

بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ

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CrystalGraphics



Mucormycosis



Mucormycosis Epidemiology

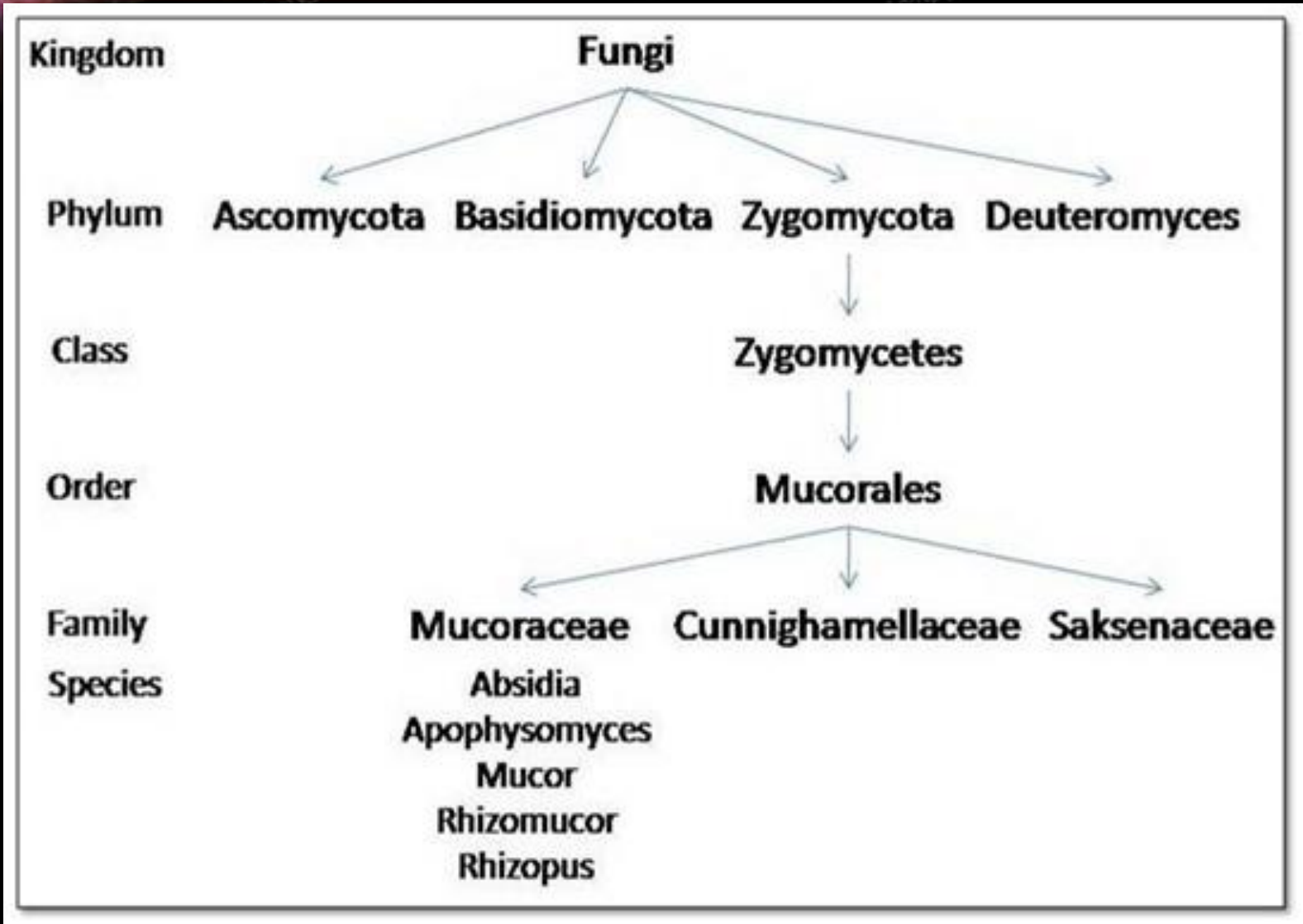


تعریف

موکورمایکوزیس که قبلاً با نام زیگومیکوزیس و گاهی قارچ سیاه نیز نامیده می‌شد

- یک عفونت قارچی نادر ولی جدی Angio invasive است
- عموماً در افرادی که سیستم ایمنی ضعیف تری داشته و توان مبارزه کمتری با عفونت دارند بروز می‌کند.

