

COVID19 – ASSOCIATED MUCORMYCOSIS



Dr. Ravindra Khaiwal
Dr. Suman Mor





राजेश भूषण, आईएएस
सचिव

RAJESH BHUSHAN, IAS
SECRETARY



Foreword

Mucormycosis is a critical condition caused by a group of molds known as Mucormycetes. These fungi can be found all over the environment, but they thrive in soil & decaying organic materials like leaves, compost piles, & rotten wood. It affects people who have health issues that impair and reduce their ability to combat pathogens in the environment. These people include immune-compromised individuals with uncontrolled diabetes mellitus, neutropenia & in people who have taken immunosuppressant for the treatment of blood cancer, hematopoietic stem cell transplantation, etc. The infection is not contagious & cannot be passed from one person to another. But if mucormycosis is left uncared, it may turn fatal.

Mucormycosis can also complicate the case of severe COVID-19 infection. The COVID-19 pandemic is still a major public health issue around the world & now its wide range of symptoms & complications have emerged. One of these complications is fungal infection such as mucormycosis. Patients who are treated for COVID-19, those who have taken excessive steroids & who are diabetics have greater susceptibility of getting mucormycosis. Clinical manifestations of mucormycosis can vary based on anatomical sites such as nasal blockage, discharge from the nose, pain or swelling in the one-sided face, chest pain, cutaneous involvement, abdominal pain with nausea & vomiting, etc.

This pictorial booklet aims to make people aware by providing education & knowledge on COVID-19 & its complications such as mucormycosis in simple easy to understand language. Its purpose is to enhance the self-care measures in persons who are suspected or confirmed COVID-19 to protect themselves against mucormycosis.

I applaud the efforts of Dr. Ravindra Khaiwal, Department of Community Medicine & School of Public Health, Post Graduate Institute of Medical Education & Research, Chandigarh & Dr. Suman Mor, Department of Environment Studies, Panjab University, Chandigarh, for bringing out the booklet of '**COVID-19 -Associated Mucormycosis**'.

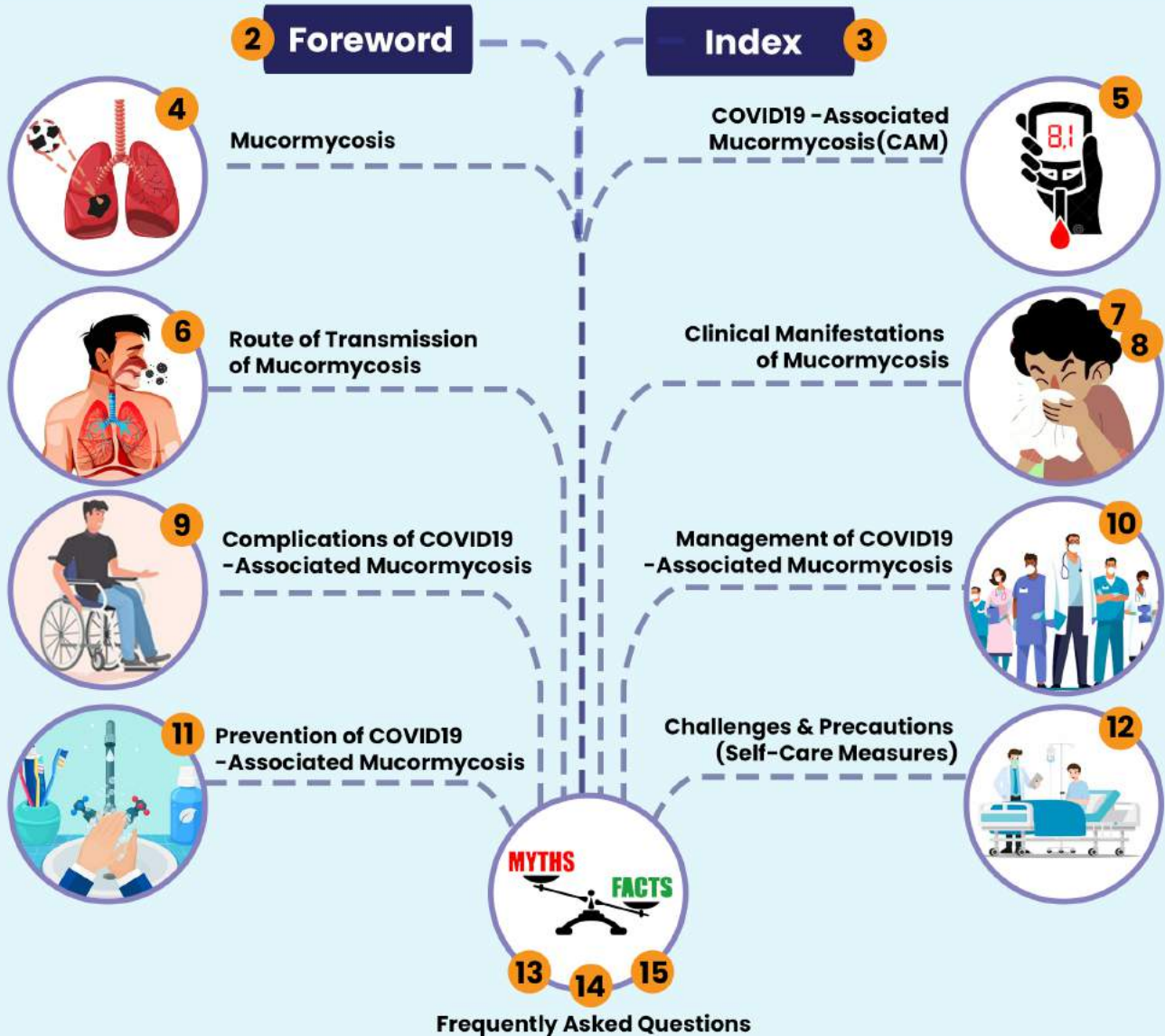
This booklet will create awareness about the early identification of disease & prevention strategies, including guidance on what should be done & what should not be done for COVID-19 Associated Mucormycosis.

