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Fungemia in the French department of Mayotte, Indian Ocean: a 10 years survey

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Abstract

Objective: This study aimed at providing original data on fungemia in the Centre Hospitalier de Mayotte in terms of prevalence, epidemiological characteristics of infected patients, yeast species distribution and profile of in vitro antifungals susceptibility.

Methods: A total of 223 positive blood cultures for yeasts were retrospectively reported during the period April 2010- April 2020.

Keywords: Candidemia; antifungals; *Candida* spp; Intensive care unit; Mayotte; Indian Ocean

Results: Ninety-five episodes were identified corresponding to an incidence rate of 3.7 cases/100,000 inhabitants. The average age of patients was 33.5 years, and 63.3% patients were hospitalized in intensive care unit. The main co-morbidities were surgery in the 30 days prior to fungemia (27.8%), neoplasia (22.8%), parenteral nutrition (17.7%), diabetes (16.5%) and immunosuppressive medications (31.6%). *Candida* spp accounted for the majority of isolates (92.4%) with a predominance of non-*albicans* species (55.8% vs 33.7%), including *C. albicans* (33.7%), *C. tropicalis* (30.5%) and *C. parapsilosis* (20%). The antifungal susceptibility profiles did not differ from expected results for each species and did not change significantly over time.

Discussion: Fungemia remain frequent hospital infections associated with high mortality in Mayotte. The vast majority of fungemia was due to *Candida* spp. Non-*albicans Candida* species reach half of the *Candida* isolates with a high percentage of *C. tropicalis*. Surprisingly, no case of candidemia due to *C. glabrata* were identified. The management of candidemia remains satisfactory and the treatment was adapted according to the international recommendations. However, the high susceptibility of *Candida* spp. isolates to fluconazole may invite to reconsider the use of this molecule as empirical and first-line treatment of candidemia in Mayotte.

Introduction

Invasive fungal diseases (IFD) are still a public health problem in France because of their prevalence and increasing incidence. In addition, their severity and high morbidity-mortality rate, particularly in intensive care units, persist despite appropriate treatment [1-7]. According to the French National Reference Center for Invasive Mycoses and Antifungals (<https://www.pasteur.fr/fr/sante-publique/CNR/les-cnr/mycoses-invasives-antifongiques/rapports-d-activite2018>), fungemia accounts for half of IFD cases. The overwhelming majority of fungemia is candidemia. Prompt administration of an appropriate systemic antifungal treatment is essential for controlling invasive infections and reducing mortality [6-10].

Candida albicans is the main species responsible for candidemia. However, an increase in infections due to non-*albicans Candida* species has been observed in France and elsewhere [1,10]. Hematology departments are no longer the only departments concerned because patients receive antifungal prophylaxis according to international guidelines and numerous cases are now reported in intensive care units (ICUs) and departments in charge of immunosuppressed or recent surgery patients. Nonetheless, available data on fungemia in the general population are limited [2-3,7], as most studies have focused on cohorts of patients at particular risk, including ICU patients, those with hematological malignancies, transplant patients, and those infected with HIV.

Most recent studies have provided important information on the risk factors associated with fungemia and have assessed the overall risk of death in various countries. The main factors are a stay in the ICU, recent surgery, especially abdominal surgery, parenteral nutrition, hemodialysis, steroids or chemotherapy for cancer, the presence of a central vascular catheter, being newborn, especially with low birth weight or being premature, the presence of cancer, and being a recipient of a solid organ transplant [1,10]. No data are available on fungemia in the Indian Ocean and particularly on the island of Mayotte (374 square kilometres). Mayotte is a French department, located in the archipelago of the Comoro Islands near Madagascar. The latest demographic data obtained in September 2017 reported a population of 256,500 inhabitants, of whom more than 50% were under 20 years of age [11,12]. The Centre Hospitalier de Mayotte (CHM) is the only actor of hospitalization in Mayotte and manages approximately 10.4 hospitalizations per 100 inhabitants [13]. The CHM is active in surgery, obstetrics-gynecology, general psychiatry, and medicine, with an emergency service, and pediatrics. It is the node of a network of 13 dispensaries providing local primary and preventive care, acts as an advanced life-support service, and includes a multi-purpose medical service with an onco-hematology activity [14].

