KPC-producing *Klebsiella pneumoniae* colonization and infection predispose to *Candida spp.* isolation and selection of non-*albicans* species

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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 *Candida albicans* versus *Candida* 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, wound, 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 patients' 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 (Figure 1). 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, KPC-Kp bloodstream infection and rectal colonization upon ICU admission. (Table I).

Figure 1. Specimens from which *Candida albicans* and non-*albicans* were isolated

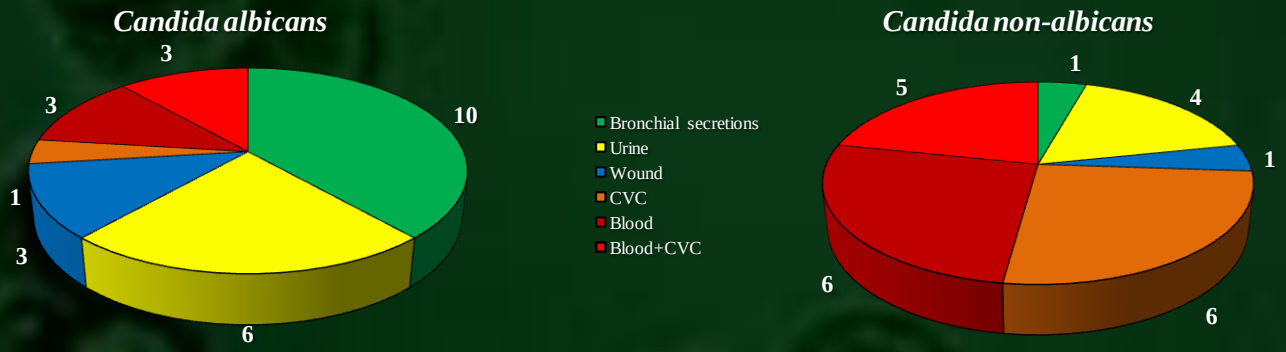

Table 1. Multivariate analysis for *Candida* isolation (*albicans* and non-*albicans*) risk factors of Intensive Care Unit patients

Characteristics	*Candida spp.* isolation vs. no isolation		*C.* non-*albicans* isolation vs. *C. albicans* isolation	
	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)	-	-
Hospitalization during summer months	0.018	2.4 (1.2-5.0)	-	-
Parenteral nutrition	0.009	3.0 (1.3-6.7)	0.015	16.5 (1.7-159.3)
Administration of metronidazole	0.011	3.1 (1.3-7.3)	-	-
KPC-Kp bloodstream infection	<0.001	5.5 (2.3-13.4)	-	-
KPC-Kp colonization upon admission	-	-	0.015	16.5 (1.7-159.3)
Transplantation	0.047	11.0 (1.0-115.9)	-	-
Presence of colostomy or abdominal catheter	-	-	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	0.2 (0.1-0.4)	-	-

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.