I commend the efforts of all those who have contributed in creating this extremely valuable document.

Place : New Delhi
Date : 11th June 2021

(Rajesh Bhushan)

COVID19 - ASSOCIATED MUCORMYCOSIS (CAM)



AUTHORS / Dr. Ravindra Khaiwal & Dr. Suman Mor

EXPERT REVIEWERS

We greatly acknowledge the input & suggestion received from our subject experts.



Dr. Arunaloke Chakrabarti
Professor & Head
MEDICAL MICROBIOLOGY,
PGIMER, Chandigarh



Dr. Naresh K. Panda
Professor & Head
OTOLARYNGOLOGY (ENT),
PGIMER, Chandigarh



Dr. Jagdish Chander
Consultant Microbiology
former Professor & Head
GMCH, Sector 32,
Chandigarh



Dr. Suneela Garg
Dir. Professor & Head
Community Medicine Maulana
Azad Medical College
New Delhi



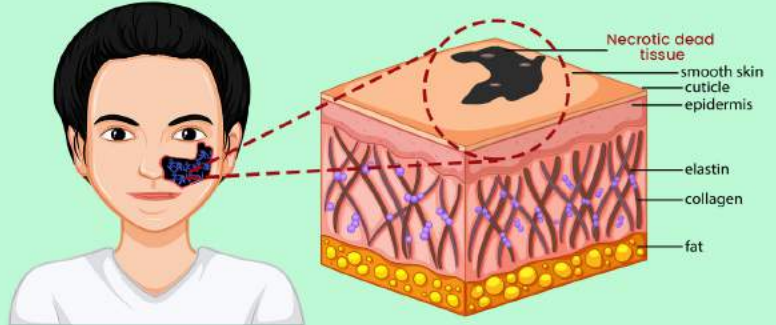
Dr. Ritesh Agarwal
Professor,
Department of
PULMONARY MEDICINE,
PGIMER, Chandigarh



MUCORMYCOSIS

Mucormycosis is a deadly invasive fungal infection that mostly affects people who are taking medications for other health issues that impair their ability to combat pathogens in the environment.

Mucormycosis has emerged as a significant fungal infection with high mortality rates in the last two decades. After candidiasis & aspergillosis, mucormycosis has emerged as the third most widespread invasive mycosis in immunocompromised patients.