Our objective was to provide original data on fungemia at the CHM and, particularly, to evaluate: (1) the prevalence of fungemia in hospital setting in Mayotte and its evolution over the last 10 years, (2) the epidemiological characteristics of infected patients, (3) the *Candida* species involved and their profile of sensitivity/resistance to antifungals, and (4) their management and outcome.

Materials and methods

Patients and data collection

This was a retrospective study on fungemia over the last 10 years at the Mayotte Medical Center (CHM) from April 2010 to April 2020. In total, 32,254 pediatric blood bottles and 38,642 pairs in adults were sampled. Among them, 223 blood cultures positive for fungi have been reported during the last 10 years. Two or more fungal blood cultures from the same patient were considered as separate episodes

if they occurred more than 21 days apart. A total of 95 episodes of fungemia were recorded and analyzed.

Data collection was performed using DXcare software (version 7.7.2 of July 2015 from Medasys) and analyzed by a senior infectious disease specialist and an intern. In the event of discrepancies, the information was checked again (1 case) and validated by a third senior physician. The following variables were included:

- Demographic data, including sex and age,
- Underlying disease and the hospitalization ward,
- The immunosuppression status, defined by at least one of the following factors: diabetes, profound neutropenia (<0.5 G/L), chemotherapy, HIV-positive serology at the AIDS stage, corticosteroid therapy (0.5mg/kg/day) for more than 15 days, presence of a solid cancer, presence of liquid cancer, treatment with an immunosuppressant, or presence of chronic kidney failure,
- Presence of a central vascular device prior to infection; a catheter related-infection was defined by a positive culture with the same fungal agent as in the blood culture and/or signs of catheter inflammation and/or a differential in blood culture growth in favor of the catheter (growth of the sample from the catheter at least 2 h prior to that from the periphery),
- Parenteral nutrition in the month prior to fungemia,
- Recent surgery less than one month before fungemia,
- A fungemia complication assessment, with systematic cardiac echography and fundus examinations and abdominal-pelvic and cerebral CT scan according to clinical signs,
- The characteristics of the antifungal treatment,
- The mortality rate at days 8 and 30 and at discharge from the hospital.

Mycological study

Blood cultures were performed by the biological laboratory of the Mayotte Medical Center using the BACT/ALERT® (Biomérieux, Marcy l'Etoile, France) blood culture system and vials from April 2010 to October 2017 and the BACT/ALERT® VIRTUO® system (Biomérieux, Marcy l'Etoile, France) since November 2017 (BACT/ALERT PF PLUS (Ref 410853) culture bottles were used for pediatric patients and BACT/ALERT FA PLUS (Ref 410821) and BACT/ALERT FN PLUS (Ref 410852) were used for adults).

If the cultures were positive, 50µL of positive flasks were inoculated on Sabouraud-gentamicin-chloramphenicol agar plates and incubated at 37°C for 24 to 60 h. Identification and antifungal susceptibility testing were performed using the VITEK[®]2 system from Biomérieux (Marcy l'Etoile, France). The integrated VITEK[®]2 is an instrument based on advanced colorimetry. VITEK[®]2 cards incubated at 35°C are automatically measured by fluorescence every 15 min. Each profile is interpreted according to a specific algorithm. Antifungal susceptibility was also determined using VITEK[®]2 cards, by comparing the growth of the patient's isolate to the growth of yeast reference strains with known MICs. Susceptible//intermediate/resistance (SIR) classification was performed according to EUCAST breakpoints according to the manufacturer, with annual updates. However, the system in CHM is not configured to deliver MICs results, so these data were not analyzed.

