



**SUPERBUGS (BLACK, WHITE, YELLOW AND GREEN FUNGUS) IN INDIA, 2021:- A  
NARRATIVE REVIEW**

**Mohd Aasim<sup>\*1</sup> and Chanchal Chourasiya<sup>2</sup>**

<sup>1</sup>Student, Department of Pharmaceutical Sciences, NKBR College of Pharmacy and Research Centre Meerut, Uttar Pradesh, India.

<sup>2</sup>Assistant Professor, Department of Pharmaceutical Sciences, NKBR College of Pharmacy and Research Centre Meerut, Uttar Pradesh, India.

**\*Corresponding Author: Mohd Aasim**

Student, Department of Pharmaceutical Sciences, NKBR College of Pharmacy and Research Centre Meerut, Uttar Pradesh, India.

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**ABSTRACT**

India is struggling from the Corona Virus but there are four fungal infections grow in India during COVID. These four fungal infections are "Black, White, Yellow and Green fungus". These fungal infections are called "Superbug". "Superbug spread through the multiple or excessive use of Antibiotics and Steroids, to treat Corona Virus infection. Excessive use of Antibiotics and Steroids weaken to Immune System. This is a major reason, why, fungal infection grow in India during COVID". These fungi present in the environment surrounding us, but they don't affect us because our immune system is strong. "Black fungus or Mucormycosis is an old fungal infection", but other three fungal infections (White, Yellow, and Green) is new. We don't have proper knowledge and Research about these fungal infections. This is also big trouble. In this paper, we discussed Superbug, Antibiotic Resistance and these fungal infections.

**KEYWORDS:** Superbug, Antibiotic/Antimicrobial resistance, Superbug in India, Black fungus, White fungus, Yellow fungus, Green fungus.

**INTRODUCTION**

Superbug is a strain of bacteria, virus, fungi and parasites that has become resistant to Antibiotics and other medication. Which are used to treat common infections they cause.<sup>[1]</sup> Antibiotics are the vital class of drugs are used to treat a wide variety of infections and also help to save much lives. **For example-**Respiratory tract infection, Urinary tract infection and skin infection etc. The recent rise in superbugs is the result of overuse of antibiotics and multiple uses of antibiotics, which contributes to antibiotic resistance. Each year, Antibiotic-resistant infections lead to more than 3500 deaths in the United States according to "Centers for Disease Control and Prevention" (CDC). Antibiotic-resistant bacteria can be more present in certain areas such as hospitals and other medical facilities, which requires regular sterilization. Regular sterilization is the key to reduce and kill the growth of bacteria. The term superbug was developed by the media. Any germs may become a superbug, bacterial and viral strains are routinely infect humans, animals and crops.<sup>[2]</sup> The United States center for Disease Control and Prevention (CDC) estimated that at least 2 million people each year in the United States, contract a superbug-related illness. Antibiotics are the wonder discoveries of the 20<sup>th</sup> century. This is true, but the real fact is the antibiotic

resistance mostly rise in hospital, communities and the environment also concomitant with their use.<sup>[3]</sup>

**Spread of Superbugs**

Superbugs only spread through with an infected person, surface or via an intermediary such as hospital workers, medical staff and doctors. The most common way of spread the infection is in the hospital through the medical staff because they touch the patient who has the bacteria on the skin, without clean hands move on to another patient and passing on the bug into a wound. The bacteria can also survive away from the body in the dust, in unwashed bleeding and on medical equipment. For patients, the most common time during surgery where there is open wounds for the bacteria enters into the bloodstream.<sup>[4]</sup>

**Superbug in India**

In the last of 2019, a series of Pneumonia cases from unknown causes were found in Wuhan [Hubei, China]. After some week, in January 2020, deep analyses of lower respiratory tract samples. Found that, this is a Novel Virus Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) as the causative agent for Pneumonia cluster. Slowly-Slowly, coronavirus spread all over the world. On March 11<sup>th</sup>, 2020, when the

number of Countries involved was 114, WHO declared the pandemic status of coronavirus.<sup>[5]</sup>

In India, the first case of coronavirus was found on the Jan 27, 2020. That was a 20-year-old female present to the emergency department in a general hospital, Thrissur, Kerala with a one-day history of dry cough and sore throat.<sup>[6]</sup>

After that coronavirus spread day by day in India.