They have a tendency for invading blood vessels because they are angioinvasive, causing significant necrosis & embolism in the surrounding area

Based on anatomic localization, Mucormycosis can be classified as



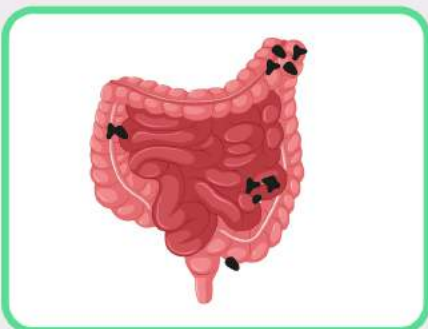
RHINO-ORBITO-CEREBRAL



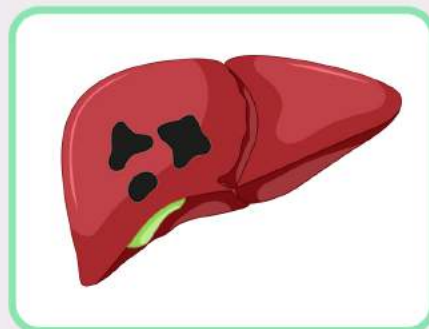
PULMONARY



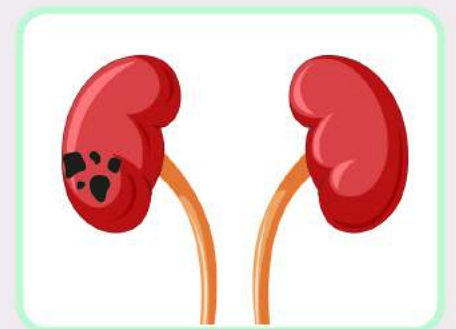
CUTANEOUS



GASTROINTESTINAL



DISSEMINATED



ISOLATED RENAL



COVID19 – ASSOCIATED MUCORMYCOSIS (CAM)



During the current COVID19 pandemic, a wide range of symptoms & complications have arisen & are being identified. One of these complications is fungal infection such as mucormycosis after the pulmonary aspergillosis, etc.



Several treatment approaches have been tested but systemic steroids have been demonstrated to increase the survival of COVID19 patients



However, the excessive use of steroids can lead to occurrence of fungal infection such as mucormycosis



Mucormycosis-if uncared may turn fatal & have been reported in those COVID19 patients who are diabetic & who have taken excessive steroids



COVID19 -Associated Mucormycosis(CAM) has a high incidence rate in India as prevalence of diabetes mellitus is high (8.9% of adults)