Other biological data collected were the peripheral or central origin of the blood culture and the incubation time before positivity of each culture flask, allowing determination of whether or not a catheter infection was present.

Ethics and statistics

According to the French Public Health Laws (Code de la Santé Publique, 2017, Article R.1121-1-1. [https://www.legifrance.gouv.fr/eli/decret/2017/5/9/AFSP1706303D/jo/texte.](https://www.legifrance.gouv.fr/eli/decret/2017/5/9/AFSP1706303D/jo/texte)) protocols of this type do not require approval from an ethics committee and are exempt from the requirement for formal informed consent.

Data were analyzed using R statistical software, version 3.6.0.

Patient characteristics were analyzed at the time of infection, including risk factors for infections. However, some clinical and biological data were absent for some patients (less than 15%). Data are reported as numbers and percentages for categorical variables. Prevalence was calculated based on available hospital activity data, i.e. data from 2010 to 2020. Categorical variables were compared using Fisher's exact test or the Chi2 test, when appropriate, to test associations between categorical patient characteristics and *Candida* species, with statistical significance considered at the 5% threshold.

Results

Demography and epidemiology

Over a period of 10 years (from April 2010 to April 2020), 223 positive blood cultures were reported at the CHM, corresponding to 95 episodes of fungemia. The resulting estimated incidence of fungemia was thus 3.7 cases/100,000 inhabitants. The rate of fungemia was 4,8/100,000 ICU admissions and

0.34/100,000 hospital admissions (95/273,025). The percentage of hospital acquired fungemia was 87% (83/95).

The distribution of fungemia cases shows that approximately 5 to 15 cases were diagnosed each year. A total of 93 patients were involved in the 95 episodes, 61 adult patients (over 18 years of age) and 32 children (0 to 18 years of age). Males represented 55.9% of cases. The mean age for the overall population was 33.5 years (range 9 days to 83 years, median 36 years). The average age in the pediatric population was 8.4 years (9 days to 18 years) and males represented 62.5% of cases. In the adult population, the mean age was 48.9 years (20 years to 83 years) and males represented 52.45% of cases (Figure 1).

Thirty-six fungemia among 79 (45.5%) were considered as catheter related infections and all of them were secondary to infection of a central vascular device. Information was missing for 16 cases.

Species distribution and antifungal susceptibility

All microorganisms responsible for fungemia were identified as yeast but without species identification for three episodes. The vast majority of isolates were identified as *Candida* species (92.4%), but other genera were also identified: *Cryptococcus neoformans* in 4 episodes, and 1 episode each for *Trichosporon asahii*, *Pichia* spp and *Kodamaea ohmeri* (Table 1).

At the species level, the 3 common *Candida* species involved were *C. albicans*, *C. tropicalis* and *C. parapsilosis* representing more than 84% of the episodes (80/95). The other *Candida* species made up less than 1% of the episodes and no episode involving *C. glabrata* was recorded.

A comparison of the patient characteristics according to the three major *Candida* species identified is presented in Table 2. There was a statistically significant difference in the distribution of *Candida* species with respect to age, with a significant proportion of *Candida parapsilosis* infections in children < 3 months of age.

Antifungal susceptibility profiles did not differ from the expected results for any species: high susceptibility to all antifungal agents tested for isolates of *C. albicans* (except 1 strain intermediate to voriconazole and 5 strains intermediate to amphotericin B), *C. tropicalis*, *C. dubliniensis*, *C. ciferrii*, *C. guilliermondi* and *C. lusitaniae*, and lower susceptibility to caspofungin for one strain belonging to the *C. parapsilosis* complex (Table 3).

Clinical characteristics, co-infections and outcome

Episodes were mainly diagnosed during an ICU stay (44/95, 46.3%), of which 27 occurred in adults, 13 in neonates, and 4 in children. Sixty-two percents of patients hospitalized had a central venous catheter at the time of fungemia, of which more than half were jugular central catheters (Figure 2).

