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# Fungal Infections Related With Patient Covid-19

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## Cover Page Footnote

I would like to inform you my first name Duaa and middle name Abd alabas and last name muhammed .thanks alot

ORIGINAL STUDY

# Fungal Infections Related With patient Covid-19

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**Abstract**

**The objectives of this study was to investigate the fungus species associated with COVID-19 viral infection in 250 patients hospitalized to the intensive care unit (ICU) at Al-Diwaniyah Teaching Hospital in Al-Diwaniyah City, Iraq, between October 2021 and June 2022. With 187 isolates (34.46%), *Candida* spp. outperformed the other identified fungal species. With 20 isolates (8%), *Aspergillus* spp. placed in second place. With two isolates *Rhizopus* sp., *Coccidiodes* sp., and *Rhodotorula* sp. (0.8%), and 4 isolates *Penicillium* sp (0.73%), In addition, the male has a greater proportion (55.9%) than the female and co-infections with fungi were more common in the 60—69 age group then in the 70—79 age group (64% versus 44%, respectively). Taking a deeper look at the patients' medical histories, it was shown that fungal co-infection was more prevalent in those with chronic sickness than in those without chronic disease (57.9% versus 42.1%, respectively).**

*Keywords:* Fungal, Coinfection, COVID-19 patients, Chronic sickness

## 1. Introduction

Global health is currently threatened by a pandemic called as Covid-19 [1]. Yet, the World Health Organization declared it a pandemic in the first quarter of 2020 as a result of the rapid global spread of this disease [2]. In the most severely ill patients, bacterial and fungal infections can have a dramatic effect on the course of their illness, leading to a worse prognosis, a greater need for intensive care, and even an increase in mortality [3]. The incidence and impact of co-infections in COVID-19 patients, notably those of us with acute respiratory distress syndrome, are ambiguous among the multiple likely reasons of morbidity and death [4]. In addition, the epidemiology of these diseases shows that invasive mycoses are increasingly common among the immunocompromised and those taking chemotherapy or other immunosuppressive treatments In COVID-19 patients who are critically unwell and mechanically ventilated, fungal infection is prevalent White [5].

The virulence of the SARS-CoV-2 virus against lung tissue, as well as the formation of broad bilateral alveolo-interstitial lesions, gives a scientific explanation for this phenomenon. COVID-19's unique pathophysiology may explain the high prevalence of comorbidity with invasive pulmonary aspergillosis, pneumocystosis, and mucormycosis [6].

Thus, we set out to investigate the frequency of fungal coinfection in COVID-19 patients in order to shed light on a topic that is currently shrouded in mystery. The focus of this investigation is on isolating and identifying fungal species from coronavirus-infected patients, as well as classifying all patient data that is relevant to identifying risk factors for fungal infection connected with COVID19.

## 2. Methods and materials

### *2.1. Collection of the specimens and data*

Between October 2021 and June 2022, patients in the ICU at Al-Shifa Center of Al-Diwaniyah Teaching Hospital in Iraq's Al-Diwaniyah governorate were recruited for the study, and 250 clinical samples were acquired from individuals infected with COVID-19 and verified by PCR analysis. Swab

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samples included n = 40 from the mouth, n = 15 from the nose, n = 30 from the throat, and n = 165 from the sputum. The swabs were made of cotton and stored in plastic containers until they were used to spin through the patient's oral cavity. A jar with a 5-cm-wide aperture was used to collect sputum samples. Participants cleaned their mouths with freshwater before obtaining samples to lower the quantity of bacteria in their mouths and disperse their secretions. The patient should not swallow the sputum but instead spit it into a clean container. Demographic data (such as age, gender, and place of residence), epidemiology, and co-morbidities are collected.

### 2.2. Specimens' cultivation

A 0.1 mL aliquot of sputum was taken from each sample and streaked onto a plate containing Sabouraud dextrose agar Immediately after being swabbed, SDA was streaked. Twenty-four hours were spent in a 37 °C incubator with the dishes [7].

### 2.3. Species identification of fungi

Based on the fungus's cultivation and microscopically characteristics, as stated in [8].

### 2.4. Incidence rate

It is the number of new cases divided by the number of people who were already at risk when the study began [9].

$$Incidence\ rate\ (I) = \frac{number\ of\ new\ cases\ of\ disease}{population\ at\ risk}$$

### 2.5. Statistical analysis

The X2-Sequre software program was utilized for statistical analysis of the data (using the Specialized Package for Statistic Analysis Program, v 26), producing a large Significance level $\leq 0.05$.