**Table 1: This table is showing that coronavirus cases rising very quickly.**<sup>[7]</sup>

S. No.	Date	No. of Corona cases
1.	15 Feb 2020	3
2.	10 July 2020	822603
3.	15 Oct 2020	7365509
4.	17 Feb 2021	10949546
5.	20 Jun 2021	29964331

Due to the increasing number of coronavirus, the most powerful Antibiotics in the world are using to treat COVID-infected patient. Researchers found that during the first wave of COVID, the bacterial and fungal infection was very few and weak. The research, published in the “Journal Infection and Drug Resistance”, analyzed data from 17,563 COVID patients admitted to one of 10 hospitals in the council’s surveillance network from June 1 to August 30, 2020. In 3.6% or 640 patients had a secondary infection. In many hospitals, 28% patients with COVID had been infected through other bacterial and fungal infections.<sup>[8]</sup>

During the second wave of COVID in India, there is the presence of double mutation “B.1.617” variant having the signature mutations “L452R and E484Q”. This strain is highly infected and dangerous and infected to millions of people.<sup>[9]</sup> Therefore, consumption of Antibiotics was very high. Antibiotics resistance happens when germs like bacteria and fungi develop the ability to defeat the drugs designed to kill them. That means the germs are not killed and continue to grow. Infections caused by the Antibiotics resistance germs is difficult and sometimes impossible to treat. In most cases, Antibiotic resistance infections require to extend hospital stays. Because the second wave was dangerous than the first. Therefore, multiple uses of Antibiotics to treat the infected people.<sup>[10]</sup>

“Due to these Antibiotics use during COVID infection treatment caused Antibiotics resistance in COVID-infected people. In the form of result, four types of fungal infection spread in India through antibiotics resistance”.

**These four types of fungal infection called superbugs, given below:**

- Black fungus.
- White fungus.
- Yellow fungus.

- Green fungus.

Behind the spread of fungal infection many reasons and mistakes, given below:

- **Use of IVERMECTIN:** “Ivermectin is the Anti-parasitic drugs, the effectiveness of Ivermectin and its derivative in treating parasitic worm infection transformed human and veterinary medicines”. Therefore Ivermectin is not recommended in the treatment of coronavirus. Despite this decision, “support for Ivermectine in treatment of coronavirus has been circulating on the social media and Whatsapp groups”.<sup>[11]</sup>
- **Use of AZITHROMYCIN:** Azithromycin is the broad spectrum macrolide antibiotic drug with bacteriostatic activity against Gram-positive and Gram-negative bacteria include “*Bordetella Pertussis species, Legionella species, Chlamydia species* and *Mycobacterium Avium complex*” etc.<sup>[12]</sup> Azithromycin have Anti-bacterial property and can’t kill the Virus and also don’t has Anti-viral property.<sup>[13]</sup>
- **Use of REMDESIVIR:** WHO has issued a conditional recommendation against the use of Remdesivir in the treatment of COVID. Currently, there is no evidence that Remdisiver improves survival and other outcomes in these patients. This recommendation, released on November 20, 2020. This recommendation was developed by an international guideline developed group, which includes 28 clinical care experts and 4 patient-partners etc.<sup>[14]</sup>
- **Use of Prohibited Medicine:** “Ivermectin, Azithromycin, Bacicritinib, Bevacizumab, Doxycycline, Favipiravir, Fluvoxamine, Hydroxychloroquine, Itolizumab and Interferon Alpha-2b”. There is not prove that these medications are used in the treatment of coronavirus infection.<sup>[15]</sup> Interferon alpha-2b is immune modulator that are used to treat adults with AIDS-related Kaposi sarcoma, hairy cell leukemia, in chronic Hepatitis B and C. So, there is not any evidence that this medicine use in the treatment of coronavirus infection.<sup>[16]</sup>
- **Bevacizumab:** “Bevacizumab is humanized Anti-VEGF monoclonal IgG1 antibody”. In combination with chemotherapy, it is approved for the treatment of advanced *colorectal cancer*, Non-small-cell *Lung cancer*, *Metastatic breast cancer* and advanced *Renal cell cancer*. So, there is not any evidence that it is used in coronavirus infection treatment.<sup>[17]</sup>
- **Doxycycline:** Doxycycline is a broad-spectrum antibiotic widely used to treat infection caused by Gram-positive and Gram-negative microorganisms. It is highly effective against many microorganisms such as “*Bacillus Anthracis, Staphylococcus Pyogenes* and *Yersinia Pestis*” etc.<sup>[18]</sup> The department of health and social care advised NHS trusts to stop using Doxycycline in the management of patients hospitalized with COVID,

unless it is being used for other licensed indications.<sup>[19]</sup> Other medicines also like this.