The general characteristics of the factors analyzed in the sample population studied are presented in Table 4. There was a significant difference in mortality rates (at D8 and/or D30) for different risk factors: chemotherapy, corticosteroid therapy, solid cancer, and hematological malignancy.

The main risk factor were surgery in the 30 days prior to fungemia (27.8%), 45% of which were digestive surgery, neoplasia (22.8% with 8.9% of hemopathy), parenteral nutrition (17.7%), diabetes (16.5%), chemotherapy (13.9%), corticotherapy (12.6%) and other immunosuppressive medication (5.1%), HIV infection (2.2%), neutropenia (2.2%), chronic kidney failure on dialysis (8.9%) (Table 4).

Bacteremia occurred within +/- 5 days after positive blood culture for fungi in 30 patients (11 due to *Staphylococcus aureus* and 19 due to Enterobacteriaceae). Among them, 9 episodes were observed in neonates < 1 year, 4 in children and 17 in adults.

(i) Antifungal treatment

Information on patient management was available for 79 patients (83.2%). Among these cases of candidemia, the starting point for more than third (36 cases) was a central vascular device (Table 4).

There were 13 cases (13.7%) for which no treatment for fungemia was provided. Among them, three (3.2%) were due to a palliative management decision, and 10 (10.53%) to a probable oversight or lack of knowledge of the physician. In most cases (66/95 cases, 69.5%), the management of fungemia was satisfactory (Table 5).

The management of candidemia included systematic extension assessment (ocular fundus examination, transesophageal ultrasound, and abdominal CT-scan for 95% of patients) and the administration of systemic antifungal treatment. The most frequent complications were fungal endocarditis (4/95, 4.2%) (Table 6).

The probabilistic treatment was always caspofungin, with de-escalation to fluconazole after an antifungal susceptibility testing (AST) and a negative blood culture. In the absence of an AST, caspofungin was continued. The duration of treatment was 14 days after the 1st negative blood culture, except for 10 cases with documentation of secondary localization requiring longer treatment and sometimes surgery (case of endocarditis).

The management of the four cases of cryptococemia was satisfactory with an extension assessment (Lumbar Punction (LP) and ocular fundus examination) and administration of a first-line treatment of

14 days with liposomal amphotericin B (3 mg/kg/d, iv) combined with flucytosine (100 mg/kg/d, po), followed by maintenance treatment with fluconazole (400 mg/d, po) during 8 weeks, all associated with subtractive LP.

(ii) Outcomes (mortality)

Mortality data were obtained for 89 patients. There were 26 deaths by D30, i.e. an overall mortality of 29.2%, with 50% occurring within the first eight days. Among these 26 cases, there were 24 cases of candidemia (92.3%) and two cases of fungemia due to unidentified yeast. Thus, the mortality rate for candidemia was 27%.

The independent risk factors for death at D30 in our study were the presence of hematological malignancy, administration of chemotherapy, and administration of corticosteroid therapy. The independent risk factors for death at D8 were central catheter infections and the presence of a solid cancer (Table 4).

Discussion

This study is the first in the Indian Ocean to evaluate the epidemiology and management of a cohort of patients with fungal infections. This analysis of yeast fungemia in Mayotte generated essential information for local public health, with an estimated incidence rate of 3.7 cases/100,000 among the general population, similar to the incidence rate calculated for metropolitan France (3.6/100,000 in 2010) [3]. These data also allow the optimization of individual patient management, with a better description of the affected population, the biodiversity of species involved and their sensitivity to antifungal agents, and evaluation of the outcome.

