Role of Nursing Immunocompromised Patients and COVID-19 in oral Candidiasis Infection

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Abstract

Oral candidiasis is the most common fungal infection that frequently occurs in patients debilitated by other diseases or conditions. also known as "thrush," is a fungal infection of the tongue and other oral mucosal sites marked by fungal overgrowth and invasion of superficial tissues. The aims of Study are assessment Role of nursing immunocompromised patients and COVID-19 in oral candidiasis infection. Material and methods: This study included a total of one hundred and twenty-two samples were collected from COVID-19 patients with suspected of associated with oral candidiasis. All patients had laboratory confirmed COVID-19 infection with positive SARS-CoV-2 RTPCR from nasopharyngeal swabs or respiratory secretions. Patients were hospitalized at Al–Zahra Hospital during the period from 15 October 2021 to 15 April 2022. Results: The results were appearance 58/122 (47.5%) of COVID-19 patients were infected with oral candidiasis, the result showed 58 Candida isolates out of 122 samples of (Nasal, sputum, throat swab) were collected based on culture, morphological and commercially available ID – YST card system (Vitek 2 system Bio Mèrieux, France for pathogenic yeast) were carried out in various setting phenotyping identification tests for Candida spp. The highest percentage among isolated Candida spp belonged C.albicans 27/58 (46.5%) C. parapsilosis was 13/58 (22.4%) , followed by C.tropicals 11/58 (18.9%) and the lowest percentage was for C.kruse 7/58. In this study Out of 58 patients 50 was immunocompromised patients: As 23 (46%) Diabetes, 13 (26%) Hypertension, 6 (12%) cardiovascular disease, 4(8%) lung disease, 3 (6%) Liver cirrhosis and 1 (2%) with chronic kidney disease. The results of present study showed that high percentage of infection were in third week of Hospitalization 36/58 (62%) ($p<0.05$), while the low percent was in fiist week 2/58(3.4%) ($p<0.05$),

Keywords: SARS-CoV-2, candidiasis, nursing, immunocompromised patients

1. Introduction

Candida are considered opportunistic microorganisms and are known to be a potential cause of nosocomial infections (1), which can aggravate pre-existing conditions (2). Hospitalized patients show a stronger predisposition to oral candidiasis due to environmental and systemic changes which alter the natural microbiota and favor the emergence of opportunistic infections (3). Attention has been given to the occurrence of opportunistic fungal infections in patients suffering from COVID-19 and the associated potential complications. Patients affected by SARS-CoV-2 are subject to develop lymphocytopenia. These patients are also likely to undergo several treatments which can further increase their susceptibility to infection, such as intensive care unit (ICU) hospitalization, use of broad-spectrum antibiotics and corticosteroids, and intubation. Any preexisting chronic diseases (diabetes, hypertension, etc.) render these patients further immunocompromised , Together, these factors make SARS-CoV-2 patients particularly susceptible to the development of oral and oropharyngeal candidiasis (OPC) (4) More than 15 different Candida species can cause Oral candidiasis disease, with C. albicans, C. glabrata, and C. tropicalis being the most prevalent pathogens (Pappas et al., 2016) Candida albicans is responsible for about (70 to 80%) of all Candida infection (5). The interaction between Candida albicans and its host cells is characterized by a complex interplay between the expression of fungal virulence factors, which results in adherence, invasion and cell damage, and the host immune system, which responds by secreting proinflammatory cytokines, activating antimicrobial activities and killing the fungal pathogen (6).

2. Materials and Methods

Location of study

This study has been carried out in the 1laboratory of department of Biology– College of Science – University of Wasit, Public Health Lab in Wasit, Al-Zahra and Al-Karama Teaching Hospitals through the period from October 2021 to the end of April 2022.

Samples Collection

One hundred sample include (nasal, throat) swab and sputum samples were collected from patients suffering from Corona virus disease. This study was recorded from October 2021 to the end of April 2022, including the criteria, patients of all age groups in isolation wards in Al-Zahra Teaching Hospital. The majority of patients admitted to the hospital were from Wasit and its suburbs. Nose and throat swabs from each patient were collected in sterile clean swabs with transport media and sputum sample in a sterile container.