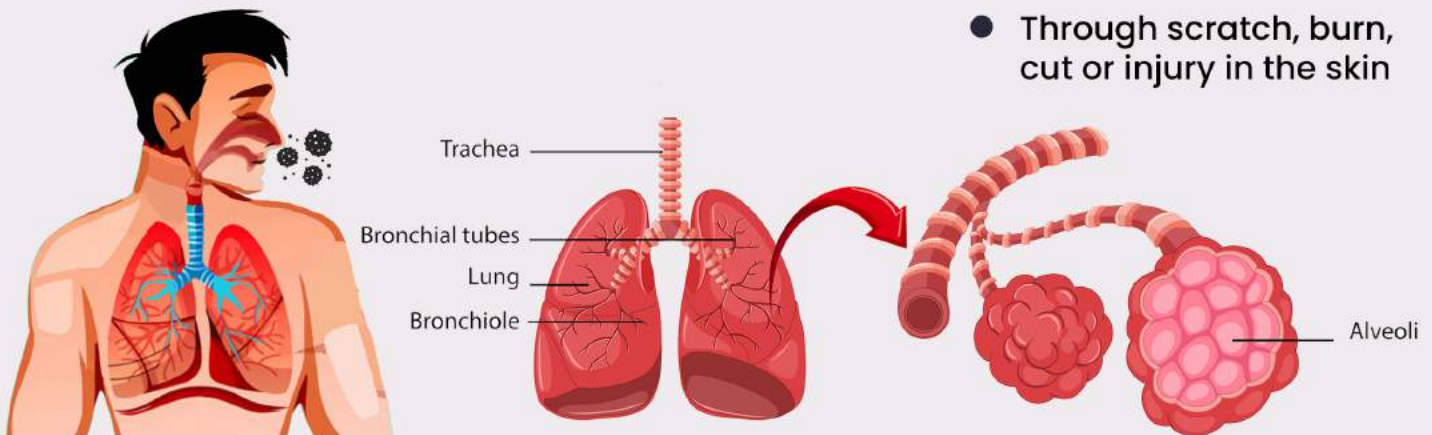


Mucormycosis is not contagious & cannot spread between people & animal

ROUTE OF TRANSMISSION OF MUCORMYCOSIS

HOW DOES MUCORMYCETES ENTER ONE'S BODY?

- Inhalation of the spores from the air
- Through scratch, burn, cut or injury in the skin



RISK FACTORS OF MUCORMYCOSIS

- Prolonged ICU stay
- Voriconazole therapy
- Excessive use of steroids
- Patients on dialysis & iron overload
- Co morbidities- Post-transplant/malignancy



AIDS

Immunodeficiency such as uncontrolled diabetes mellitus, protein calorie malnutrition, neutropenia, HIV/AIDS, etc.



Contaminated adhesive bandages, wooden tongue depressors, nearby construction & hospital linens, etc.

- Burns, traumatic injuries & substance abusers
- Case of COVID19 infection that was treated concurrently



CLINICAL MANIFESTATIONS OF MUCORMYCOSIS

ON THE BASIS OF ANATOMICAL SITE, MUCORMYCOSIS IS CLASSIFIED INTO 6 TYPES:

RHINO-ORBITO-CEREBRAL MUCORMYCOSIS



Nasal blockage, bloody or brown/black nasal discharge & local pain



Toothache, maxillary tooth loosening & jaw involvement



Pain, numbness or swelling in the one-sided face



Fatal within a week, if left untreated

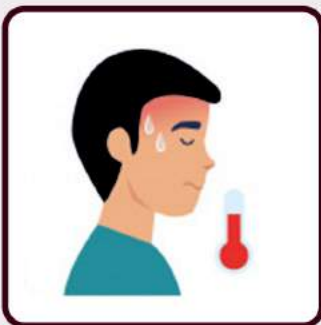


Headache, orbital pain, lethargy



Blurred or double vision with pain, redness around eyes

PULMONARY MUCORMYCOSIS



FEVER



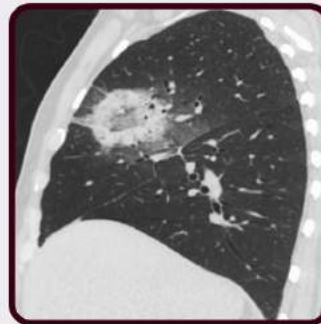
COUGH



SHORTNESS OF BREATH



CHEST PAIN




PNEUMONIA




HEMOPTYSIS

CLINICAL MANIFESTATION OF MUCORMYCOSIS


CUTANEOUS & SOFT TISSUE MUCORMYCOSIS




Cotton like growth over the tissues




Pustules, wounds over the surface



Erythema & tenderness that progresses to necrosis



Contact dermatitis that leads to ulceration



Muscle pain

ISOLATED RENAL MUCORMYCOSIS



Fever



Pain



Pyuria



Hematuria

GASTROINTESTINAL MUCORMYCOSIS



Abdominal pain with nausea & vomiting



Ulceration of gastric mucosa



Bleeding from anus, fever



Thrombosis, hemorrhage, necrosis & ulceration

DISSEMINATED MUCORMYCOSIS

Pneumonia, stroke, subarachnoid hemorrhage, brain abscess, cellulitis or gangrene of skin structure

COMPLICATIONS OF COVID19 – ASSOCIATED MUCORMYCOSIS

Can mucormycosis cause other conditions to develop?