“So, there is the reason why superbugs (fungal infection) grow in India during coronavirus”.

## Description of superbugs

### 1. “Black fungus or Mucormycosis”

#### Introduction

Mucormycosis is defined as a dangerous fungal infection caused by members of *Mucorales* and *Zygomycotic species*. The term Mucormycosis was given by the “American pathologist R.D. Baker” and it can also be called Zygomycosis.<sup>[20]</sup> Mucormycosis found particularly in soil, associate with rotten organic matter such as animal dung.<sup>[21]</sup> Mucormycosis (*Auricularia auricular*) is one of the four most important cultivated edible fungi in the world. It is rich in carbohydrates, amino acids, essential elements and trace elements. It also contains a large number of functional nutrients such as polysaccharides, melanin, polyphenols and flavonoids. Therefore, Mucormycosis, as a popular traditional Chinese medicine ingredient, is considered as one of the nutrient-rich and pharmacologically active edible fungi that has been shown to possess immune-enhancing, anti-inflammatory, antiviral, anticoagulant and antitumor properties.<sup>[22]</sup>

#### History and Origin

The first case of Mucormycosis was found by the “German pathologist Paltauf in 1885”, described the first case as *Mycosis Mucornia*.<sup>[20]</sup> And later coined as Mucormycosis in 1957 by R.D. Baker.<sup>[23]</sup> The rate of Mucormycosis increased rapidly, mostly in immunocompromised individuals consequently in the 1980s and 1990s.<sup>[24]</sup> Thus a study was carried out depending upon the spreading rate in France which showed amplification by 7.4% per year. The supposed possibility of seasonal variation of Mucorales and its occurrence all over the world was also reported.<sup>[25]</sup>

#### Type of fungi that cause black fungus

Several different types of fungi can cause Mucormycosis. These fungi are called *mucormycetes* and belong to the scientific order Mucorales. Given below;

- Rhizopus species.
- Mucor species.<sup>[24]</sup>
- Rhizomucor species.
- Syncephalastrum species.
- Saksenaea.
- Apophycomyces.
- Cunninghamella bertholletiae.
- Lichtheimia.<sup>[26]</sup>

#### Case history of black fungus

It is spreading very fast and its symptoms are very painful and unbearable because around 7200 have been affected by the Mucormycosis and 219 have lost their lives. It has also been observed that the COVID patient on ventilators have a high risk of black fungus due to

their airways being exposed to humidity and moisture. In Gujarat, there were 371 cases in Ahemdabad, and another 400 in Rajkot. Goa also reported six cases of Mucormycosis. The health minister in Delhi, Satyendar Jain said that there were 197 cases of Mucormycosis in hospitals across the city. Maharashtra is the first state to be hit hard by India’s second COVID wave, has already reported around 1500 cases and 90 deaths (due to the fungal infection).<sup>[27]</sup>



Figure 2: “Structure of Mucormycosis”.<sup>[27]</sup>

The health minister of India said that India has reported over 28,200 cases of Mucormycosis.<sup>[28]</sup>

#### Prevalence or Spread and Cause

Globally, the prevalence of Mucormycosis varied from 0.005 to 1.7 per million population, while its prevalence nearly 80 times higher (0.14 to 1.7 per million) in India compared to developed countries, in a recent estimate of the year 2019-2020. In other words. India has the highest cases of Mucormycosis in the world.

