

# Recent Infection With Black Fungus Associated With COVID-19: A Review

<sup>2</sup>ASHWAK JASIM KZAR<sup>3</sup>, TUNJAI NAMIQ FAIQ<sup>1</sup>, OZDAN AKRAM GHAREEB

<sup>1</sup>Department of Otolaryngology, Kirkuk General Hospital, Kirkuk Health Directorate, Iraq.<sup>1</sup>

<sup>2</sup>Department of Community Health Techniques, Technical Institute of Kirkuk, Northern Technical University, Iraq.<sup>3</sup> Department of Medical Laboratory Technology, College of Health and Medical technique, Middle Technical University, Iraq

## ABSTRACT

Recently, an emergency health problem erupted that worried the world, which is the black fungus infection associated with Covid-19, especially in India and some regions of the Middle East. The members of genus *Rhizopus* or *Mucor* resulted the common mucormycosis. Humans become infected by inhaling and depositing the spores of fungi in the tissues of the body. Rhinocerebral is the site most susceptible to infection. Several factors may have contributed to an increase in the incidence of mucormycosis in patients with COVID-19, including hypoxia, steroid-induced elevated blood glucose levels, and diminished phagocytic action of leukocytes due to immunosuppression, and non-sterile medical supplies. In addition, there is an unsanitary phenomenon resorting to some people in India, it is smearing the body with cow dung and urine, which may have a role in the spread of the black fungus infection. Proper use of both the dose and duration of steroids is essential to avoid an increase in cases of mucormycosis, especially when caring for critically ill COVID-19 patients.

**Keywords :** Black fungus, infection, health problem.

## INTRODUCTION

Mucormycosis, popularly known as black fungus, is a category of fungal infections produced by Mucorales members that can affect a variety of organs, such as the paranasal sinuses, orbits, brain, lungs, gastrointestinal tract, and skin<sup>(1-3)</sup>. Inhalation and deposition of fungal spores in these tissues cause sinus and lung infections, and skin infections can occur when the skin is disruption in the case of burns or trauma<sup>(4)</sup>. Mucormycosis is uncommon worldwide, however it is more frequent in India and the Middle East. Mucormycosis outbreaks have been linked to significant natural catastrophes<sup>(5,6)</sup>. COVID-19, is an acute respiratory illness This can cause ARDS, numerous organ failure, and even death<sup>(7-10)</sup>. The pathophysiological characteristics of COVID-19 may permit a minor fungal disease, the tendency to result in a respiratory infection, and this may lead to an increased threat of aggressive fungal infection<sup>(11,12)</sup>. In addition, COVID-19-induced immunological dysregulation, which includes lower numbers of T lymphocytes, CD4 + T cells, and CD8 + T cells, may affect innate immunity<sup>(13-15)</sup>. In order to develop effective intervention and prevention strategies for COVID-19, there are important requirements, including identification and knowledge of risk factors and other associated infections.

Kingdom	Fungi	Frequency of infection	
Subphylum	Mucoromycotina		
Order	Mucorales		
Family	Mucoraceae		
Genera	<i>Rhizopus</i>		47%
	<i>Mucor</i>		18%
	<i>Cunninghamella</i>		7%
	<i>Apophysomyces</i>		5%
	<i>Lichtheimia</i>	5%	
	<i>Saksenaea</i>	5%	
	<i>Rhizomucor</i>	4%	

Figure (1) : Classification of common causes Mucormycosis genera

**Structures and Classification:** Although there are several genera in the arrangement of Mucorales causing infection in man (Fig. 1)<sup>(16)</sup>, Most infections of mucormycosis are due to genus *Rhizopus* or *Mucor* members (Fig. 2). The growth of fungus is sporophytically on various decayed and rotten organic matter, moist leather, horse and cattle dung. As well as, human food like bread and cheese. The spore splits from the setting and formulates ribbon-like hyphae on the substrate<sup>(17-19)</sup>.

**Pathogenic conditions that can arise from infection with black fungus:** Rhino- Orbito – Cerebral mucormycosis: infects paranasal sinuses, then spreads rapidly to surrounding tissues, including the palate, sphenoid sinus, orbits, and cavernous sinuses, as well as the brain Black eschar indicated necrosis of these tissues, a concerning symptom of local expansion<sup>(20,21)</sup>.

Pulmonary mucormycosis :infects lung (chest hurt), lesions usually require the nevis but might outspread to the pericardium, the pulmonary artery, the aorta, or the mediastinum. Hemoptysis may also occur due to invasion of the pulmonary arteries<sup>(22)</sup>.

Cutaneous mucormycosis: The most common cutaneous mucormycosis symptom is induration of the skin with surrounding erythema that quickly progresses to necrosis. Necrosis, redness, swelling, purulent discharge, and a mouldy look were the major signs<sup>(23,24)</sup>.

Gastrointestinal mucormycosis: The colon, small intestine, and oesophagus were the most prevalent sites of infection, followed by the stomach. The most common symptom was abdominal discomfort, which was followed by gastrointestinal bleeding and changes in bowel syndrome. Fever occurs occasionally or infrequently<sup>(25)</sup>.

**Disseminated mucormycosis:** is an infection characterised by the presence of at least two non-contiguous locations. Lungs, sinuses, soft tissues, the central nervous system, the liver, and kidneys are the most prevalent sites of infection. Iron overload patients, profound immunosuppression are the core groups in vulnerability. Patients with disseminated mucormycosis ha

the greatest death rate when compared to other clinical presentations (26,27).