In our study, the cases of fungemia were all first episodes and exclusively due to yeast, mainly candidemia. Candidemia are still frequent hospital infections, the incidence of which appears to be stable in Mayotte after a progressive increase until 2016. The population in our study had an average age of 33.5 years (range 9 days to 83 years) and males represented 55.9%. The average age in our study is low relative to that reported in the literature [1-4]. This can be explained by the very young population in Mayotte. Most of the patients had a recent stay in an intensive life-support unit, as in most studies [1,2,15]. Focusing on the 85 episodes of candidemia, we observed a predominance of non-*albicans* *Candida* species over *Candida albicans* (62.4% vs 37.6%) versus 57% of *Candida albicans* responsible for candidemia in the French National survey, Amarcand [5]. This finding is different from that of many epidemiological studies on candidemia. Only a few showed such an imbalance in favor of non-*albicans* *Candida* species [1,16]. This distribution cannot be explained by pre-exposure to antifungal agents, as we only found two cases of pre-exposure to fluconazole, a well-known antifungal

drug that selects non-*albicans* species [17]. *Candida albicans* was still the major species, although at a particularly low frequency, followed by *Candida tropicalis* at a particularly high frequency of 34.1% (29/85) versus that found in the national Amarcand French survey, which reported only 4.9% of cases with *Candida tropicalis*, as in other international studies [1-3,15]. Furthermore, the major non-*albicans* species *Candida glabrata*, which represents the second most prevalent species responsible for candidemia in metropolitan France (16.7% in the Amarcand survey), as in many other countries, was not detected in Mayotte. We thus analyzed the biodiversity of all *Candida* species isolated not only from blood but also other samples to understand why this species was not present. *Candida glabrata* was only isolated two times in a total of 4,849 samples. Similarly, *Candida krusei* and *Candida kefyr* were not found to be responsible for candidemia in Mayotte and were detected at a low frequency (11 and 1/4849, respectively).

Such an unexpected observation of a rare species that predominates in the fungal flora has been rarely reported. In French Guyana, *Candida krusei* and *Saccharomyces cerevisiae* were detected in over 30% of the digestive flora of Amerindians living in a remote community in the Amazon forest. This carriage was reported to be of food or environmental origin [18]. Here, we have no evident hypothesis to understand such high detection of *C. tropicalis*. *C. tropicalis* is generally considered to be associated with patients with malignancy and neutropenia, but this was not shown by our data [19-21]. However, a global surveillance study (1997-2003) that included 134,715 isolates of *Candida* species from 127 hospitals in 39 countries showed a decreasing trend in the isolation of *C. albicans* over time and an increased proportion of *C. tropicalis* and *C. parapsilosis* [22]. In addition, the distribution of the species was highly regionally dependent.

All strains were susceptible to almost all antifungal agents, which can be explained by a low selection pressure due to the minimal prescription of antifungal agents in the Mayotte Hospital Centre, but above all to adapted and justified prescriptions according to international guidelines. Thus, the determination of the species alone allows a good early prediction of susceptibility to antifungal agents, before obtaining *in vitro* susceptibility results. Furthermore, the very low frequency of fluconazole-resistant strains found supports the use of empirical treatment with fluconazole until the final characterization of the species and its susceptibility profile to allow the adaptation of the drug treatment. This is an important consideration to save costs in a hospital under financial pressure.

Candidemia are still responsible for a high mortality rate, estimated to be 0.36-0.43/100,000 inhabitants in metropolitan France [3]. In our study, we observed a mortality rate of 27% by D30, of which 50% of the deaths occurred by D8. This result shows a relatively low mortality rate compared to that found in the French Amarcand study, with overall mortality of 40% by 30 days [5]. In a broad observational study of candidemia in the Paris area (2,507 candidemia episodes in 24 tertiary care

hospitals), global mortality at 30 days was 51% in the ICU and approximately 40% overall, depending on the year of study [23]. In our study, the main risk factors for death were the presence of a solid cancer or hematological malignancy, the administration of chemotherapy, and the presence of a central vascular device infection.

