicans	3	5,8
		C. albicans	1	1,9
Total			52	100

Antimicrobials activities

The most efficient antibiotics were imipenem for bacilli and gentamicine for cocci (Table III).

TABLE III: SUSCEPTIBILITY RATES TO ANTIBIOTICS OF ISOLATED BACTERIA FROM NOSOCOMIAL URINARY INFECTION

NFGNB= No-Fermentative Gram Negative Bacilli ; Amoxi + clav ac = amoxicilline + clavulanic acid

Antibiotics	Enterobacteria : n=35 (%)	NFGNB n=5 (%)	Staphylococcus : n=8 (%)
Amoxicillin	0		50
Amoxi + clav ac	8,6		87,5
Ceftriaxone	8,6		87,5
Ciprofloxacin	28,6		87,5
Cotrimoxazole	20		25
Gentamicine	60	80	100
Imipenem	100	100	
Cefixime		60	
Cefpodoxime		60	
Pipemidique acide		60	
Netilmicine		40	
Nitrofurantoïne		40	
Pristinamycine		40	

Specifically, the sensitivity rates were for *Eschechia coli* (n=16) 100% with nitrofurantoïne and 87.5% with netilmicine; for *Klebsiella spp* (n=14) 71.4% with gentamicine and 100% with nystatine, econazole and miconazole for *Candida spp* (n=4).

Evolution after treatment

After treatment, the evolution was favourable for all the 43 patients with nosocomial urinary infection (100%). The first therapeutic profile using gentamicine or ciprofloxacin or pipemidic acid has been corrected for 28 patients (65.1%) according to the antibiogram or antifongigram results. The average duration of treatment was 12 days but it lasted one to two weeks for 39 patients (90.7%) and two to three weeks for four patients (9.3%). Any case of death related to the nosocomial urinary infection was noted.

DISCUSSION

During this study conducted in the urology unit of the national university hospital (Yalgado Ouédraogo) of Ouagadougou in Burkina Faso, the nosocomial urinary infection prevalence rate was 57.3% within the studied population. This result indicates that the nosocomial urinary infection is an important public health problem in our region. Our studied population was dominated by male sex (81.33%) but the infection rate was approximately 57% in men and women contrarily in developed countries where males seem to be more infected [13, 14].

Generally, infection occurs among patients with urinary catheter (69.7%) especially for long period. Effectively, it has been demonstrated that the contamination probability increases 10 to 30% per day of catheterization and reaches 100% after two months [15]. The nosocomial urinary infection is more frequent in patients 60 years old and after (71.9%) however, age groups are not statistically associated to the infection as previously observed [16].

The infection incidence was higher in high blood pressure patients (73.7%) compared to patients with normal blood pressures (51.8%), although the difference was not statistically significant. In our studied population no case of severe high blood pressure has been noted (diastolic ≥14; systolic ≥9).

The origin of patient was not a significant factor of urinary infection occurring : 53.6% for patients coming directly from their residence versus 68.4% for patients coming from another health-care facilities (P=0.258). However, it's known that in these secondary medical centres hygiene is often defective and medical treatments are often unsuited because of lack of specialists [17, 18].

During this study, the incidence of the nososcomial urinary infection was more important in case of obstructive pathologies (62.1%), bladder cleaning (70%), bladder catheterization (60.6%) and urologic surgery (58.7%). But, these events are not statistically risk factors (p=0.126; p=0.181; p=0.120; p=0.575 respectively). However, many publications recognized that in urology, obstructive pathologies and surgical acts increase the risks of urinary infection [19, 20, 21, 22].

A total of 48 bacteria and 4 yeasts have been identified from the urinary samples among whom three were bi-microbial with following associations: *Klebsiella pneumoniae* + Candida not albicans, *Acinetobacter baumanii* + *Candida albicans* and *Escherichia coli* + *Staphylococcus aureus*. The most frequent identified genus

were Enterobacteria, (76.7%) and Staphylococcus (15.4%) which are current aetiologies of urinary infections [5, 10]. The most frequently identified species were *Escherichia coli* (30.8%), *Klebsiella spp* (26.9%) and *Staphylococcus spp* (15.4%) as demonstrated by many authors [9, 21, 22, 23, 24, 25, 26, 27, 28, 29].

In our study, the resistance rates of the isolated Enterobacteria were more than 71% with amoxicillin, amoxicillin + clavulanic acid, ceftriaxone, ciprofloxacine and cotrimoxazole. The high resistance level of nosocomial urinary infection bacilli is well documented and is supported by antibiotic selection pressure leading to resistant samples in hospital [9, 25, 26, 28]. Despite their susceptibility to imipenem, the five strains of non-fermentative bacilli showed resistance rates from 40 to 60% with pipemidic acid, cefixim, cefpodoxim, Netilmicin, Nitrofurantoïne and pristinamycin. The eight strains of S*taphylococcus spp* were susceptible to amoxicilline + clavulanic acid, ceftriaxone, ciprofloxacine and very sensitive to gentamicin as earlier demonstrated [25, 27, 28]. All the four samples of Candida spp were very sensitive to nystatine and econazole.

None of the antibiotics tested were sufficiently active on the bacilli and the cocci. The best therapy seems to be imipenem in association with gentamicin ; unfortunately imipenem is very expansive in our context.

The antibiogram permitted to adjust anti-biotherapy for 28 patients (57.1%) and evolution was favourable for all the patients after an average of 12 days of antibiotic treatment. This treatment duration is not very different from that observed in the hospitals of developed countries where hygiene around the patients is recommended to limit the infection risks [7, 8]

CONCLUSION

During this study, nosocomial urinary infections were very frequent in the urology unit of the national university hospital (Yalgado Ouédraogo), but we found no statistically significant risk factors. To reduce this infection rate, hygiene must be reinforced in our healthcare facilities and "Committees Against Nosocomial Infections" must be created in every hospital in Africa. In case of infection, we propose gentamicin in combination with penicillin or metronidazole as first line of chemotherapy.

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