Identification of isolated Yeast

Swab sticks collected from patients with covid19

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were streaked on the well labeled Sabouraud's dextrose agar (SDA) plates incubated at 35-37 for 24-48 hours. The growth was recognized by microscopic analys was utilizing the Gram stain staining method, Germ tube test, Api Candida as well as morphological and cultural features.

Gram stain

According to the manufacturer's directions, make the gram stain (7) After being stained with Gram's stain and studied under a microscope on the slide, cultural features on SDA that include form, color, and size are used to identify the morphology of the Candida (8).

Germ tube test

To distinguish *C. albicans* from other yeast, this test was employed. Candida forms a germ tube when it is cultured in human or sheep serum at 37 degrees for three hours. Put 0.5 ml of human serum in a tiny tube. Using a Pasteur pipette, gently emulsify a yeast colony in the serum. Incubate the tube at 37 degrees for two to three hours. The serum is then placed to a slide to be inspected, covered with a coverslip, and viewed under low- and high-power microscopes (9).

3. Statistical Analysis

Using SPSS V 25 for Windows, data were input and analyzed. Inferential statistics (Chi-Square Test) and descriptive statistics (frequencies, mean standard deviation and accompanying tables and graphs) were applied. A. statistically significant1 P-value ≤ 0.

4. Results and Discussion

Prevalence of oral candidiasis Among COVID-19 patients.

Patients affected by SARS-CoV-2 are subject to develop lymphocytopenia. These patients are also likely to undergo several treatments which can further increase their susceptibility to infection, such as intensive care unit (ICU) hospitalization, use of broad-spectrum antibiotics and corticosteroids, and intubation. Any preexisting chronic diseases (diabetes, hypertension, etc.) render these patients further immunocompromised (1). Together, these factors make SARS-CoV-2 patients particularly susceptible to the development of oral candidiasis. In current study 58/122 (47.5%) of COVID-19 patients were infected with oral candidiasis s show in the figure (1).

Figure 1. prevalence of oral candidiasis Among COVID-19 patients

This result agreed with (10) who finding of administration of immunosuppressive agents, corticosteroids, and broad-spectrum antibiotics, ICU admission, intubation/mechanical and ventilation were associated with fungal diseases in patients with COVID-19. Other study which consistent with our result indicate that fungal diseases commonly observed in symptomatic patients with COVID-19 such as leukopenia (9%–25%), lymphopenia (35%–63%) and T-cell dysfunction (10, 11). Taking into consideration the characteristic disease progression and course of severe COVID-19 disease, most of the patients have associated risk factors such as broad-spectrum antibiotics and corticosteroids usage, lymphocytopenia, admission to the ICU, mechanical ventilator support, or other local risk factors such as improper oral hygiene habits, denture-wearing or decreased flow of saliva resulting in dryness of the mouth due to the use of certain medications that may favour Candida proliferation and infection (12) .

Detected of Candida spp in oral candidiasis patients.

In this study a total of 58 Candida isolates out of 122 samples of (Nasal, sputum, throat swab) were collected based on culture, morphological and commercially available ID –YST card system (Vitek 2 system Bio Mèrieux, France for pathogenic yeast) were carried out in various setting phenotyping identification tests for Candida spp. The highest percentage among isolated Candida spp belonged C.albicans 27/58 (46.5%) C. parapsilosis was 13/58 (22.4%) , followed by C.tropicals 11/58 (18.9%) and the lowest percentage was for C.kruse 7/58 (12.0%) as shown in table (1).