## 3. Results and disscusion

During October 2021 and June 2022, 250 clinical specimens were obtained from COVID19-positive patients hospitalized in the critical care unit the Al-Shifa Institute of Al-Diwaniyah Teaching Hospital in Al-Diwaniyah province, Iraq. While only 48 samples tested negative for fungal infection, Table 1 displays the percentage of fungal species in specimens with positive results: 80.8% for fungal species

*Table 1. Proporation of type of sickness.*

| Type of sickness | Patient with covid-19 | Patient with just fungi * | Score |
|---|---|---|---|
| Quantity | 48 | 202 | 250 |
| Proporation % | 19.2 | 80.8 | 100 |

There are S. D. x2 = 94.864 P VALUE = 0.000*.

*Table 2. Isolates with fungal species.*

| Species fungal | Count of strain |
|---|---|
| *Candida sp.* | 187** |
| *Aspergillus sp.* | 20 |
| *Rhizopus sp.* | 2 |
| *Penicillium sp.* | 4 |
| *Coccidiodes sp.* | 2 |
| *Rhodotorula sp.* | 2 |
| Total | 217 |

There are statistically significant differences at the level of significance 0.05. $X^2 = 761.719$, P value = 0.000**.

associated with viral infection (based on a total of 202). This is a relatively high percentage when compared to the number of samples for other infections; for example, the number of samples for COVID19 infection was only 48 samples, at a rate of 19.2%. According to our findings, there has been a dramatic rise in the number of patients with fungal infections connected to COVID-19 compared to the number of patients who merely had COVID-19 (p 0.00) (see Table 2).

Among the 217 fungal isolates found in the patients, 187 were from *Candida* sp., 20 from *Aspergillus* sp., 2 from *Rhizopus* sp., 4 from *Penicillium* sp., 2 from *Coccidioides* sp., and 2 from *Rhodotorula* sp.

We figured out the rate of fungal co-infection with COVID-19 and for each species, which is shown in Table 3 and Figure 1. The rate of candidiasis seems high compared to other mycotic infections, which are usually spread by breathing in mold spores or, less often, through a cut or wound in the skin, and it happens after COVID-19 infection [10]. Aspergillosis was ranked second in terms of how often it happens. It is more common in people with a weaker immune system who are less able to fight off infections [11]. Mucormycosis is a rare fungal infection that can be caused by taking too many corticosteroids. which weaken the immune system and cause blood sugar to rise [12].

Figure 2 and Table 4 show that men made up the bulk of those diagnosed with fungal co-infections. The results are in line with those of a more recent study [13], in which males made up 54.72 percent of the sample. The different effects of estrogen on a woman's immune system explain why women tend to have a lower infection rate than men. Estrogen has an effect on B and T cells, neutrophils, dendritic

*Table 3. Incidence of mycosis.*

| Type of mycosis | Incidence % |
|---|---|
| Candidiasis | 34.46 |
| Aspergillosis | 8 |
| Mucormycosis | 0.8 |
| Pencillosis | 0.73 |
| Coccidioidomycosis | 0.8 |
| Rhodotorula infection | 0.8 |

cells, macrophages, and natural killer cells, among others. Antigenic stresses like disease and vaccination typically elicit stronger immune responses in females than in males [14].

*Table 4. Distribution of fungal co-infection according to gender and age groups.*

| Age range (year) | Gender | | Total | $X^2$ | P-value |
|---|---|---|---|---|---|
| | Male | Female | | | |
| 20–29 | 4 | 10 | 14 | 46.408 | 0.000** |
| 30–39 | 2 | 16 | 18 | | |
| 40–49 | 19 | 6 | 25 | | |
| 50–59 | 10 | 19 | 29 | | |
| 60–69 | 52 | 12 | 64 | | |
| 70–79 | 21 | 23 | 44 | | |
| 80–89 | 5 | 3 | 8 | | |
| Total | 113 | 89 | 202 | | |

There are statistically significant differences at the level of significance 0.01. $X^2 = 46.408$, P value = 0.000**.