- اولین مورد موکورمایکوزیس احتمالاً توسط فردریش کوچن مایستر در سال ۱۸۵۵
- فوربرینگر اولین بار این بیماری را در ریه‌ها در سال ۱۸۷۶ توصیف کرد.
- در سال ۱۸۸۴، لیختهایم توسعه بیماری را در خرگوش ایجاد کرد
- بعداً به عنوان *Lichtheimia* و کیک سیاه نان شناخته شده بود
- در سال ۱۹۴۳، ارتباط آن با دیابت کنترل نشده در سه مورد با درگیری شدید سینوس، مغز و چشم گزارش شد.





Epidemiology

- These fungi grow rapidly and release large numbers of spores that can become airborne.
- Agents are common in the environment
- Relatively frequent contaminants in the clinical microbiology laboratory
- Humans have ample exposure to these fungi during day-to-day activities.



Epidemiology

- Mucormycosis is rare, and its incidence is difficult to calculate accurately
- The incidence rate of mucormycosis globally varies from 0.005 to 1.7 per million population.
- Most cases are sporadic,
- Invasive mucormycosis has also been associated natural disasters.



• افراد در هر سنی ممکن است تحت تأثیر قرار بگیرند، از جمله نوزادان که به صورت زایمان زودرس به دنیا آمده‌اند.

• این بیماری در رخدادهای طبیعی نیز گزارش شده‌است

زمین‌لرزه و سونامی ۲۰۰۴ اقیانوس هند ✓

گردباد میسوری ۲۰۱۱ ✓

پاندمی کووید-۱۹ ✓

Types of Mucormycosis

- 1** Cutaneous mucormycosis (skin)
- 2** Rhinocerebral mucormycosis (sinus and brain)
- 3** Pulmonary mucormycosis (lung)
- 4** Gastrointestinal mucormycosis
- 5** Disseminated mucormycosis





