# Evaluation of *Candida* colonization in the oral cavity of diabetic and non-diabetic patients.

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**Abstract** *Candida* is found as normal microflora in the oral cavity, skin, gastrointestinal tract, and vagina in healthy people. However, when the mucosal barrier is disrupted, or the immune system compromised it changes into a pathogen and cause infection. OC is the common infection that occur in the oral cavity as a result of an overgrowth of *Candida* especially *C.albician*. There are numerous risk factors as: age, gender, nutrition, smoking, denture, oral hygiene, salivary pH illness and xerostomia (dry mouth) that make diabetic patients more susceptible to OC. Diabetes mellitus is a common endocrine metabolic disorder in which high glucose level of saliva, low secretion of saliva, xerostomia and disruption of physiological conditions promote the overgrowth of *Candida* and cause infections. Sixty-seven isolates were collected from a patient admitted to Specialized Medical Hospital, In Mansoura. Forty –two isolates were belong to diabetic patients while the last fifteen were from normal healthy people as a control. The isolates were cultured on SDA then identified morphologically and gram staining. The identification with different species latterly done by Germ tube test (rapid identification of *C.albician*) and then VITEK. In germ tube test, 52 isolates show identical *C.albician*, while the last 15 then later identified by VITEK in which 11 isolates were *C.albician*, 1 *C.Keurosi*, 1 *C.tropicalis*, and 2 *C.dublinisis*.The most dominant specie was *C.albican* which represent 83% of isolates.

**Key words:** *Candida,* Oral candidiasis (OC), *C.albician*, Diabetes mellitus (DM)

## 1. Introduction:

Diabetes mellitus (DM) is a metabolic disorders characterized by elevated blood glucose levels, that results from insufficient insulin secretion or increased cellular resistance to insulin effect **[1]**. Diabetic patients with impaired glucose control are exposed to various clinical complications including, retinopathy, nephropathy, neuropathy, macrovascular disease, and slow wound healing. In addition, they are more vulnerable to infection **[2]**.

*Candida* species (spp.) is a part of the normal flora on the skin and on the mucosal membranes of the oral cavity and gastrointestinal tract. It is present in the oral cavity of up to 75% of the population. The prevalence of these organisms varies considerably depending on geographical location, host immune response and host susceptibility**[3]**. However, DM causes overgrowth of *Candida.* There is also a link between diabetes and periodontal diseases (such as gingivitis and periodontitis) (4). Oral candidiasis is a common opportunistic infection among diabetic patients**.** White patches in the mouth, tongue, and throat are the main symptoms of oral candidiasis **[5]**.

*Candida albicans* (*C. albicans*) is the most common *candida* spp. that cause human disease. Meanwhile, an important growth in the frequency of non-albicans *candida* (NAC) has been observed [6].

The ability of *C. albicans* to infect hosts depends on the presence of a wide range of virulence factors. Among these factors are the morphological replacement among yeast and hyphal forms, the expression of adhesins and invasins on the cell surface, the formation of biofilms, and the secretion of hydrolytic enzymes [8].

This study aimed to compare the frequency of diferrent *Candida* spp. in the oral cavity of diabetic and non-diabetic patients. Furthermore, to detect the most dominant species by diferrent methods for accurate treatment.

## 2. Materials & Methods:

### 2.1. Sample collection:

A total of 100 oral swabs were collected from diabetic patients admitted to Mansoura University Hospital and other100 samples from non-diabetic persons as control group. The samples were transported immediately to the laboratory of microbiology in a sterile container within one 2 hr after collection for microbiological analysis[7].

### 2.2. Isolation & identification of *Candida* isolates:

All samples were streaked on Sabouraud's Dextrose Agar plates, then incubated at 37°C for 24hrs. The plates were observed for growth and the isolated colonies were identified based on colony, shape, consistency, and characteristic yeast odor[8]. Germ tube test was used for differentiation between *C .albicians* and NAC[9]. In addition, Vitek system (bioMérieux, France) was used for identification of *Candida* isolates to species level according to the manufacturer's instructions[10].