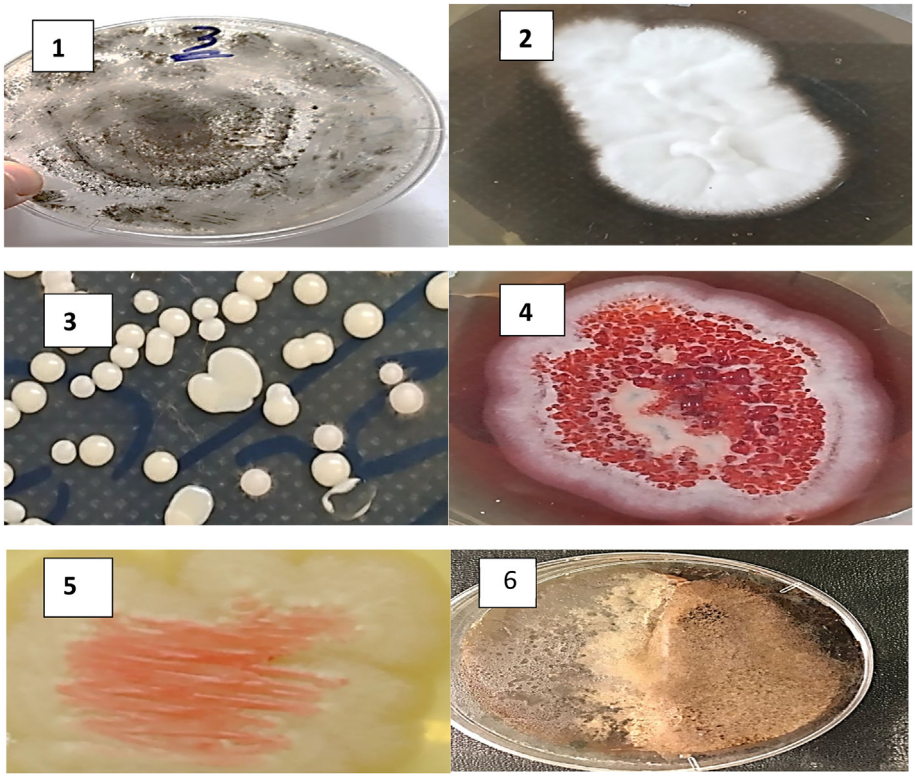


*Fig. 1. Fungal isolates, 1- Aspergillus sp. 2-coccodiodiosis sp. 3. Candida sp. 4- Penicillium 5- Rhodotorula sp. 6- Rhizopus sp.*

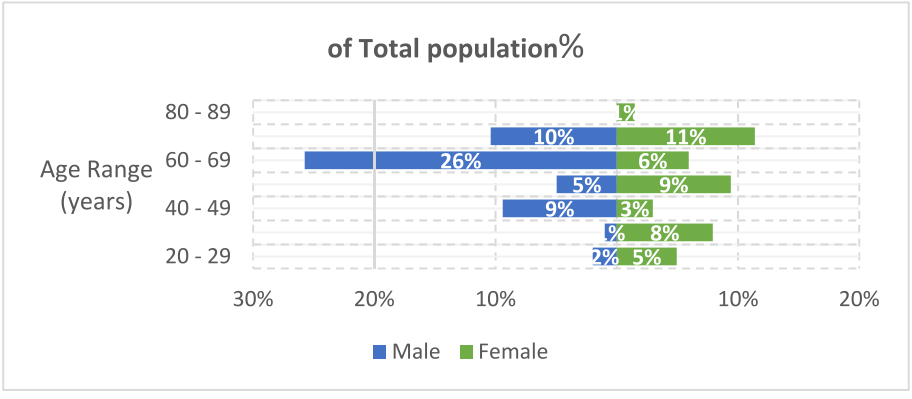


*Fig. 2. percentage of fungal co-infection according to gender and age groups.*

The age effect on the prevalence of COVID-19-related fungal infections is shown in Fig. 3. Patients beyond the age of 60 (for a total of 65) have a higher prevalence of fungal co-infection than patients under the age of 49. (37 patients). People over the age of 60 with COVID-19 (mean average age = 61) are more likely to have a secondary fungal infection than younger people (p 0.000). In addition, we emphasized the importance of the patient's medical history in the development of the fungal infection, as shown in (Figs. 4 and 5), in which patients with chronic illnesses accounted for more than half of all patients with fungal co-infection, with diabetes making up the majority at 47.1%. [15], found that people with diabetes are more likely to have Aspergillosis related to *Candida*, and these results are in line with their findings. Co-morbidities, such as diabetes and heart disease, increase a patient's