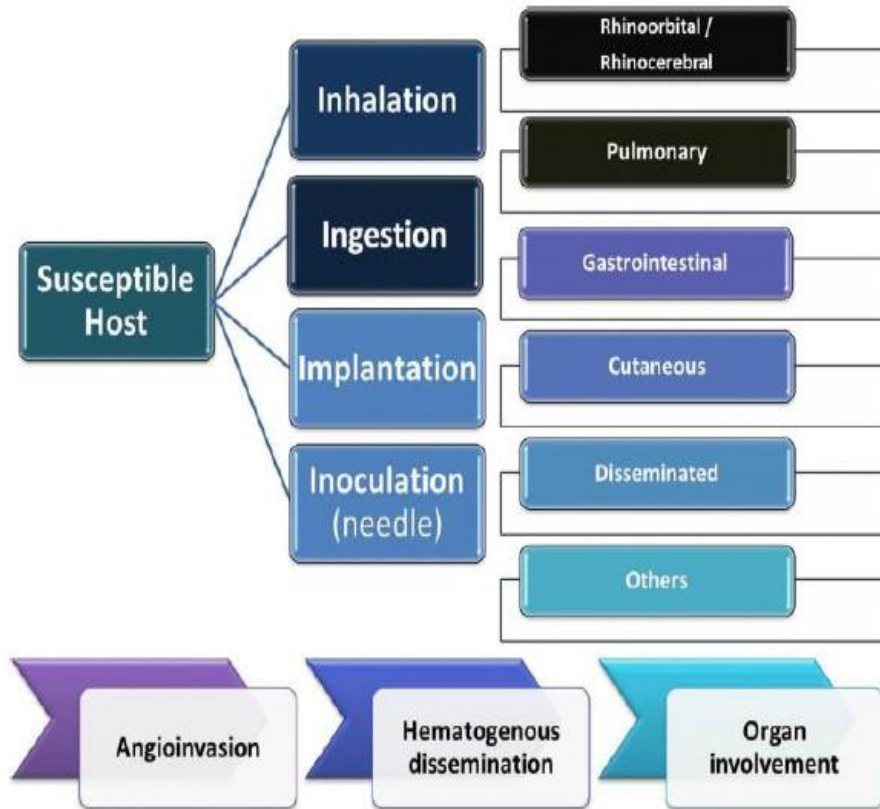
Types

- Rhinocerebral (39%),
- lungs (24%),
- Skin (19%),
- Brain (9%),
- Gastrointestinal tract (7%),
- Disseminated disease (6%),
- Other sites (6%)



Transmission of mucormycosis

- Mucorales are commonly found in soil, decaying matter, fallen leaves, compost, animal dung and air.
- *Rhizopus* can be found in moldy bread.
- The major route of infection is via inhalation
Ingestion of spores from the environment
- It is not contagious not spread person to person.
- Mucormycosis can't spread between people and animals.





Pathophysiology

- Mucorales are vasotropic, causing tissue infarctions,
- Hyphae invade blood vessels, producing tissue infarction, necrosis, and thrombosis
- *Rhizopus* organisms have an enzyme, ketone reductase, which allows them to thrive in high glucose, acidic conditions

عوامل خطر



- پیوند اعضا
- ایدز
- دیابت شیرین کنترل نشده
- سرطان‌هایی مانند لنفوم
- نارسایی کلیه
- کورتیکواستروئید طولانی مدت
- سیروز و سوءتغذیه است
- افزایش آهن به دلیل درمان دفروکسامین مسیلات
- در برخی از موارد عامل زمینه‌ساز مشخصی وجود ندارد

