

# Study of *Candida albicans* Isolated from Wounds of Type 2 Diabetes Patients after Plastic Surgery

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## ABSTRACT

This study included 65 wound patients were admission in Salah ad-Din General Hospital in Tikrit during November 2017- May 2019, to determine the prevalence of *C. albicans* causing wound infection in DM patients after plastic surgery. Wound swabs were taken after three and six days of burn patients from the pus of the wound area, inoculated on culture media (sabouraud dextrose agar and Candida Chrome agar) and incubated aerobically for (24-48) hours at 37°C. After incubation at 37°C for 48 hours the identification of yeast was performed based on a colony colour. The method is based on the differential release of chromogenic breakdown products from various substrates by *Candida* species following differential exoenzyme activity. In this study, 30% of patients were overweight and 40% were obese, although the study didn't include the relation of BMI with infection but still referred to its association. The study also viewed that maximum rate of patients were within the age group 37-46 years (40%) followed by 30% in the age group 47%-56%. Additionally, so

60% of patients were females. The *C. albicans* was the most isolated fungal cause of wound infection (70%) and *Aspergillus* was the second (30%). The presenting study revealed that *C. albicans* colonies appeared on sabouraud dextrose agar as white to cream, smooth and circular colonies and green colonies on CHROM agar. *C. albicans* was the predominant isolated fungal cause of wound infection in DM patients who admitted because plastic surgery.

**Keywords:** T2DM; Plastic surgery; *Candida albicans*; Wound infections

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## INTRODUCTION

During the past 10 years, fungal infections have gained considerable medical importance, particularly in patients with severe underlying diseases. While *Candida* species were previously the predominant causative agents of invasive mycoses, in recent years opportunistic moulds, such as *Aspergillus* species or other hyphomycetes, and zygomycetes, have increasingly been implicated in human infection. In contrast to the yeasts, several of these moulds show a high degree of resistance to most antifungal drugs<sup>(1)</sup>. *Candida albicans* occurs naturally as a commensal of mucous membranes of the oral cavity, gastrointestinal tract and genitourinary tract of healthy human<sup>(2)</sup>. On sabouraud dextrose agar colonies are white to cream colored, smooth and glabrous in appearance. Microscopic morphology shows spherical to subspherical budding yeast-like cells or blastoconidia, Gram positive. It is much larger than bacteria, reproduced by budding<sup>(3)</sup>. The genus *Candida* includes about 150 different species, however, only a few are known to cause human infections. *C. albicans* is the most significant pathogenic species; at least 70% of all human *Candida* infections are caused by *C. albicans*. Other *Candida spp.* pathogenic in humans include *C. tropicalis*, *C. glabrata*, *C. krusei*, *C. parapsilosis*, *C. dubliniensis*, and *C. lusitanae*<sup>(4)</sup>. Several Candidal infections are a serious problem, especially in individual whose immune defense mechanism has been weakened. *C. albicans* cause infection of the skin, oral cavity and esophagus, gastrointestinal tract, vagina and vascular system of humans<sup>(5)</sup>. Virulence factors of *C. albicans* include host recognition biomolecules (adhesins), morphogenesis (the reversible transition between unicellular yeast cells and filamentous, growth forms), secreted hydrolytic enzymes includes proteases and phospholipases. There are a limited number of antifungal drugs, especially compared with the number of antibacterial drugs<sup>(6,3)</sup>. So the aim of this study was

to determine the prevalence of *C. albicans* causing wound infection in DM patients after plastic surgery.

## MATERIAL AND METHOD

This study included 65 wound patients were admission in Salah ad-Din General Hospital in Tikrit during the period from November 2017 to May 2019 with age ranged between (17-70) years. They were suffering from wound infection after different types of surgical plastic surgery were done for them. Wound swabs were taken after three and six days of burn patients from the pus of the wound area in the morning before the bathing of the affected area (before hydrotherapy). Each swab was placed in a sterile tube with transport media till reaching the laboratory to be inoculated on culture media (sabouraud dextrose agar and Candida Chrome agar) and incubated aerobically for (24-48) hours at 37°C<sup>(1)</sup>. CHROMagar *Candida* Staniszevska *et al.*, 2011b is a selective fungal medium that includes chromogenic substances allowing for quick identification of several different *Candida spp.* based on a colour change. It can be used the for identification of individual non-*albicans species*, as well as *C. albicans*, if germ tube test was not characteristic. After incubation at 37°C for 48 hours the identification of yeast was performed based on a colony colour. Using this method, we were able to identify the following individual non-*albicans species*: *C. glabrata* (dark pink colonies, wet), *C. tropicalis* (blue colonies, wet), *C. krusei* (light pink colonies, dry), and *C. albicans* (green colonies, wet)., which also facilitates the detection of mixed infections with more than one species of *Candida*. The method is based on the differential release of chromogenic breakdown products from various substrates by *Candida* species following differential exoenzyme activity.