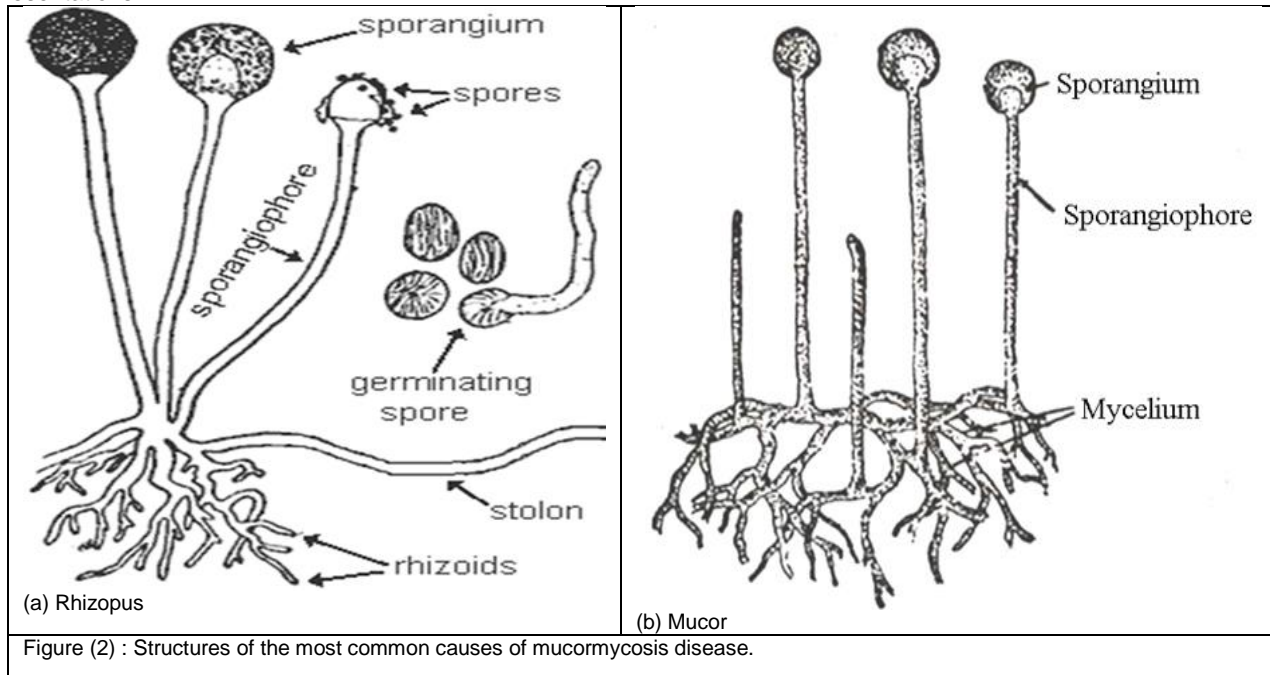


Figure (2) : Structures of the most common causes of mucormycosis disease.

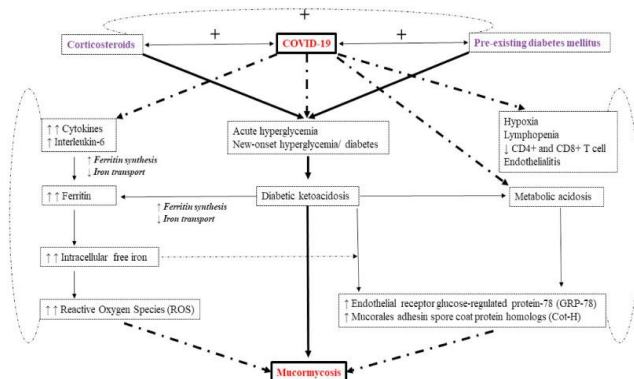


Figure (3): Hypothetical mechanism of low susceptibility for mucormycosis infection in persons infected by COVID-19.

**Risk Factors & Accompanying COVID-19:** The sites most susceptible to infection are in sequence as follows: rhinocerebral, cutaneous, pulmonary, disseminated and gastrointestinal tract (28). Low immunity people or COVID-19 patients, diabetics, people who consume steroids and other comorbidities such as cancer or organ transplants are more vulnerable to infection. Recently, the incidence of mucormycosis has increased in persons with COVID-19, particularly in India and the Middle East(29,30). Whereas, people infected with COVID-19 present an perfect setting for low oxygen (hypoxia), high glucose (diabetes, steroid-induced hyperglycemia), acidic medium, high iron levels (excess ferritin) and low phagocytic activity of leukocytes due to immunosuppression, along with many common risk aspects together with elongated hospitalization using or not using ventilators(31,32). All of this helps and encourages the germination of Mucorales spores in them, as shown in figure (3)(33). Besides, poorly sterilized medical supplies,

such as the use of wet masks and a hot and humid environment, together act as a breeding ground for disease. However, important risk factors worth noting are glycemic status and use of steroids. Since India is the capital of the world for diabetics and about 9% of the population is affected, strict control of blood glucose is the prerequisite to avoid opportunistic infections(34). Besides all that, there is an unhealthy phenomenon that some people in India turn to, which is smearing the body with cow dung and urine, a practice that some believe protects from the virus. This may have a promotional role in the spread of black fungus infection(35).

### CONCLUSIONS

Because the development of black fungus is attributed to the use of glucocorticoids, so it is recommended to resort to its wise use. In other words, its use in mild cases of COVID-19 should be avoided. Also, in the absence of necessity, drugs that target immune pathways should be inhibited. Physicians caring for unsympathetically infected COVID-19 persons must aware of perilous infections complicating the course of COVID-19.

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