Risk factors

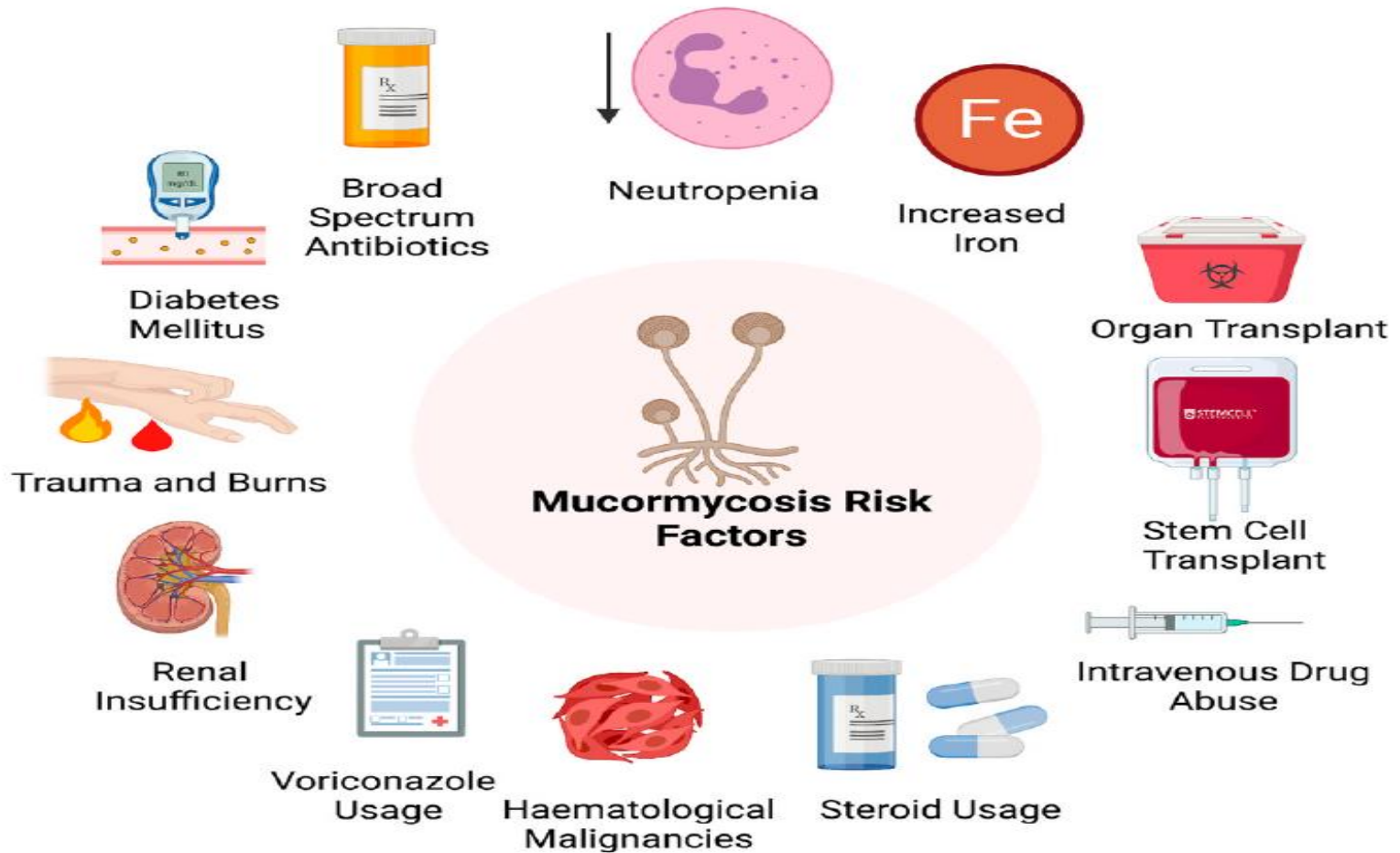


Fig. 2. Risk factors associated with the development of mucormycosis:

