

Detection of Oral Candidiasis in Different Cancer Patients in Khartoum Oncology Hospital, Khartoum State, Sudan

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Abstract

Candida is the major fungal pathogen of humans causing a variety of afflictions ranging from superficial mucosal diseases to deep seated mycoses. Opportunistic infections due to Candida species occur frequently in cancer patients because of their inherent immunosuppression. This study aimed to detect the prevalence of oral yeast among Sudanese cancer patients with different cancer patients who received different cancer treatment in Khartoum oncology hospital (al Zarra Hospital). Fifty oral swabs were collected from the patients with different age groups ranging from 10 to 100 old, 18\50 were males and 32\50 were females. The study was carried out in the period from December 2021 to May 2022. All samples were first cultured on to Sabouraud's dextrose agar media which was supplemented with penicillin antimicrobial agent, from those only 40% were showed growth. Then growth colonies identified by Gram's stain and sub cultured on chromogenic Candida agar media and inoculated on serum for germ tube test. The colonies gave light green colonies were identified as *Candida albicans* with (18%), which were the most prevalence strain of isolated Candida species, followed by *Candida tropicalis* which gave blue colonies with (18%) and then *Candida krusei* with (4%) which gave creamy-mooove colonies. The study showed that the distribution of an oral yeast among cancer patients was 40% and age group over 50 years old were more affected with an oral yeast. That female was most affected with an oral yeast (64%) (32 female) than male (36%) (18 male). Head and neck cancer (HNC) patient were the most affected group among cancer patients (35%). The study showed that cancer patients that affected with an oral yeast resident out of Khartoum city (66%) compared to those from Khartoum city (34%). Also, the oral yeast infection was high in cancer patients that resident out of hospital (86%) compared patient admitted on the hospital (14%). This study concluded that the frequency of an oral yeast in cancer patients who were received treatment was 40%. The most prevelant species was *Candida albicans* with 18% which followed by *Candida tropicalis* 18% and *Candida krusei* 4%. Patient in age more than 50 years old were more affected with an oral yeast. The most affected cancer patients were those who were diagnosed with head and neck cancer.

Keywords: Yeast, *Candida*, cancer, oral, Khartoum, Sudan.

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1. INTRODUCTION

The yeasts cause many type of diseases like Oral Thrush, vaginitis, meningitis, meningoencephalitis, skin infection, UTI and pneumonia. The most common yeast that causes yeast infections are *Candida albicans*, non-Albicans *Candida*, *Cryptococcus neoformans*, *Trichosporon* spp and *Malassezia* spp. Dimorphic *Candida* exist as commensal yeast carriages or infiltrate hyphae in the oral cavity.(Cho *et al.*, 2021)

Several reasons have been proposed for the increase in invasive fungal infections in cancer patients including extended survival of cancer patients as well as

advances in supportive care by the use of antineoplastic and immunosuppressive agents, improved control of bacterial infections by using broad-spectrum antibiotics, hematopoietic stem cell transplantation, prosthetic devices and grafts and more aggressive surgery (Goswami and Kishore, 2019).

Pathogenic yeast forms are commonly associated with invasive fungal disease in the immunocompromised host, including patients with haematological malignancies and patients of haemopoietic stem cell transplants (Tofil *et al.*, 2014). The frequency of nosocomial yeast infections has

increased dramatically in the recent years. They are considered an important cause of morbidity and mortality in immunocompromised cancer patients (Kiasat *et al.*, 2019). Yeast infection was more common in patients with hematological malignancies (56.4%) than those with solid tumors (43.3%) (El-Mashad *et al.*, 2019). *Candida* is the major fungal pathogen of humans causing a variety of afflictions ranging from superficial mucosal diseases to deep seated mycoses. Opportunistic infections due to *Candida* species occur frequently in cancer patients because of their inherent immunosuppression (Aslani *et al.*, 2018). Cancer patients were highly colonized with different oral yeast species. *C. albicans* was the most common isolate associated with oral infection and colonization among the treated cancer patients. In contrast with control group it occupied a higher percent among the colonized species only. (Nagla *et al.*, 2018).

In the recent years, in Khartoum state the numbers of patients with cancer have yeast infection is increase according to Khartoum oncology hospital. This study aim to detect the percentage of yeast infection in cancer patient on Khartoum sate.