In Mayotte Hospital Center, the management of candidemia seems satisfactory and the treatment was given according to the recommendations of the IDSA and ECMM [24,25]. In the vast majority of cases, systemic antifungal treatment was empirical with caspofungin, followed by fluconazole when possible after documentation. However, as mentioned earlier, the high sensitivity of isolated yeasts to fluconazole could justify its use as a first-line empirical therapy. Central catheters were generally removed according to international recommendations. However, we regret the unjustified non-management of some fungemia cases, particularly in the surgical departments. This observation will be considered when updating the recommendations for the management of fungemia in our establishment.

The limitations of our study included its retrospective and monocentric nature. In addition, there was a lack of clinical data for a few patients and the number of episodes, which could account for a lack of statistical power. However, these data provide important and original information for local public health policy in Mayotte and more widely in the Indian Ocean, as well as for the optimization of individual patient management. Our study could serve as baseline data for a future prospective multicenter study of invasive fungal infections in the Indian Ocean, in collaboration with hospitals in La Reunion, Madagascar, and even the Comoros. This will help to fill the gap in the data on invasive fungal infections.

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TABLES

Table 1. Species distribution of yeasts responsible for fungemia (N = 95).

Identification of yeast isolates	N (%)
<i>Candida albicans</i>	32 (33.7)
<i>Candida tropicalis</i>	29 (30.5)
<i>Candida parapsilosis</i>	19 (20)
<i>Cryptococcus neoformans</i>	4 (4.2)
Not identified yeast	3 (3.2)
<i>Candida dubliniensis</i>	2 (2.1)
<i>Candida guilliermondii</i>	1 (1)
<i>Candida ciferrii</i>	1 (1)
<i>Candida lusitanae</i>	1 (1)
<i>Kodamaea ohmeri</i>	1 (1)
<i>Pichia</i> spp	1 (1)
<i>Trichosporon asahii</i>	1 (1)

Table 2. Patient baseline characteristics, according to the isolated *Candida* species (N=78).

Clinical characteristics	<i>Candida</i> species isolated %(n)			<i>p</i>
	<i>C. albicans</i> N=32	<i>C. parapsilosis</i> N=18 ^a	<i>C. tropicalis</i> N=28 ^a	
Age <3 months	12.5% (4)	50% (9)	14.3% (4)	0.009
Age >50 years	25% (8)	11.1% (2)	28.6% (8)	NS
Sex (MEN)	62.5% (20)	61.1% (11)	50% (14)	NS
Recent central catheter	68.7% (22)	44.4% (8)	75% (21)	NS
Parenteral nutrition	18.7% (6)	22.2% (4)	10.7% (3)	NS
Diabetes	12.5% (4)	0	21.4% (6)	NS
Digestive Surgery	6.2% (2)	1.1% (2)	21.4% (6)	NS
Other Surgery	18.7% (6)	0	14.2% (4)	NS
Corticosteroids	9.3% (3)	16.6% (3)	3.5% (1)	NS
Solid cancer	18.7% (6)	16.6% (3)	7.1% (2)	NS
Hematological malignancy	6.2% (2)	0	10.7% (3)	NS
Mortality D8	6.2% (2)	22.2% (4)	17.8% (5)	NS
Mortality D30	21.8% (7)	27.7% (5)	32.1% (9)	NS
Among whose D8	28.5% (2/7)	80% (4/5)	55.5% (5/9)	NS

NS: not significant; D: day

^aClinical data were missing for 1 patient with *C. parapsilosis* and 1 patient with *C. tropicalis* candidemia.

Table 3. Distribution of the species antifungal susceptibility.