- Yes, mucormycosis can get easily spread across the body
- If, left untreated, the infection can lead to



Diagnosis of mucormycosis

• Healthcare professionals evaluate the patients':

Medical history



Signs



Physical examinations



Laboratory tests



Fungal culture

Radiodiagnosis such as CT scan & MRI of lungs, sinuses or other parts of body

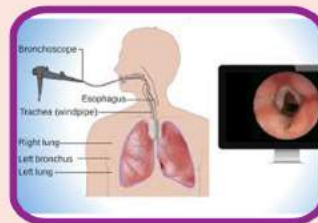
Pulmonary



Chest X-ray



Chest high resolution computed tomography



Transbronchial biopsy



CT guided biopsy from lung- for microscopy & culture

Rhino-orbito-cerebral

Consult ENT surgeon for endoscopic collection of debrided tissue/biopsy Imaging test such as CT scan or MRI

Isolated Renal Mucormycosis



• Ultrasonography



• Imaging tests



• Renal biopsy

MANAGEMENT OF COVID19 - ASSOCIATED MUCORMYCOSIS

Observing & evaluating conditions time to time

Patients with mucormycosis should be admitted to a different Mucormycosis unit

Diabetic ketoacidosis & diabetes should be controlled

Reduce excessive use of steroids or if possible avoid taking steroids



For COVID19 positive patients, helpline number and counseling center should be provided



Monitor patients clinically, radiologically & microbiologically for reaction & disease progression



To clear the necrotic tissue, surgical debridement should be performed



Early diagnosis & prompt treatment should be required



Patients of mucormycosis should be handled by a multidisciplinary team that includes representatives from various departments such as ENT, Eye, Surgery, Medicine, Microbiology, Dental, etc.

Medical Treatment

Install PICC line (Peripherally Implanted Central Catheter)

Maintain proper hydration before amphotericin B infusion

Start antifungal therapy



PREVENTION OF COVID19 - ASSOCIATED MUCORMYCOSIS



When handling soil, wear shoes, long pants, long sleeve shirts & gloves



Wear mask while going to a dusty construction site



Early detection can aid in preventing the spread of the fungal infection

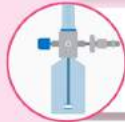


Personal hygiene should be maintained

What should be done?



During oxygen therapy, use only clean, sterile water in humidifiers



Change the humidifier water daily



Daily wash the humidifier in mild soapy water then rinse with clean water & then air dried & once a week soak the humidifier in a mild antiseptic condition



Blood sugar levels should be monitored post-COVID19 discharge



Use of antibiotics & antifungals at correct duration & dose



What should be done?



Do not rule out bacterial sinusitis in all cases of blocked nose, particularly in COVID19 patients on immunomodulators



Do not use oral steroids in patients with normal oxygen saturation

Do not reluctant to seek interventions



Do not use un-boiled tap or mineral water

CHALLENGES & PRECAUTIONS (SELF-CARE MEASURES)

CHALLENGES FACED BY PEOPLE

Reduction in the availability of critical medical care



Shortage in supply of drugs (medical equipments & beds) & Shortage of Doctors, nurses & health care workers



Stress & anxiety in patients affect mental health



Financial burden on patients delayed diagnosis



Transportability issue: lack of vehicles

Delayed diagnosis



PRECAUTIONS (SELF CARE MEASURES)

Immunocompromised persons should stay away from the outdoors



Wounds should be bandaged or apply ointment

Frequent hand washing to prevent fungal spores



Take extra care during summer or autumn months, maintain proper hygiene by taking bath



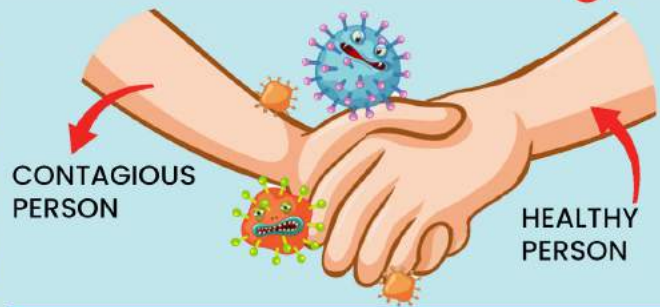
To disseminate public awareness messages



FREQUENTLY ASKED QUESTIONS ?

What is a fungal infection?

Fungi are microorganisms that have a material called chitin in their cell walls. Mold or fungus that is already present in the environment causes fungal infection. Some fungi such as mushrooms are edible. But some other types of fungi such as mucorales, candida species & aspergillosis species can be more dangerous.