India is already having the second “Largest population with Diabetes Mellitus” (DM) and was the capital of the world, until recently. “Diabetes mellitus has been most common risk factor linked with Mucormycosis in India”<sup>[23]</sup> Multiple or excessive uses of Antibiotics during COVID infection treatment caused fungal infection because Antibiotics resist in the human body. Fungi and bacteria develop the ability to defeat the drug design to kill them and fungi and bacteria are capable to grow.<sup>[10]</sup>

Randeep Guleria Director of All India Institute of Medical Science (AIIMS) said in a press conference, “Misuse of steroids or excessive use of steroids is the main reason behind COVID associated Mucormycosis. The chance of fungal infection increase in a patient who is diabetic, COVID-19 positive and is taking steroids. To prevent it, we should stop the misuse of steroids”.<sup>[29]</sup>

#### Symptoms and Affected area

Recent papers have reported that Mucormycosis mainly three types which is found in the human body such as Rhino-orbital Mucormycosis, Gastro-intestinal Mucormycosis and Pulmonary (lungs) Mucormycosis.<sup>[30]</sup> Which includes Nose, Sinuses, Orbit, Central Nervous System (CNS), Lungs (Pulmonary), Gastro-Intestinal

Tract (GIT), Skin, Jaw Bones, Joints, Heart, Kidney and the infection can also appear in the Eyes. When the fungus enters the skin through a cut, burn or others type of skin trauma. If, the fungus goes in via a cut or a burn, it can cause local infections and inflammation. But if it goes in via the Sinus, it can affect the eyes and eventually, the Brain, leading to a fatal and dangerous.<sup>[23-27]</sup>

So, therefore, symptoms of Mucormycosis depend on where in the body the fungus is growing, given below:

#### **Symptoms of Rhino-cerebral (Sinus and Brain) Mucormycosis include**

- One-sided face inflammation.
- Headache.
- Nasal and sinus congestion.
- Black lesions on nasal bridge or upper inside of the mouth that quickly become more severe.
- Fever.

#### **Symptoms of Pulmonary (lungs) Mucormycosis include:**

- Feces
- Cough
- Chest pain and shortness of breath

**Cutaneous (skin) Mucormycosis:** It can look like a blister or ulcer and the infected area may turn black. Other symptoms include pain, warmth, excessive redness and swelling around the wound.

#### **Symptoms of Gastro-Intestinal Mucormycosis include**

- Abdominal pain
- Nausea and vomiting
- Gastrointestinal bleeding

**Disseminated Mucormycosis:** Typically occurs in people who are already sick from other medical conditions. So, it can be difficult to know which symptoms are related to Mucormycosis. Patients with disseminated infection in the brain can develop changes in mental status or coma.<sup>[31]</sup>

#### **Treatment**

Treatment option for invasive Mucormycosis is limited. There has been no prospective randomized trials to define the optimal antifungal therapy for Mucormycosis. "Caspofungin and Amphotericin B" combination therapies were shown to have a synergistic effect in diabetic ketoacidosis mice with Mucormycosis.<sup>[32]</sup> "Normal saline (IV) infusion is given before 4-6 weeks of antifungal, **Amphotericin B Dose (3-4mg/kg body weight per day)** which is out of stock or in short supply with Pharmacies/Distributors. Some cases require surgery. For other, Respiratory-tract fluid sample may be tested, tissue biopsy or CT scan (Lungs/Sinuses) may be recommended and conducted.<sup>[27]</sup>

## **2. "White fungus"**

### **Introduction**

White fungus, also known as *Candidiasis*, is a serious fungal infection. According to central disease control and prevention, white fungus or invasive *Candidiasis* can affect the Blood, Heart, Vagina, Brain, Eyes, Bones and other parts of the human body.<sup>[33]</sup> Candidiasis is a fungal infection caused by a yeast (a type of fungus) *Candida*. Some species of can cause infection in people, the most common is *Candida Albicans*. Candida normally lives on the skin and inside the body such as the gut, mouth, vagina and throat without causing any problem. Candida causes infection, if it grows, the infection is out of control.<sup>[34]</sup> It is also known as *Aspergillus Flavus* infection and it is not a new disease.<sup>[35]</sup>