2. MATERIAL AND METHOD

Study design

This was descriptive cross-sectional and laboratory study done in Khartoum oncology hospital (El Zara Hospital) in the Khartoum state from December 2021 to May 2022.

Sample size

Fifty oral swabs were collected from known Sudanese cancer patients receiving cancer treatment with different age and sex.

Laboratory Examination

The oral swabs were cultured on to Sabouraud's dextrose agar media supplemented with chloramphenicol, incubated at 37c for 24 to 48 hours. Identification of *Candida* was carried out microscopically after staining with Gram's stain, the isolated organism was sub cultured on *Candida* chromogenic agar culture media and also inoculated into human serum to detect the germ tube.

Gram's stain

Thin smear prepared from pure colonies, then stained with Gram's stain and examined under microscope.

Germ tube test

A small amount of the yeast colony was inoculated in to 0.5 ml of human blood serum, incubated at 37-36c for up to 3 hours. After incubation wet preparation was examined microscopically with x40 magnification. The presence of germ tubes having no constriction at the site of origin is considered a positive test result, consistent with *C. albicans*.

Chromogenic *Candida* Agar culture media

From isolated colonies on Sabouraud's dextrose agar which supplemented with chloramphenicol antibiotic, 2-3 colonies was taken by a sterile wire loop and sub cultured in *Candida* chromogenic agar media, then incubated at 36-37c for 24-48 hours. The result is according to manufacture as follow: Blue –dark green colonies it mean that the isolate is *Candida tropicalis*. Light green colonies for *Candida albicans*, Creamy-light violet colour, the isolate is *Candida krusei*

Data analysis

All data obtained in this study were analysed statistically by SPSS Statiscal analysis program.

3. RESULTS

Fifty oral swabs were collected from the oral cavity of Sudanese cancer patients who were received treatments in Khartoum Oncology hospital (al Zarra Hospital). Yeast species were isolated from 20 patients (40%) while 30 (60%) of them were not affected (Figure. 1). *Candida albicans* were the most frequent species among all age groups. The most affected age groups with an oral Candidiasis were those less than 20 years old (Table 1). The results showed that high frequency of an oral Candidiasis among head and neck cancer patients (HNC) 7(35%) followed by GIT cancer patients 5(25%). *Candida albicans* and *Candida tropicalis* were the most frequent species on these cancer patients (Table 2).

Female cancer patients were most affected with oral yeast infections with 64% %, while. Male cancer patients were less affected with 36% (Fig.1) The results showed that cancer patients that affected with an oral yeast resident out of Khartoum city (66%) and those from Khartoum city (34%) were the most affect. The results showed that cancer patients that resident out of hospital were the most affected with an oral yeast (86%) and the infection was low in hospitalized patients (14%). Figure (2).

Table 1: Frequency of *Candida* species among different age groups.

