Incidence and Antifungal Susceptibility of Candida Albicans Infections

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**ABSTRACT**

INTRODUCTION. Candida albicans is the most common inhabitant of the skin, mouth, vagina and gastrointestinal tract of human beings. One of the major reasons for the increase in Candida infection is the development of its resistant strains due to drugs used in the treatment of candidiasis. MATERIALS AND METHODS We studied 4027 samples collected from patients in various wards of the Emergency County Hospital Craiova, Romania between 2014-2015. The specimens were: pharyngeal exsudates, sputum, tracheal secretions, skin secretions, stools, ear secretions, urine, vaginal secretions. All the specimens were transported to the microbiology laboratory and cultured within 3 to 4 h of collection. Among the 4027 samples, 652 showed culture characteristics similar to Candida albicans. The samples were inoculated under sterile conditions using Sabouraud culture media, a medium designed to inhibit bacterial growth and allow the development of fungi. Antifungal Susceptibility Testing was performed by disc diffusion according to CLSI 2014 guidelines using: clotrimazole, ketoconazole, miconazole, econazole, amphotericine B, fluorocytosine, nistatin. RESULTS AND DISCUSSION In our study group the urocultures and dermatological products have a high infection rate, between 100% to 70%, in contrast, we find evidence of secretion ear (3.13%) and the throat swab (9.33%). Various resistant levels were detected against antifungal drugs but, complete resistance to 5-fluorocitozina (100%), and the organisms showed highly sensitive to Cotrimazol şi Ketoconazol (100%). In the case of Miconazol 256 (39, 26%), Econazol, 215 (32,98%), Amphotericinei B, 230(35,28%). Nystatin 329 (50,46%). CONCLUSIONSElucidating these mechanisms may provide new foundations for antifungal chemotherapy and can present an exciting challenge for the future investigations. Candida albicans infections are present and diverse clinical pathology.

**KEYWORDS** incidence, antifungal susceptibility, Candida albicans, Cotrimazol, Ketoconazol

Introduction

*Candida* species are the most common cause of fungal infections worldwide. *Candida* species are normal microbiota within the gastrointestinal tracts, respiratory tracts, vaginal area and the mouth and it is sexually transmitted diseases [2]. *Candida* is a yeast growth present in all females and is normally controlled by bacteria. *Candida* species differ in their antifungal susceptibility and virulence factors. The genus is composed of a heterogeneous group of organisms, and more than 17 different *Candida* species are known to be aetiological agents of human infections; however, more than 90% of invasive infections are caused by *C. albicans*, *C. glabrata*, *C. parapsilosis*, *C. tropicalis*, *C. krusei* [3], *C. dubliniensis*, and *C. lusitaniae*. The yeast begins to invade and colonize the body tissues by releasing powerful chemicals into the bloodstream causing symptoms like: lethargy, chronic diarrhea, yeast vaginitis, bladder infections, muscle and joint pain, menstrual problems, constipation and severe depression. [15,16,17] The medical term for this overgrowth is candidiasis. Candidiasis is responsible for 90% of the cases of infectious vaginitis [4]. The most prevalent fungal pathogen of humans is *Candida albicans* which ranks as the fourth most common cause of hospital acquired infectious disease and is the primary cause of systemic candidiasis, with mortality rates approaching 50% [1]. Prolonged usage of antifungals in treating infections caused by *C. albicans* has led to the emergence of azole resistance. This acquired azole resistance in clinical isolates of *C. albicans* mostly results in cross-resistance to many unrelated drugs, a phenomenon termed multidrug resistance (MDR) [5,6,7]. MDR is a serious complication.
during treatment of opportunistic fungal infections which possess grave concern given the limited number of clinically useful antifungal drugs available [8,9]. The reasons for this increase in fungal infections are multifactorial: better clinical evaluation and diagnosis, greater survival for patients with malignancies, chronic diseases, increasing number of transplants, complex surgical procedures, catheters, implants and use of wide spectrum antibiotics.[14] Candida species have developed a multitude of mechanisms to survive exposure to antifungal drugs and some of them include an over expression or mutations. Thus identification of Candida up to species level along with antifungal susceptibility becomes very essential. [10,11] The accurate species identification of Candida is important for the treatment, as not all species respond to the same treatment because of the trouble of anti-fungal resistance.

Fungal etiology of some affections is a reality more and more common in medical practice, facilitated, because of the excessive use of antibiotics, often given in inadequate condition of sickness and taken in excessive doses, and also to the "abuse" of steroids, plus the high incidence of serious debilitating diseases (cancers, HIV infection, diabetes) which requires aggressive therapy or combination therapies that may have a negative effect by decreasing the overall body strength.[12,13]

Aim

The aim of the present study was to know the prevalence of Candida albicans from different specimens and to detect their antifungal susceptibility.