But, Infectious disease expert "Sanjay Pujari (member of the national task force on COVID-19) said that **White fungus for Candidosis or any candida linked infection is completely misnomer. Doctors and media should refrain from using such incorrect terms as they only create panic among the people. The fungal infection (caused by the candida) easily treatable with and inexpensive Anti-fungal oral tablets. It does not require expensive injections such as liposomal Amphotericin-B, a key drug of choice in treating Mucormycosis**". An invasive fungal infection (caused by the fungus mucor) currently on the rise mainly on COVID recovered patients across the country. A patient with white lesions/patches mainly on the tongue, inner cheeks and palate. Hence, a section of media is calling it white fungus which is, in fact, incorrect and creates unnecessary panic. "Sanjay Pujari also said that **white fungus is a variety of edible mushrooms (Tremella Fuciformis) used in traditional Chinese cuisine and medicine**". Candida is part of normal flora on the skin, it can be treated with local application of Anti-fungal or sometimes tablets. Sanjay Pujari further said that I diagnosed and treated four COVID recovered patients with oral Candidosis. All of them recovered with minor medications within 15 days. Candidosis is not invasive in nature, it is unlike Mucormycosis.

Another oral surgeon Prasad Dadhe said, "I have seen only two or three cases of Candidosis in COVID patients. Those diagnosed had uncontrolled diabetes and the infection of Candidosis is settled down with minor medications in few days. Candidosis is not life treating, it is unlike Mucormycosis".<sup>[35]</sup>

But, Dr. Arunesh Kumar (senior consultant and head medicine/pulmonology in Paras Hospital) said, According to reports, new cases of white fungus have been found in Patna, Bihar, this infection is more dangerous than black fungus, while Dr. Arunesh Kumar speaking to national media.<sup>[37]</sup>

“According to the facts, reports and statement of experts and doctors, this is not clear, actually what is a white fungus and what is causes of the white fungus. So we should wait of authentic research”.

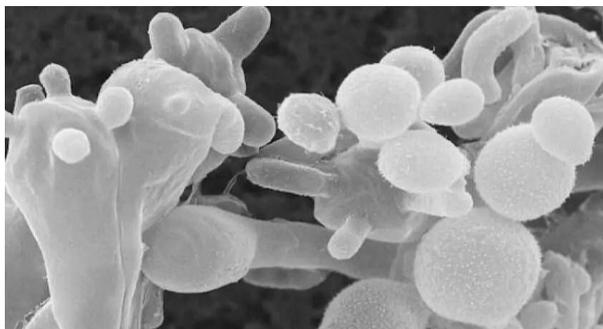


Figure 3: “Structure of White fungus”.<sup>[37]</sup>

### Origin and history

The first case of White fungus was traced in Mau District (Uttar Pradesh). It was the first case of India. White fungus was detected in a 70-year-old man. Who had been earlier treated for COVID at a Delhi hospital in April and was discharged following recovery. “He was regularly on steroids following his recovery from COVID. After some time, he developed eye floater (jelly-like substance inside the eyes) and lost eyesight”. Following his vitreous biopsy, White fungus infection was confirmed.<sup>[38]</sup> On May 23, 2021, 7 new cases of White fungus were traced in Ghaziabad hospital.

On May 27, 2021, Delhi reports its first-ever severe case of White fungus. That was 49-year-old woman, who was infected with White fungus, admitted to the Sir Ganga Ram Hospital (SGRH) on May 13, complain about severe abdominal pain, constipation and vomiting. “A CT scan of the abdomen revealed free air moderate amount of free fluid in the abdominal cavity suggestive of the intestinal perforation”, the hospital said in a statement. Doctors immediately placed a tube inside the abdomen and drained out the one liter of bile-stained pus. A team of surgeons led by Dr. Samiran Nundy of the Department of Surgical of Gastroenterology and Liver Transplant conducts emergency surgery on the patient the next day.

Dr. Nundy also said that the surgery revealed a perforation in the lower of end the food pipe. A part of the small intestine had developed Gangrene and sloughed off and the patient had multiple thinned-out patches in the wall of the colon with one small leak and a small piece of the intestine was sent for the biopsy. Dr. Anil Arora (chairman of the institute of liver, Gastroenterology and Pancreticobiliary Sciences at the hospital) said that the biopsy revealed severe ulceration of the intestinal wall with resultant perforation and Necrosis caused by the invasive white fungus. Dr. Anil Arora further said that the White fungus causing severe ulceration and gangrene of the intestine with multifocal perforations in the food pipe.<sup>[39]</sup>