## 3. Results :

In this study, 67 clinical isolates of *Candida* were collected. Forty-two (42%) were isolated from oral cavities of diabetic patients, while twenty-five (25%) were from non-diabetic control group (**Table 1).**
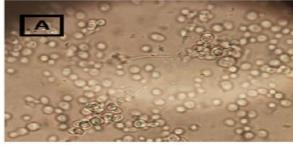
**Table 1.** The frequency of *Candida* isolates among the patients and control groups.

| Number of samples | Diabetic | Non-diabetic |
|---|---|---|
| Total number | 100 | 100 |
| Positive *Candida* | 42 | 25 |
| Negative *Candida* | 48 | 75 |
| Percentage of positive | 42% | 25 % |

Among the isolated *Candida* from diabetic patients, 30 (68.2%) were females, and 12 (31.8%) were males (**Table2).**

**Table 2.** The percentage of *Candida* isolates among the studied population.

| Samples | Gender | | | | | |
|---|---|---|---|---|---|---|
| | Female | | Male | | Total | |
| | No. | % | No. | % | No. | % |
| Diabetic | 30 | 68.2% | 12 | 31.8% | 42 | 76.7% |
| Non-diabetic | 15 | 52.4% | 10 | 47.6% | 25 | 32.3% |
| Total | 41 | 63% | 24 | 37% | 67 | 100 % |



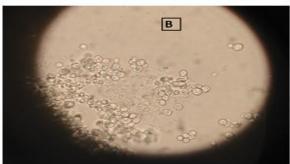**Fig 2.**The diferrence between positive (**A**) and negative (**B**) germ tube test.

**Table 3:** Proportion of *candida* infection among patients and control group

| Candida infection | Patients group (n=100) | Control group(n=10) | Test of significance | P value |
|---|---|---|---|---|
| **Species of candida** | 38 (90.5%) | 25 (100.0%) | MC | 0.585 |
| *C.albician* | 1 (2.4%) | 0 (0%) | | |
| *C.keursi* | 1 (2.4%) 2 (4.7%) | 0 (0%) | | |
| *C,dublinisis* | | 0 (0%) | | |
| *C.tropicals* | | | | |

## 4. Discussion:

Centres for disease control and prevention (CDC), detect that Egypt is one of the top ten countries with the highest distribution of diabetes and considered ninth with diabetes .There is an association between diabetic control and oral yeast fungal infections[11-12]

High levels of salivary glucose, low saliva secretion, impaired chemotaxis, and a defect in phagocytosis caused by a lack of polymorph nuclear leukocytes are some of the factors that make diabetic patients more vulnerable to oral candidiasis[13].

In this study patients with diabetes, were originating to have a higher incidence of *Candida* colonization. The promotion of *Candida*'s binding to epithelial cells and the significant reduction of tissue resistance to infection may be responsible for the increased *Candida* colonialization in diabetic patients. Similarly, increased *Candida* carriage rates in diabetic patients are associated with salivary glucose and pH levels[14].

In this research, sixty-seven *Candida* isolates were collected from the oral cavity, 42% from diabetic patients and 25% from non-diabetic control group.

Among diabetic patients 68.2% were females and 31.8% were males. The current work agreed with another study that observed higher *Candida* incidence in type 2 diabetic females than males [13].

Additional factors that increase the incidence of *candida* in non- diabetic control as smoking 10(10%) , the use of denture 2(2%) and the presence of other diseases as Arthritis 2 (2%) and pressure 1%.This assured in the previous studies[15]

*Candida albicans* was the most dominant species 38 (90%) isolated from the diabetic patients in their oral cavity compared with the non-diabetic controls 25 (25%). In agreement with our results [16]found that (55%) of diabetic patients were found to carry *Candida* spp. in their oral cavity, and *C. albicans* was the most prominent species (43.1%) isolated from the oral cavity of the diabetic patients compared with the non-diabetic controls (27%).

The good control of blood glucose level and duration of glucose occurrence may also effect on presence and growth of *candida* yeast .In our study it was found that the patients with duration more than 10 years were 23 that represent (54.8%) while those with duration less than 10 years 19 that represent (45.2%) .These results were in line with another study [17].

Belazi et al. isolated Candida spp. from the oral cavity of 64% of diabetic patients and 40% of non- diabetic controls. They detected the promoting factors such as xerostomia, dentures, advanced age, gender, and diabetes for colonization of *Candida* in the oral cavity, which showed the same results as the current ones[18].

Zomorodian et al. identified a significant association between the poor glycemic control and the higher prevalence rates of *Candida* carriage and density in diabetic patients. In addition, a high prevalence of *C. dubliniensis* in diabetic patients was found, which might be misdiagnosed with its morphologically related species, *C. albicans*.This approval with found in the present study [19].

Mohammadi et al. found the candidal load of oral mucosa in DM patients was originate to be significantly higher than those of the control group, 55% of diabetic patients were found to carry *Candida* spp. in their oral cavity, and *C. albicans* was the most prominent species. Consideration of the possibility of oral *Candida* infections in DM patients is emphasized for improving patient treatment outcomes and reducing healthcare costs[20].

## 5. Conclusion:

This study concluded that diabetic patients with poor glucose control are riskier to develop oral *Candida* infection.

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