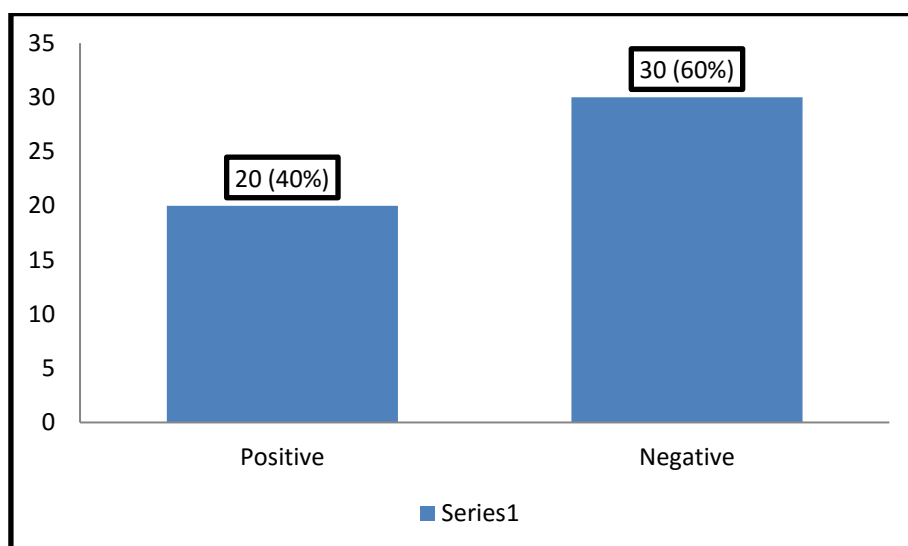
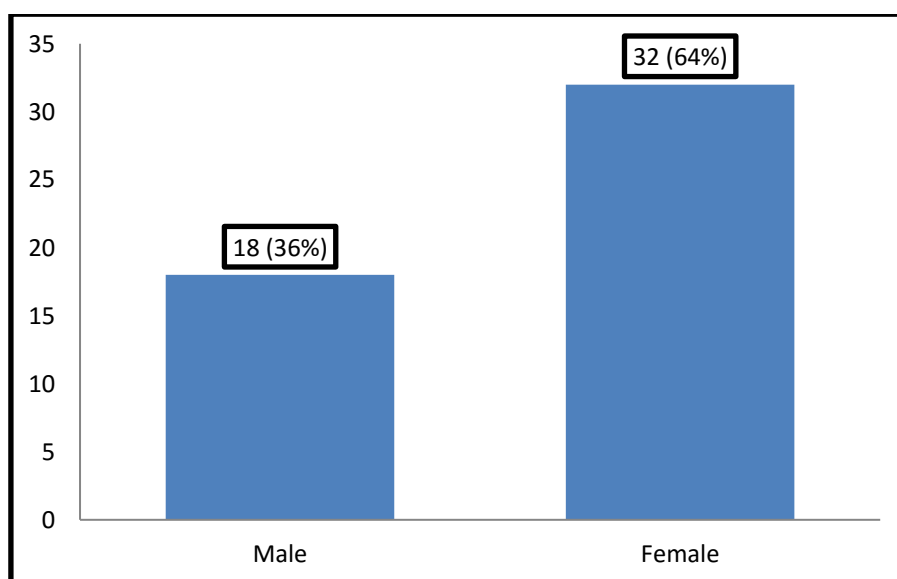
Age group	Count	Growth			Total
		<i>C.albicans</i>	<i>C.krusei</i>	<i>C.tropicalis</i>	
10 – 20	2	1	1	0	4
21-30	2	2	0	1	5
31-40	4	0	0	2	6
41-50	7	1	0	1	9

Age group	Count	Growth			Total
		<i>C.albicans</i>	<i>C.krusei</i>	<i>C.tropicalis</i>	
51-100	15	5	1	5	26
Total	30	9	2	9	50

Table 2: Distribution of Candida species according to the type of cancer

Malignancy	Patient No.	Growth			Total
		<i>C.albicans</i>	<i>C.krusei</i>	<i>C.tropicalis</i>	
Leukemia	3	1	0	0	1
HNC	3	3	0	4	7
Liver carcinoma	1	0	0	2	2
breast carcinoma	8	0	1	1	2
Others	2	0	1	0	1
GUT	6	1	0	1	2
GIT	7	4	0	1	5
Total	30	9	2	9	20

HNC = head and neck cancer, GIT=Gastro Intestinal Tract GUT=Genital Urinary Tract