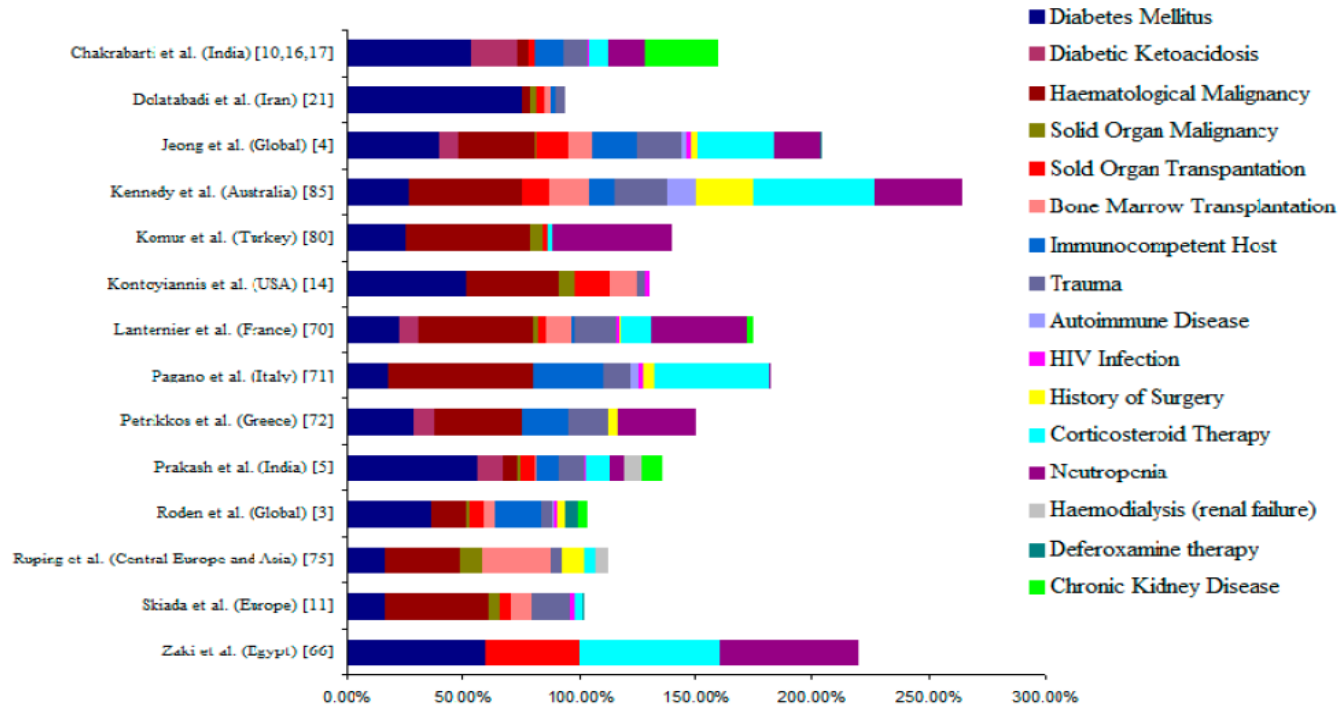


Figure 1. Underlying disease/risk factors associated with mucormycosis. The percentage of values given in the figure was calculated based on the data given in the literature. Percentage counts in total are more than actual values, because multiple risk factors are counted more than once. The data was pooled from studies by Chakrabarti et al. 2006, 2001, 2009 [10,16,17].

Mortality rate

The mortality rate depends upon the:

1. Underlying condition of the patient,
2. Fungus type
3. Affected site in the body

(for example, the mortality rate reported was 46% for patients with sinus infections, 76% for pulmonary infections, and 96% for disseminated mucormycosis) (CDC, 2021)



Prognosis

- Prognosis and survival depend on early diagnosis and timely initiation of treatment.
- Higher mortality of 80% → disseminated disease to CNS
- Rhino-orbital-cerebral → mortality rate of 25% to 62%