Species	Number of isolates											
	Fluconazole		Voriconazole		Caspofungin		Micafungin		Amphotericin B		Flucytosin	
	S	I/R	S	I/R	S	I/R	S	I/R	S	I/R	S	I/R
<i>Candida albicans</i> N=32	32	0	31	1	31	0	28	0	27	5	30	2
<i>Candida tropicalis</i> N=29	29	0	29	0	27	0	25	0	29	0	29	0
<i>Candida parapsilosis</i> N=18	18	0	18	0	16	1	15	1	18	0	17	1
Other <i>Candida</i> species* N=5	5	0	5	0	5	0	5	0	5	0	5	0
Total	84	0	83	1	79	1	73	1	79	5	81	3

* Included *C. dubliniensis* (n=2), 1 *C. guilliermondii*, 1 *C. lusitanae*, and 1 *C. ciferrii*

S: susceptible; I: intermediate; R: resistant

Table 4. Underlying conditions, host factors, and mortality for 93 patients (95 episodes) with fungemia.

Risk factors		No of patients (%)	No of deaths at D30		No of deaths at D8	
			N(%)	P	N(%)	P
Parenteral nutrition (n=79)	No	65 (82.3)	16 (25)	NS ^a	8 (12)	NS ^a
	Yes	14 (17.7)	6 (43)		2 (14)	
Central catheter (n=79)	No	20 (25.3)	5 (25)	NS ^a	5 (25)	NS ^a
	Yes	59 (74.7)	17 (29)		5 (8)	
Catheter infections (n=92)	No	56 (60.8)	18 (32)	NS ^a	12 (21)	0.028^a
	Yes	36 (39.2)	8 (22)		1 (3)	
Catheter ablation (n=66)	No	16 (24.2)	6 (38)	NS ^a	3 (19)	NS ^a
	Yes	50 (75.8)	13 (26)		4 (8)	
Recent surgery (n=79)						
	Digestive surgery	10 (12.7)	1 (10)	NS ^b	0	NS ^b
	Skin surgery	5 (6.3)	3 (60)	NS ^b	1 (20)	NS ^b
	Other surgery	7 (8.8)	1 (14)	NS ^b	1 (14)	NS ^b
	No surgery	57 (72.2)	17 (30)		8 (14)	
Chemotherapy (n=79)	No	68 (86)	15 (22)	0.013^a	8 (12)	NS ^a
	Yes	11 (14)	7 (64)		2 (18)	
Immunosuppressive drugs (n=79)	No	75 (95)	22 (29)	NS ^a	10 (13)	NS ^a
	Yes	4 (5)	0		0	
Corticosteroid therapy (n=79)	No	69 (87.4)	16 (23)	0.040^a	8 (12)	NS ^a
	Yes	10 (12.6)	6 (60)		2 (20)	
Diabetes (n=79)	No	66 (83.5)	19 (29)	NS ^a	9 (14)	NS ^a
	Yes	13 (16.5)	3 (23)		1 (8)	
Solid Cancer (n=79)	No	68 (86)	17 (25)	NS ^a	6 (9)	0.039^a
	Yes	11 (14)	5 (45)		4 (36)	
Hematological malignancy (n=79)	No	72 (91)	17 (24)	0.024^a	9 (13)	NS ^a
	Yes	7 (9)	5 (71)		1 (14)	
Chronic kidney failure dialysis (n=79)	No	72 (91)	18 (25)	NS ^a	9 (13)	NS ^a
	Yes	7 (9)	4 (57)		1 (14)	
Intensive care unit stay (n=79)	No	29 (36.7)	5 (17)	NS ^a	4 (14)	NS ^a

Yes	50 (63.3)	17 (34)	6 (12)
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NS: Non significant. ^a Comparing “yes” and “no” groups. ^b Comparing this type of surgery with no surgery.

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Table 5. Distribution of antifungal treatment (N=95).

Therapeutic care	No of patients (%)
Appropriate antifungal treatment	66 (69.5)
No antifungal treatment	10 (10.5)
Therapeutic limitation /Palliative care	3 (3.2)
No information on care	16 (16.8)

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Table 6. Distribution of fungemia complications (N=95).

