

KPC-PRODUCING KLEBSIELLA PNEUMONIAE COLONIZATION AND INFECTION PREDISPOSE TO CANDIDA SPP. ISOLATION AND SELECTION OF NON-ALBICANS SPECIES

M. Papadimitriou-Olivgeris¹, A. Spiliopoulou², F. Fligou³, P. Manolopoulou⁴, I. Spiliopoulou², V. Dodou⁴, K. Filos³, E. Anastassiou², M. Marangos¹, M. Christofidou²

¹Division of Infectious Diseases, School of Medicine University of Patras, Patras, Greece ; ²Department of Microbiology, School of Medicine University of Patras, Patras, Greece ; ³Division of Anaesthesiology and Intensive Care Medicine, School of Medicine University of Patras, Patras, Greece ; ⁴Intensive Care Unit, Saint Andrew's General Hospital, Patras, Greece

Objectives: *Candida spp.* are an important cause of infections in critically ill patients, associated with high morbidity and mortality. Our goal was to identify the risk factors contributing to isolation of *Candida spp.* and to compare the characteristics of patients with *C. albicans* versus *C. non-albicans*.

Methods: A retrospective observational study was conducted during a 28month period in two Greek Intensive Care Units (ICUs). Samples (blood, catheter-tip, urine, bronchial secretions, trauma, peritoneal fluid) from patients of both ICUs were tested for the presence of *Candida*. All yeasts were identified using Vitek 2 Advanced Expert System (bioMerieux). KPC-producing *K. pneumoniae* (KPC-Kp) colonization was assessed by rectal sampling upon admission to ICU and weekly afterwards. Epidemiologic data were collected from the ICU computerized database and patient's chart reviews. Statistical analysis was performed with SPSS ver. 19.0, as appropriate.

Results: Among 565 patients, 49 (9%) had at least one *Candida* positive sample. *C. albicans* was the predominant isolate (26 patients, 53%). *C. parapsilosis* was isolated from 12 patients, *C. glabrata* from six, *C. tropicalis* and *C. krusei* from two patients each and *C. pseudotropicalis* from one. In total, 259 (49%) patients were enterically colonized by KPC-Kp, while 51 (9%) developed KPC-Kp infection. Multivariate analysis found that obesity, female sex, hospitalization during summer months, admission at ICU B, parenteral nutrition, administration of metronidazole, transplantation and KPC-Kp bloodstream infection were independently associated with *Candida (albicans and non-albicans)* isolation while administration of fluconazole was a protective factor (Table I). *C. non-albicans* isolation was associated with presence of colostomy or abdominal catheter, hospitalization during summer months, administration of quinolones, parenteral nutrition and KPC-Kp bloodstream infection and rectal colonization upon ICU admission. (Table I).

Table I. Multivariate analyses for risk factors for *Candida* isolation (*albicans* and *non-albicans*) of Intensive Care Unit patients

Characteristics	<i>Candida spp.</i> isolation vs. no isolation		<i>C. albicans</i> isolation vs. no isolation		<i>C. non-albicans</i> isolation vs. no isolation		<i>C. non-albicans</i> isolation vs. <i>C. albicans</i> isolation	
	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)
Obesity	0.021	2.4 (1.1-5.1)	-	-	-	-	-	-
Female sex	0.020	2.4 (1.0-4.7)	0.007	3.6 (1.4-9.2)	-	-	-	-
Hospitalization during summer months	0.018	2.4 (1.2-5.0)	-	-	0.045	2.6 (1.0-6.7)	-	-
Parenteral nutrition	0.009	3.0 (1.3-6.7)	-	-	0.008	4.3 (1.5-12.6)	0.015	16.5 (1.7-159.3)
Administration of metronidazole	0.011	3.1 (1.3-7.3)	0.017	3.8 (1.3-11.3)	-	-	-	-
Administration of quinolones	-	-	-	-	0.050	2.8 (1.0-8.0)	-	-
KPC-Kp bloodstream infection	<0.001	5.5 (2.3-13.4)	<0.001	13.4 (4.4-41.0)	0.009	4.3 (1.5-12.7)	-	-
KPC-Kp colonization upon admission	-	-	-	-	0.009	4.1 (1.4-11.9)	0.015	16.5 (1.7-159.3)
Transplantation	0.047	11.0 (1.0-115.9)	-	-	-	-	-	-
Admission at ICU B	-	-	0.002	5.1 (1.8-14.3)	-	-	-	-
Tracheostomy	-	-	0.025	3.3 (1.2-9.4)	-	-	-	-
Presence of colostomy or abdominal catheter	-	-	-	-	0.034	2.8 (1.1-7.4)	0.034	2.8 (1.1-7.4)
Days until isolation	-	-	-	-	-	-	0.040	1.1 (1.0-1.1)
Antifungal administration	-	-	-	-	-	-	0.047	6.9 (1.0-46.6)
Administration of fluconazole	<0.001	0.16 (0.06-0.41)	0.003	0.04 (0.01-0.33)	-	-	-	-

OR: odds ratio, CI: confidence interval, KPC-Kp: KPC-producing *K. pneumoniae*, ICU: Intensive care unit, ICU B: ICU of the General Hospital of "Saint Andrew"

Conclusions: A trend of increasing *Candida spp.* isolation has been observed over the last three years in our hospital, accompanied by a rise in the incidence of non-albicans species. Risk factors identified such as parenteral nutrition, female gender, presence of abdominal catheter, antibiotic administration and obesity are in accordance to previous studies, while KPC-Kp colonization or infection seems to be another predisposing factor to *Candida* isolation and selection of *C. non-albicans* species.