Is fungal infection contagious?

No, fungal infection is not contagious or it can not be passed on to a healthy person after coming in into contact with someone who has been infected. We all breathe the molds of fungus that are naturally found in the environment but only those with compromised immunity infected with fungal infection.



Who can get infected with fungal infection?

Healthy persons are not affected by any kind of fungal infection. It only affects immunocompromised persons i.e. when someone with a weakened immune system or who has an underlying health condition breathes the spores, they become infected.

HOW TO BOOST YOUR IMMUNE SYSTEM



Wash Your Hands



Practice Meditation



Take Your Vitamins



Drink More Water



Eat Fruits & Vegetables



Quit Smoking



Wash Fruits & Vegetables



Get Enough Sleep



FREQUENTLY ASKED QUESTIONS?

Can fungal infection only be contracted by those who have COVID19?

HIGHER RISK OF FUNGAL INFECTION



HIV/AIDS



HEPATITIS B

No, fungal infection can infect anyone. As molds of fungus are present everywhere especially in soil, in decaying organic matter such as leaves, compost piles, rotten wood etc. So, it can cause infection in anyone those who have weakened immune response such as people suffering with HIV/ AIDS, Hepatitis B are at higher risk of getting infected

Scientific name of all 3 fungal infection?

There are no such terms as black, white & yellow fungus as these terms making people terrified & scared

Black fungus-Mucormycosis

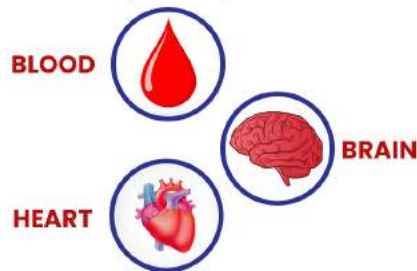
White fungus-Candidiasis

Yellow fungus-Aspergillosis

What is the difference among black, white & yellow fungus?

Mucormycosis (black fungus) is a deadly invasive fungal infection & can infect those persons who are immunocompromised & already taking medications. In case of COVID19, excessive use of steroids is one of the reason for mucormycosis.

Candidiasis (white fungus)- if left untreated, can spread to other parts of body such as the blood, brain, heart etc.



Aspergillosis (yellow fungus) is a rare fungal infection mainly affects people taking COVID19 treatment & people with weakened immune response.



Is it possible to treat black fungus?

Yes, a crucial step is early diagnosis & quick multi-specialty team management, both medical & surgical.



FREQUENTLY ASKED QUESTIONS?

What are the some common myths & facts about COVID19 - Associated Mucormycosis (CAM) ?

Face mask does not harbor black fungus



Onions & garlic: there is a myth that onion & garlic is the source of black fungus but black mold on onion & garlic is usually *Aspergillus niger* fungus

Unclean water near hospitals: According to some people, the fungi must be growing in unclean water in hospitals. But there is not any evidence that fungi produce its spores in fluid



Oxygen cylinders & humidifiers the fact that pure oxygen held in cylinders is believed to inhibit the growth of all types of germs

Why is there a rapid increase in fungal infection among recovered COVID19 patients?

During the second wave the virus has become more aggressive with the increase in number of COVID19 cases. During this wave, a wide range of complications have arisen such as severe lung damage. Patients with severe lung damage require long term oxygen therapy in ICU & medicines (e.g. steroids) to avoid inflammation, which affects blood sugar levels. All these factors causes rise in cases of fungal infection.

Are these fungal infections dangerous to health?

If left untreated, mucormycosis can be fatal. If pulmonary & gastrointestinal mucormycosis are not diagnosed correctly then it can be fatal leading to higher mortality rate