Materials and methods

We studied 4027 samples collected from patients in various wards of the Emergency County Hospital Craiova, Romania between 2014-2015. The specimens were : pharyngeal exsudates, sputum, tracheal secretions, skin secretions, stools, ear secretion, urine, vaginal secretions. All the specimens were transported immediately to the microbiology laboratory and cultured within 3 to 4 h of collection. Among the 4027 samples, 652 showed culture characteristics similar to Candida albicans. The samples were inoculated under sterile conditions using Sabouraud culture media in Petri plates, a medium designed to inhibit bacterial growth and allow the development of fungi incubated at room temperat 37°C. After 24 -48h of incubation, the culture plates were examined for the appearance, size, color and morphology of the colonies were recorded. Antifungal Susceptibility Testing was performed by disc diffusion according to CLSI 2014 guidelines using: Miconazole (25 mcg), Ketoconazole (10 mcg), Clotrimazole (10 mcg), Fluconazole (25 mcg), 5 – Fluorocitozina() Amphotericin-B (20 mcg), Econazole (10 mcg) and Nystatin (100 units) were tested. The zones measured only that is showing complete inhibition and the diameters of the zones recorded to the nearest millimeter.

Results and discussion

In this paper we studied 4027 pathological products in which we sought to isolate and identify Candida albicans. Thus were analyzed (Fig.1, Fig.2)
- 2745 from throat swab samples, of which 256 were positive for Candida albicans (9.33%);
- 490 sputum was positive for Candida albicans 220 (44 90%)
- Tracheobronchial secretions 220, 42 were positive (19.09%);
- 20 samples dermatological, 14 were positive for Candida albicans
- 10 coprocultures, 4 were positive (40%);
- 320 ear discharge, 10 were positive for Candida albicans (3.12%);
- 2 positive urine samples
- 220 vaginal discharges, 104 were positive (47.27%).

Fig. 1. Relative frequency of sample type
The presence of Candida albicans in different pathological products indicate the possibility of aggression to the different tissues and the important role of candidiasis etiology in many disease.

We have demonstrated that, there is a statistically significant difference between the highest proportions of positive samples identified for different types of samples (p = 1.81 x 10^-81 ≈0 < 0.001). If for vaginal and dermatological products have a very high rate of infection, opposite secretion find evidence of ear drops (3.13%) and the throat swab (9.33%). (Fig. 3; Fig. 4)

The isolation of Candida albicans from sputum and tracheal secretions is an important part of diagnostic, especially in acute episodes in respiratory tract infections considering the therapy with antibiotics and/or corticosteroids that create good conditions for growing.

Next, we studied the antifungal susceptibility of Candida albicans strains isolated. The set of antifungal susceptibility testing of Candida albicans used were as follows:

- Nystatin
- Amphotericin - B
- Ketoconazole
- Miconazole
- 5-Fluorocytosine
- Clotrimazole
- Econazole

The 652 strains of Candida albicans isolates had different spectral sensitivity to the antifungals used (Fig. 5).

Thus, Ketoconazole Clotrimazole- all the 652 strains were sensitive (100%). Our results are consistent with the literature.

In our study group the urocultures and dermatological products have a high infection rate, 100 and 70%, in contrast, we find evidence of secretion ear (3.13%) and the throat swab.
(9.33%). Were resistant various levels detected against antifungal drugs but, complete resistance to 5 - fluorocytosine (100%), and the highly sensitive to Cotrimazol and Ketoconazole (100%). In the case of Miconazole 256 (39 26%), Econazole, 215 (32.98%), Amphotericin B, 230 (35.28%), Nystatin 329 (50.46%).

![Antifungal Susceptibility Test](image)

The most efficient antifungal antibiotics for Candida albicans were Clotrimazole and Ketoconazole, followed by Nistatin, Miconazole, Amphotericine B and Econazole, and 5 – Fluorocitozine was not effective. As result, it is necessary, during the isolation and identification of Candida albicans as an etiological agent, to do Antifungal Susceptibility Tests.

**Conclusions**

Candida albicans infections are present and diverse in clinical pathology.

The etiology of candidiasis (Candida albicans in sputum) should be considered primarily in dermatology and gynecological conditions (especially the vagina with Candida albicans vulvovaginal).

In patients with frequent episodes of chronic disease exacerbations requiring antibiotic therapy and / or corticosteroids with serious diseases that evolve with the exploration of immunosuppression required for detection of biological products and Candida albicans.

In children with antibiotics abuse, especially preschoolers, bowel disorders can be caused by Candida albicans.

In the elderly with repeated urinary infections treated with antibiotics for long periods, Candida albicans can cause urinary infections.

The most effective antifungal Candida albicans are the clotrimazole and ketoconazole.

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**References**


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