•Covid 19 and Mucormycosis



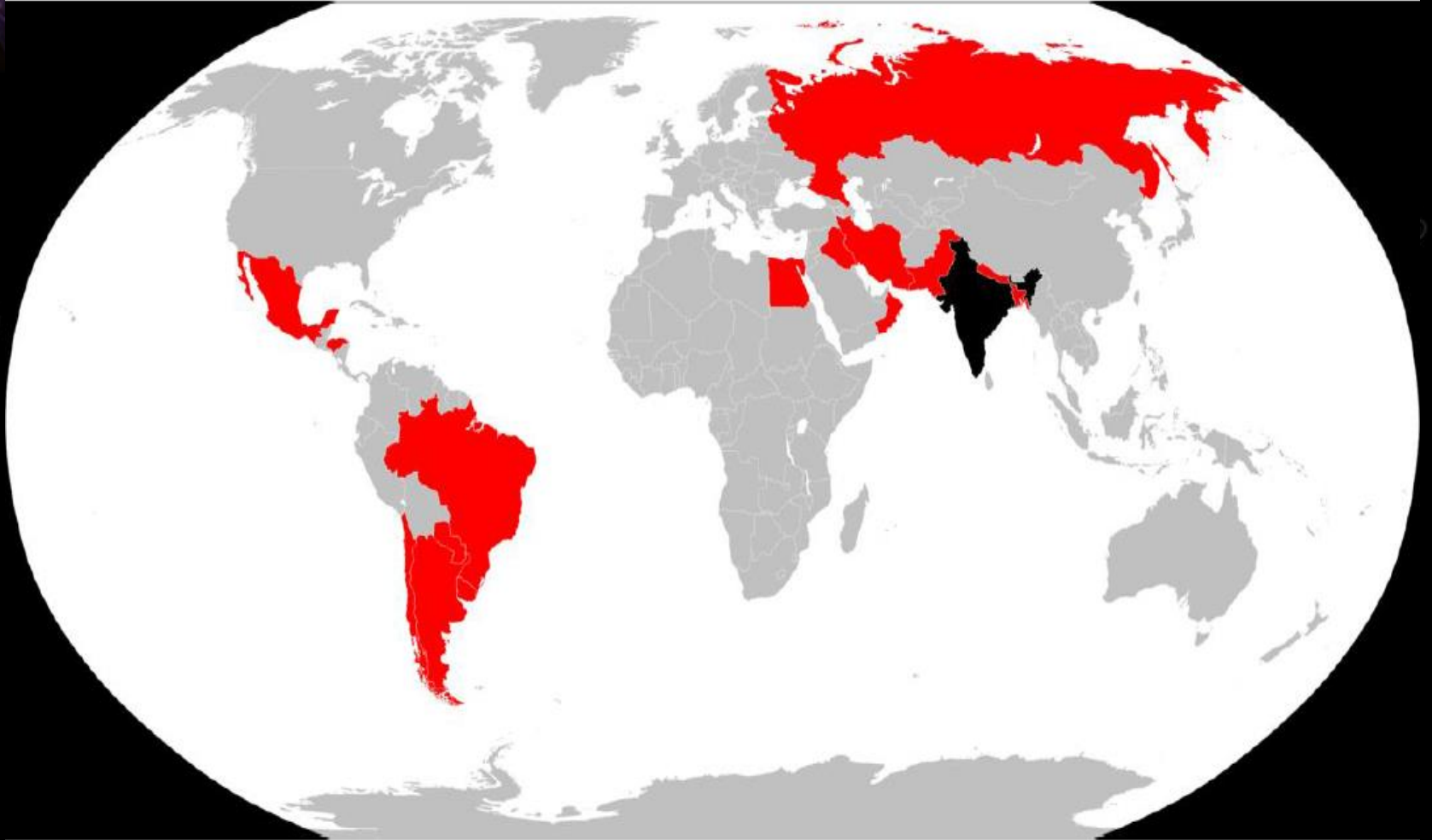
COVID-19 and Mucormycosis

- COVID-19 disease can be complicated by:
 - Secondary bacterial infection
 - Invasive fungal infection (COVID-19-associated pulmonary aspergillosis, Pneumocystosis, and mucormycosis)



Covid -19 and Mucormycosis

- One review of case reports of mucormycosis in patients with COVID-19 included 101 cases:
 - 80 % had pre-existing diabetes mellitus
 - 76 % received glucocorticoids
 - 90 % of cases involved the nose and sinuses
- Overall mortality was 31 %
- Clinicians should be aware of the potential for rhinocerebral mucormycosis as a complication of COVID-19, especially in patients with underlying diabetes mellitus.





Risk factors

- COVID-19 has a predisposition to cause extensive lung damage, which promotes colonization and infection of invasive fungi of airway, sinuses, and lung.
- **Alteration in T cell immunity**
- Use of steroids (most common)
- **Use of broad-spectrum antibiotics**