**FINDINGS**

In this study, 30% of patients were overweight and 40% were obese, although the study didn't include the relation of BMI with infection but still referred to its association. The study

also viewed that maximum rate of patients were within the age group 37-46 years (40%) followed by 30% in the age group 47%-56%. Additionally, the study concluded that 60% of patients were females

Table 1: Distribution of the general characteristics Diabetes patients

Parameters		n(%)
BMI (kg/ m <sup>2</sup> )	Non-Obese (18.5-24.9)	30
	Overweight (25-29.9)	30
	Obese ≥ 30	40
Age (years)	17-26	5
	27-36	20
	37-46	40
	47-56	30
	57-66	3
	67-76	2
	Range: 17-50	
	Mean: 43.01±3.4	
Sex	Males	40
	Females	60

The study demonstrated that *C. albicans* was the most isolated fungal cause of wound infection (70%) and *Aspergillus* was the second (30%)

Table 2: Isolated fungal genera

	Present study
Total DM patients	65
Fungal isolates	22%
First line	<i>Candida</i> (70%)
2 <sup>nd</sup> line	<i>Aspergillus</i> (30%)

The presenting study revealed that *C. albicans* colonies appeared on Sabouraud dextrose agar as white to cream, smooth and circular colonies and green colonies on CHROM agar Fig. (1-4). The chromogen mix consists of artificial substrates (chromogens), which release different colored compounds upon degradation by specific enzymes (Horvath et al., 2008). The results of microscopic examination show that the Gram negative bacteria produced rod colonies and Gram positive bacteria produced cluster-like colonies. Regarding to the *C. albicans*, it produced round blastoconidia single or in small cluster under microscope (Salyers and Whitt, 2002; Kayser et al., 2005). *Candida albicans* cultures on Sabouraud's (SDA) medium was white to cream smooth, glabrous, were is on CHROMagar medium was green, wet Figure 1 and 2. Microscopic examination showed that Spherical to sub spherical budding blastoconidia Figure 3. Germ tube positive.. Figure 1.



Figure 1: *Candida albicans* on Sabouraud's (SDA) agar (left) and CHROMagar (right)



Figure 2: CHROMagar plate showing *C. albicans*



Figure 3: Microscopy of *C. albicans* showing Budding and yeast cells (40x)

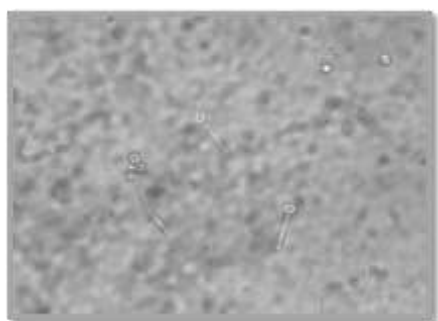


Figure 4: Germ tube of *Candida albicans* after three hours incubation (40x)

## DISCUSSION

In this study, 30% of patients were overweight and 40% were obese, although the study did not include a BMI relationship to infection but still indicated its association. The study also showed that the maximum rate of patients were within the age group 37-46 years (40%) followed by 30% in the age group 47% -56%. In addition, the study concluded that 60% of patients are females. This finding is consistent with the results of previous studies. A previous study found that middle-aged young people were the most visited by plastic surgery clinics (7). Another study showed that the age above 25 years are the most vulnerable to cosmetics because of the requirements of modern life as well as the increase of cosmetic clinics and the development of cosmetic procedures in the world, and social media has actually contributed to increase the number of visitors to these clinics. Skin colonization and the development of several skin

manifestations in patients with poor glycemic control and elevated glycosylated hemoglobin, who have abnormal carbohydrate metabolism, relative insulin availability, neuron degeneration, deranged collagen production, microvascular complications and impaired wound healing, seems to be related to a multitude of skin disorders (8-11). In addition, the prevalence of cutaneous disease have relation to number of risk factors including age, male gender, family history of onychomycosis and intake of immunosuppressive agents (12,13). *C. albicans* was completely 100% sensitive to Amphotericin B and Clotrimazole and 25% to Fluconazole. In this study, this result fitted to the result detected by several studies done earlier (14-16). The most common mechanisms responsible for drug resistance in *Candida spp.* are lower accumulation of drugs into the cells due various drug efflux proteins. Another possibility is the mutations or over-expression of the target gene, that leads to change in the structure of target enzyme which may result in alteration of the target and hence in resistance towards Azole drugs (17,18). Diabetes mellitus is firmly connected with the advancement of parasitic diseases and dermatoses associated with skin appearances. Two third of diabetic subjects have expanded recurrence of contaminations brought about by *Candida* or dermatophytes (tinea pedis and onychomycosis) during the course of the malady procedure (5,7). Dermatologic issues happen all the more frequently in patients with type 2 diabetes mellitus, by whom irresistible inclusion of the skin is all the more frequently (immune system skin sores are progressively normal in type 1 diabetes) (8). The most visit contagious illnesses are: tinea pedis (interdigitalis), onychomycosis, candidal intertrigo and candidal vaginitis (4,9). The regiment of medications relies upon culture distinguishing proof, influenced some portion of body, reality of disease, prior administration and invulnerable circumstance of the patient (4). Routinely, azoles, terbinafine are endorsed. Terbinafine (inhibitor of parasitic squalene epoxidase) cream and sertaconazole cream is the prescribed first line treatment for shallow skin diseases. Onychomycosis is a sign for fundamental antimycotics (for instance terbinafine 250 mg/d for 2-12 weeks). The foundational treatment is associated with unfavorable impacts: sickness, stomach torment, retching, loose bowels, dazedness, rash and pruritus (18-21). In patients with mucormycosis, amphotericin B with debridement is utilized (22). Other studies involving trauma patients reported a rate of candidemia <10%.3,5,13 For example, the incidence of *Candida* infection in our population was similar to that reported by our findings. This difference between the rate of *Candida* infection in trauma patients and the rate among other non-trauma critically ill surgical patients might indicate the relatively low initial inoculum of *Candida*, prompt surgical attention and the relatively younger age of trauma patients.

## CONCLUSION

It was concluded that *C. albicans* was the predominant isolated fungal cause of wound infection in DM patients who admitted because plastic surgery.

## CONFLICT OF INTEREST

none

## SOURCE OF FINDINGS

self-findings.

## ETHICAL CLEARANCE

This research was carried out with the patient's verbal and analytical approval before the sample was taken. According to this approval, all the samples were collected and the tests were carried out. A copy of the results of the tests was then given to the patients

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