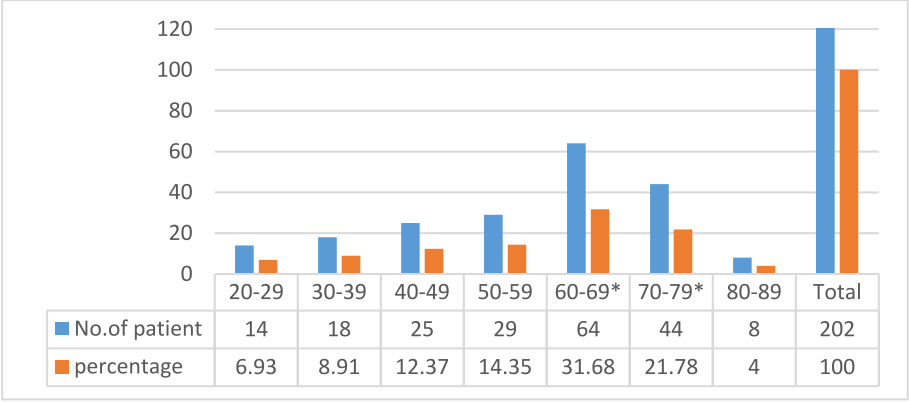


*Fig. 3. The number of patients according to the age groups (*There's S.D. between age range (60–69) and (70–79) with other age groups ($X^2$. = 104.838, P value = 0.000**.*

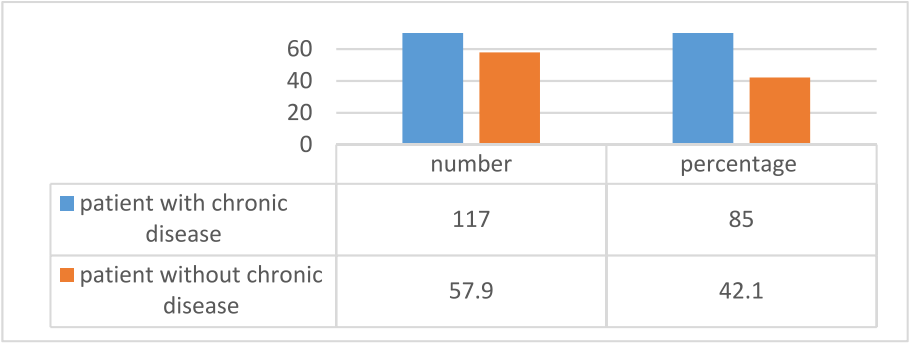


*Fig. 4. The number and percentage of patient s with chronic disease There's S. D $X^2$. = 5.069, P value = 0.000**.*

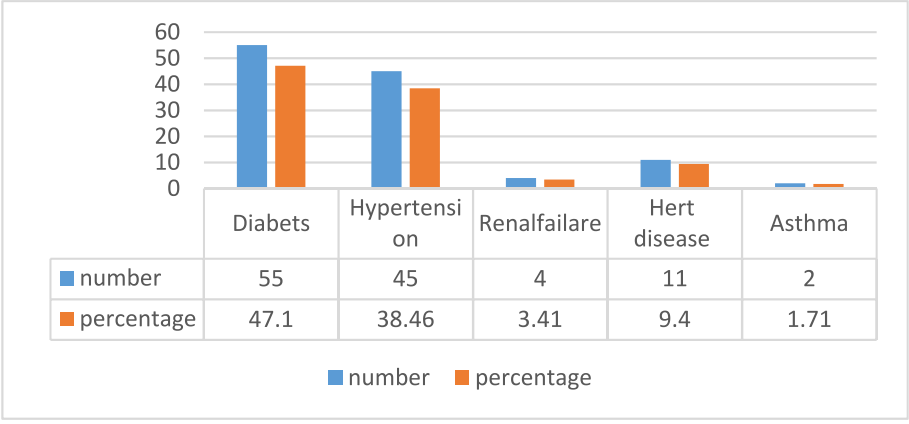


*Fig. 5. The number and percentage of chronic disease in COVID19 patients with fungal co infection There's S. D $X^2$. = 104.838, P value = 0.000**.*

sensitivity to viral infections [16] and high blood sugar levels make *Candida* easier to grow, making diabetics more prone to have candida infections.

There is evidence that SARS-CoV-2 wipes out a huge number of immune cells and overwhelms the cellular immune role, as patients with COVID 19 have a lower likelihood of having a decrease in lymphocyte count, which will effect the immunological response by reducing CD4+T- & CD8+T [17], Because of this, the immune system becomes unbalanced, increasing the likelihood of contracting a secondary illness [18]. A person's immunology changes and becomes more complex as they advance from a mild, moderate, or severe critical illness [19].

## 4. Conclusion

Coronavirus (COVID-19) infections are serious, but fungal co-infections are far more dangerous, accounting for 68% of all coronavirus infections. Secondary fungal infections were more common in men, and older persons were more at risk for fungal coinfection. Extensive evidence shows that co-occurring diseases, including diabetes in particular, increase the likelihood of contracting COVID19-related fungus. Last but not least, Patients having COVID-19 should be tested for fungal diseases as possible in order to avoid developing a more serious illness, since early detection is critical for effective treatment.

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