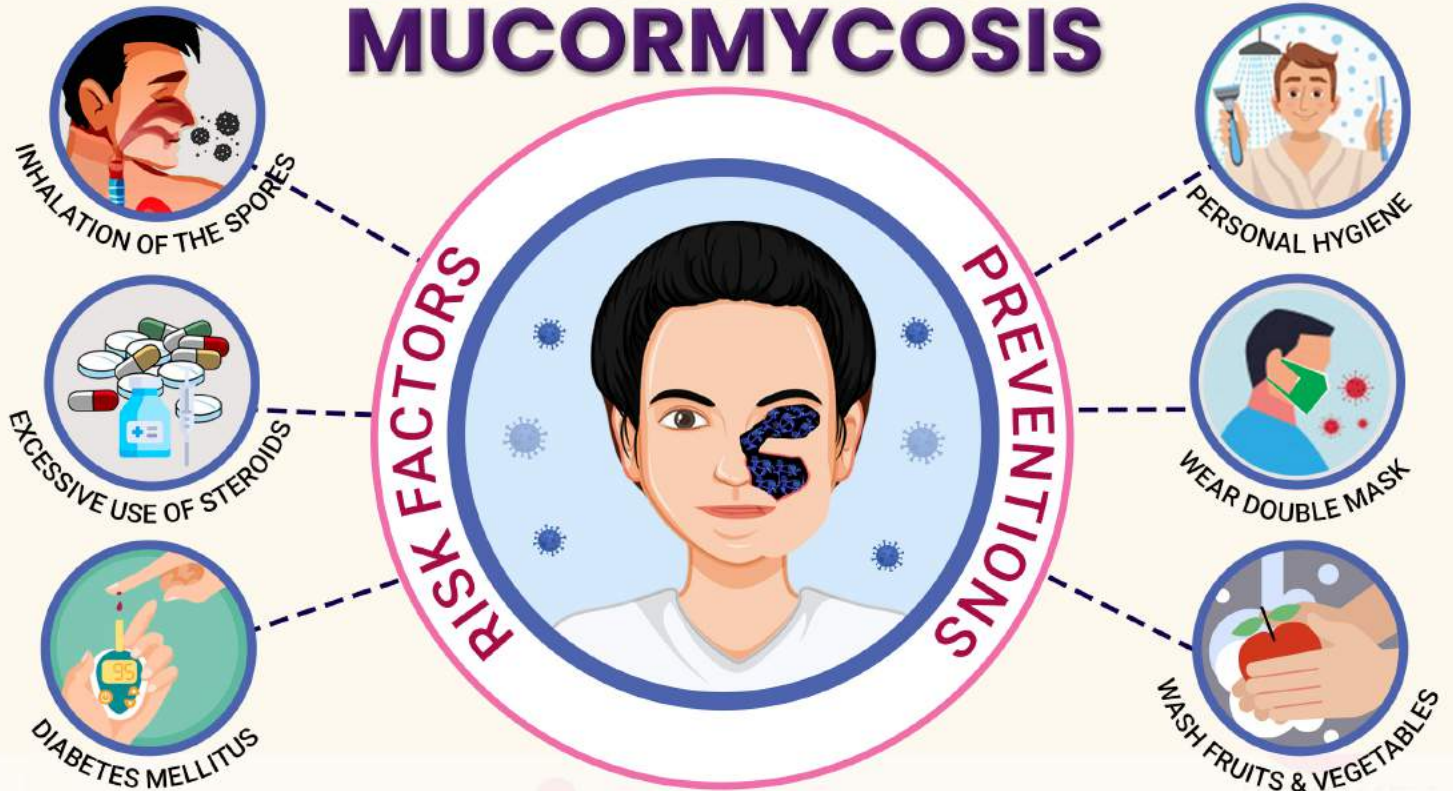


Which doctor should one visit, if one has symptoms of CAM ?



This condition necessitates the patient to go to the ENT & Eye specialists. Care coordination with a neurosurgeon, endocrinologist & microbiologist a part of the team

COVID-19 ASSOCIATED MUCORMYCOSIS



This booklet educate the public about the COVID19 -Associated Mucormycosis (CAM). It focuses on the early identification of CAM disease through awareness so that timely treatment can be availed to minimize the health complications.

About the Authors



Dr. Suman Mor
Associate Professor & Chairperson
Department of Environment Studies
Panjab University, Chandigarh -160014



Dr. Ravindra Khaiwal
Additional Professor of Environment Health
Department of Community Medicine &
School of Public Health, PGIMER
Chandigarh -160012

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ISBN: Applied Please contact Dr. Ravindra Khaiwal at E-mail: khaiwal@yahoo.com