Risk factors

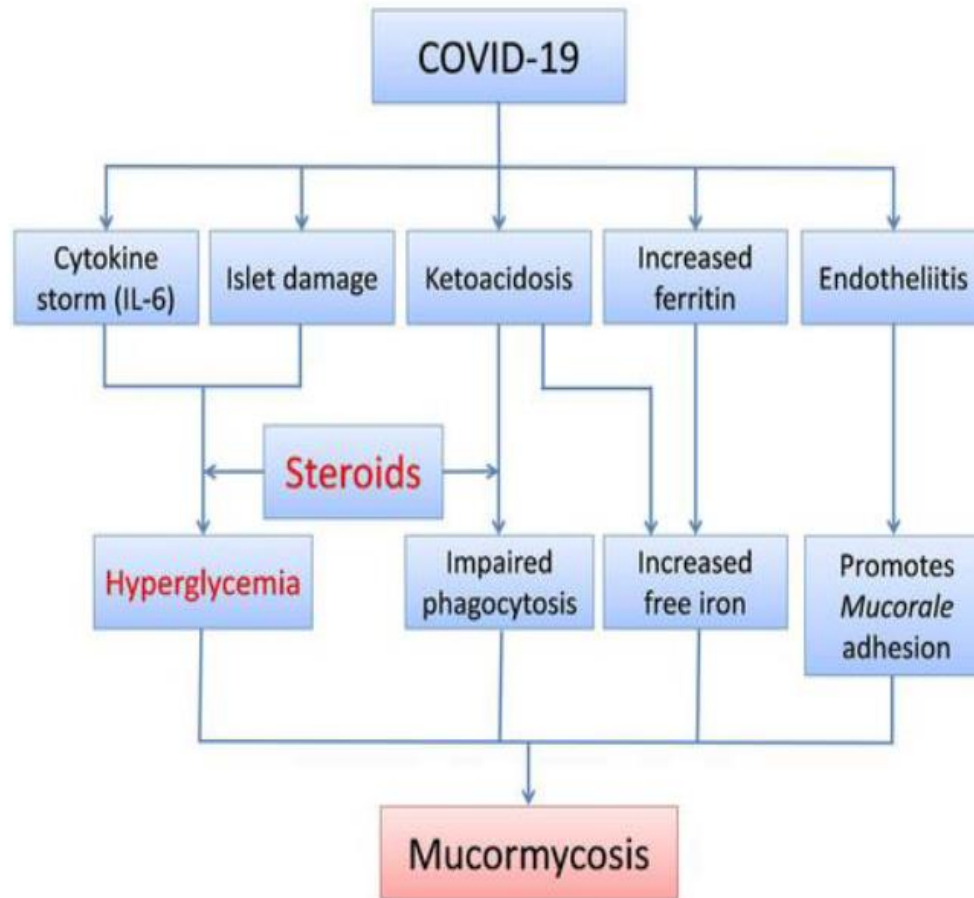
- COVID-19 disrupts iron metabolism, resulting in high ferritin state and increasing intracellular iron, which causes tissue damage.
- This causes more iron to be released into the circulation, and it is this increase in free iron that is a risk factor for mucormycosis.
- Hyperglycemia due to uncontrolled pre-existing diabetes
 - High expression of ACE-2 receptors in pancreatic islets caused by SARS-CoV-2 results in insulin resistance leading to poorly controlled diabetes



Risk factors

- New onset diabetes due to steroid overuse or severe cases of Covid – 19
- Prolonged ICU stay
- Pre-existing co-morbidities such as hematological malignancies
- Breakthrough infections in patients on Voriconazole prophylaxis.

Mucormycosis in Covid -19





Epidemiology

- The most common underlying medical condition was diabetes.
- Most had been in hospital with severe breathing problems due to COVID-19,
- Most patients developed mucormycosis 10–14 days following treatment for COVID-19



Clinical presentation

- Prevalence of 0.27% among hospitalized COVID-19 patients
- The most common clinical manifestation was rhino-orbital form
- Case fatality at 12 weeks was 45.7% with no difference in mortality among COVID-19 and non-COVID-19 patients



Prognosis

- Depend on early diagnosis and timely treatment.
- **Mortality of mucormycosis varies between 40%-80%,**
- Higher mortality of >80% is seen in patients with disseminated disease to CNS
- **Pulmonary mucormycosis carries a mortality rate of about 60%**
- Rhino-orbital-cerebral mucormycosis has a mortality rate of 25% to 62%. (50%)
- **Skin the lowest mortality rate of around 15%**



Prevention

- Prevention of COVID-associated mucormycosis needs to focus on addressing the underlying risk factors:
- **Aiming for better glycemic control in those with diabetes,**
- **Appropriate use of systemic corticosteroids; Outpatient use of systemic corticosteroids/other immunomodulating drugs for mild or moderate patients with COVID-19 should be avoided.**
- **Prevention of unnecessary use of antibiotic, antifungal and other immunomodulators**
- **Health care facilities need to strengthen their infection prevention and control (IPC) programmes to prevent healthcare-associated outbreaks.**



Prevention

- **Primary Prophylaxis**
- There is no evidence for primary prophylaxis towards mucormycosis.
- The ECMM has a moderately strong recommendation regarding primary prophylaxis with oral or IV posaconazole



Secondary Prophylaxis

- **The ECMM strongly recommends secondary prophylaxis for patients with a previous history of mucormycosis who are undergoing immunosuppression**



Prevention of the environmental spread

- Sterilization and disinfection of the equipment used by multiple patients (tracheal tubes, ventilators),
- **Good ventilation systems**
- Proper wound management (bandage, tape, adhesives)
- **Proper line management in health facilities**