Clinical complications	No of patients (%)
Hepatic abscess	1 (1.0)
Invasive candidosis (lung/brain/retina/pansinusitis)	1 (1.0)
Neuromeningeal cryptococcosis	3 (3.1)
Endocarditis	4 (4.2)
Jugular thrombophlebitis	1 (1.0)

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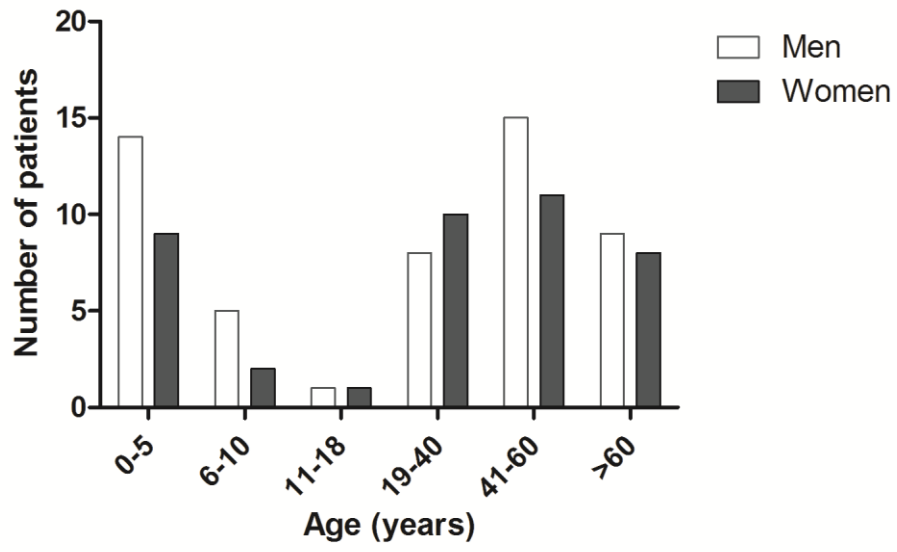
LEGENDS TO FIGURES

Figure 1. Age and sex distribution of patients with fungemia.

Figure 2. Types of catheters used in patients with fungemia (N=59).

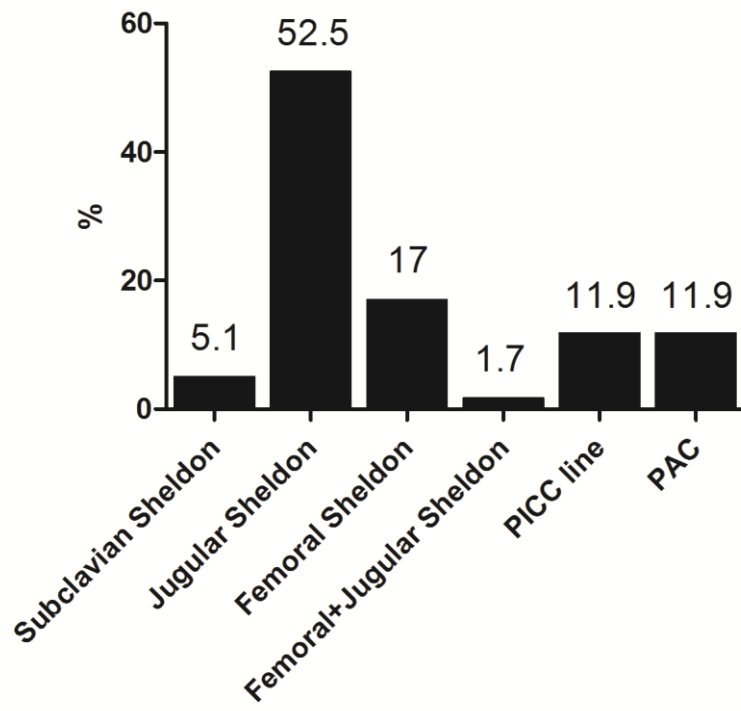
Sheldon[®]: Non-tunneled central catheter; PAC: Port à cath catheter; PICC: peripherally inserted central catheter

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Figr-1

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Figr-2