**Fig. 1: Percentage of oral yeast among cancer patients****Fig. 2: Distribution of oral yeast according to sex**

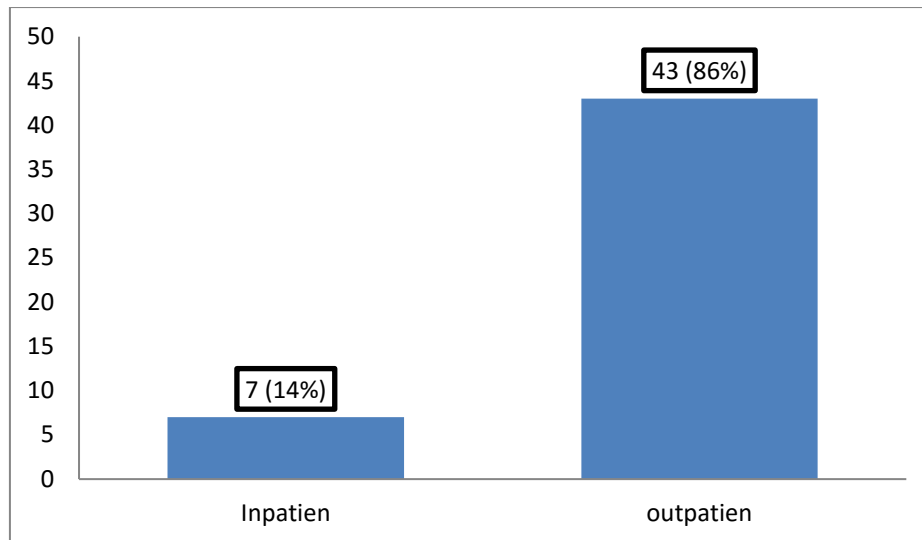


Fig. 3: Distribution of oral yeast among patient according to hospital status

4. DISCUSSION

This study revealed that the frequency of oral yeast among 50 Sudanese cancer patients with different cancer types in Khartoum Oncology hospital (al Zarra hospital) was 40% this result was similar to (Afraseyabi *et al.*, 2011) with percent (40%), and also similar to (Abdalla, 2016) study which show that the distribution of an oral Candidiasis among cancer patients was 40% and also in agree with (Nagla *et al.*, 2016) found that Oral candidiasis in 23 (33.33%) of all cancer patients. *Candida albicans* significantly more common than other *Candida* species in both study group (76.5% vs 32.5%) and control group (68.5% vs.31.4%).

Patients within an age group less than 20 years old were less infected with 8%, while patients with an age more than 50 years old were more affected group with 52% this result was disagreed with the study of (Abdalla, 2016) showed that the age group less than 20 years old were more affected with an oral Candidiasis.

Female cancer patients were more infected with oral yeast 64% (32), while male are less infected 36% (18) this fact agree (Nagla *et al.*, 2016) which stated frequency of candidiasis was high among female patients with breast cancer while it was disagree with (Abdalla, 2016) showed that males were most affected with an oral Candidiasis than females with 23%. This study showed that most frequent *Candida* species was *Candida albicans* with percentage 18%, followed by *Candida tropicalis* 18% and *Candida kruzei* 4%. This was agree with (Schelenz *et al.*, 2011), that found the majority of infections were caused by *C. albicans* but almost one third of patients harbored non-*C. albicans* strains such as *C. glabrata* which were often more resistant to anti-fungal agents. And also agree with (Liu *et al.*, 2015) found that oral yeast carriage was found in 98/203 patients (48.3%), and of these, 83 (84.7%) patients carried *C. albicans*. Our study found that the most infected cancer patients with oral yeast species were head

and neck cancer patients (HNC), this fact agree with (de Freitas *et al.*, 2013) which found that major prevalence of non-albicans species were observed in irradiated patients on head and neck and this treatment is straightly associated with fungus positiveness. And also agree with (Lalla *et al.*, 2010) addressed that head and neck radiotherapy and chemotherapy were each independently associated with a significantly increased risk for oral fungal infection, the prevalence of oral colonization with fungal organisms was 48.2% before treatment, 72.2% during treatment, and 70.1% after treatment. And also agree with (Alnuaimi *et al.*, 2015) and (Singh *et al.*, 2017), which they found that the frequencies of oral yeasts' presence and high oral colonization were significantly higher in oral cancer than non-oral cancer patients, in addition the oral mucosal colonization and infection are common in patients receiving radiation therapy for head and neck malignancies.

5. CONCLUSION

This study concluded that the frequency of an oral yeast in cancer patients who were received treatment was 40%. The most prevalent species was *Candida albicans* with 18% which followed by *Candida tropicalis* 18% and *Candida kruzei* 4%. Patient in age more than 50 years old were more affected with an oral yeast. The most affected cancer patients were those who were diagnosed with head and neck cancer.

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Conflicts of interest: The authors declare that they have no competing interests.

Authors Contribution

AEA, MSM methodology, data analysis and conducted the study, MFS supervised the study, designed, interpreted the results, and wrote the draft paper. All authors read and approved the final manuscript.

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Data availability

All datasets generated during this study are included in the manuscript.

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