Table (1): Distribution of Candida species in oral candidiasis patients

Candida species	Total positive	Percentage
C.albicans	27	46.5%
C. Parapsilosis	13	22.4%
C.tropicals	11	18.9%
C.kruse	7	12.0%
Total	58	100%
X^2	20.87	
Calculated P	0(S)	
S: Significant difference at P<0.05		

These studied shown the C.albicans more isolation than other Candida due to causes superficial and invasive infections at various anatomical sites throughout the world. It has well-known pathogenic potential, and its main pathogenic and virulent factors are the ability to adhere to various mucosa and epithelium, and is dimorphic, with the production of pseudopodia that aid tissue invasion, heat tolerance, exogenous enzymes such as proteins and phospholipases and germ tube formation with subsequent development of the filamentous form (13). Mannan (a glycoprotein presents on the cell surface of C. albicans), an adhesion responsible for the binding of C. albicans to host cells is stronger than other Candida species (14).

In addition, the current finding of C. Parapsilosis

infection compatible with (15) who found that prolonged ICU, central venous catheters, and broad-spectrum antibiotics used were among the most important causes of invasive C. Parapsilosis infection in COVID-19 patients.

Other studies by (16) showed a high prevalence of Candida infection among COVID-19 patients, so Candida species should be considered as potential pathogens in these patients. Candida species live on the mucosal surfaces of the skin as well as the respiratory, digestive and urinary tracts. Members of the genus Candida are the most frequently recovered pathogens in the intensive care unit, infecting between 6% and 10% of patients (17).

Risk Factors Associated with oral candidiasis in COVID-19

1. immunocompromised patients

In this study Out of 58 patients 50 was immunocompromised patients; As 23 (46%) Diabetes, 13 (26%) Hypertension, 6 (12%) cardiovascular disease, 4(8%) lung disease, 3 (6%) Liver cirrhosis and 1 (2%) with chronic kidney disease as shown in (table: 2).

Table 2: Distribution of oral candidiasis in COVID-19 patients in immunocompromised patients.

Disease type	Frequency	Percentage
Diabetes	23	46%
Hypertension	13	26%
Cardiovascular disease	6	12%
Lung disease	4	8%
Liver cirrhosis	3	6%
Chronic kidney disease	1	2%
Total	50	100%
X^2	49.44	
Calculated P	0(S)	
S: Significant difference at P<0.05		

This statement agreed with (18) when he mentioned that Diabetes decreases the function of the cellular immune system, and these patients are susceptible to opportunistic fungal infections, such as oral candidiasis. Other study which consistent with our result indicate that administration of immunosuppressive agents, corticosteroids, and broad-spectrum antibiotics, ICU admission, intubation/mechanical and ventilation were associated with fungal diseases (19). A significant percentage of patients with severe COVID19 are susceptible to fungal infections such as OPC (Phelan *et al.*,2020). The treatment of COVID-19 patients with secondary fungal infections is complicated (20). Besides, OC develops when local host defense is weakened, permitting the fungus to invade

2.Hospitalization length

The results of present study showed that high percentage of infection were in third week of Hospitalization 36/58 (62%) (p<0.05), while the low percent was in first week 2/58(3.4%) (p<0.05), as shown in figure (2). This statement agreed with Mohammadreza *et al.*,2021(21). when he mentioned the length of hospitalization (9.2 days) in the case group had a significant association with OPC in COVID-19 participants (P = 0.016). Patients with a more extended hospital stay may have a higher risk of OPC as they receive more antibiotics and corticosteroids. Other study which consistent with our result indicate that OPC occurs in COVID-19 patients more frequently among cases with eight days' hospitalization on average (22).

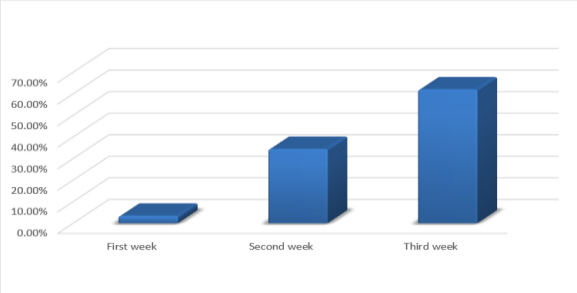

Figure (2) Distribution of oral candidiasis in COVID-19 patients Hospitalization length

5. Conclusions

The incidence of Candidiasis among immunocompromised patients and COVID-19 depending on Hospitalization length, the result showed high percentage of infection were in third week of Hospitalization, while the low percent was in first week.

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