### Sign and symptoms

- ✓ **Oral:** Whitish patches/lesions appear on the tongue, inside of the cheeks, palate and white patches/lesions on the wall of the intestine.
- ✓ **Angular Cheilitis:** Soreness, erythema (redness) and fissuring of the angles of the mouth with edema seen intra-orally on the commissures.
- ✓ **Male Genital organ:** Red, patchy sores near the head of the penis or the foreskin, severe itching or a burning sensation.
- ✓ **Vagina:** Vulval itching, Vulval soreness and irritation, superficial dyspareunia, dysuria and a whitish or whitish-gray cottage cheese-like discharge, often with curd-like appearance.<sup>[40]</sup>



Figure 4: “Aspergilloma in right lung”.<sup>[41]</sup>

“X-Ray of the chest, frontal view, showing pulmonary Aspergillosis with an Aspergilloma (fungus ball) of the right lung. Pulmonary Aspergillosis is an acute infection of the lungs by the fungus *Aspergillus*”.<sup>[41]</sup>

### Treatment

Treatment for the white fungus or *Candida* skin infection is usually simple. You don’t need to be hospitalized unless you have problems with your immune system or the candida has spread to the bloodstream.<sup>[42]</sup> Candidiasis infection is usually based upon the anatomic location of the infection, immune status of the patients, risks factor for patients with infection, species responsible and also depend upon the susceptibility of the *Candida* species towards the Anti-fungal drugs. “Classification of Antifungal agents used for the treatment of Candidiasis is given below”:

### Systemic antifungal agents

- **Polyenes:** Amphotericin B.
- **Pyrimidine Analogue:** Flucytosine.
- **Triazoles:** Fluconazole, Itraconazole, Voriconazole, Ravuconazole, Posaconazole, Ketoconazole.
- **Echinocandins:** Caspofungin, Anidulafungin, Micafungin.

### Topical Antifungal Agents

- **Topical azoles:** Terconazole, Butaconazole, Miconazole, Clotrimazole, Tioconazole, Sulconazole, Oxiconazole and Econazole.
- **Topical allylamines:** Terbinafine and Naftifine.

One of the selection criteria for the anti-fungal agents is *Candida* species susceptibility.<sup>[43]</sup>

### 3. “Yellow fungus”

#### Introduction

“The second wave coronavirus is finally slowing down with daily cases in India. But, a new fungal infection is introduced, recently reported one being the deadly ‘Yellow fungus’. Yellow fungus also called *Mucor Septicus*”. It is a fungal infection, which as per experts does not occur in the humans but commonly in “*Reptiles like Lizards*”.<sup>[44]</sup> This fungus goes into the body and attacks the vital organs of the body and if untreated at right time. It causes conditions like organ failure and acute necrosis. Yellow fungal infection can cause fatal damage to vital parts of the body. Yellow fungus shows its effect on the inner parts of the body as compared to other fungal infections.<sup>[45]</sup> “ANI quoted Dr. Tyagi as saying that this yellow fungus trait often leads to a delay in its diagnosis. This characteristic of Yellow fungus makes it very difficult to manage more dangerous as early diagnosis is a necessity in such cases”.<sup>[46]</sup> Like the other two, yellow fungus is also caused by unsanitary conditions, overuse of steroids and other medication.<sup>[47]</sup>

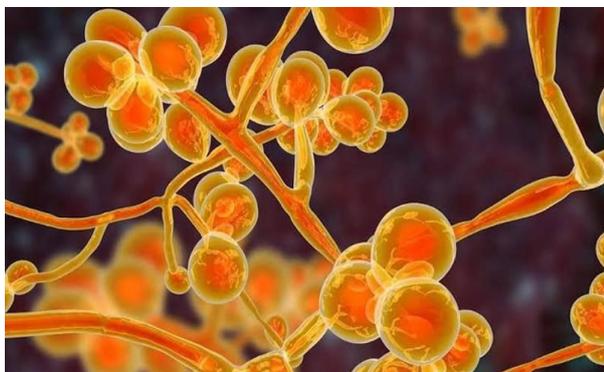


Figure 5: “Structure of Yellow fungus”.<sup>[45]</sup>

#### Origin and case history

Yellow fungus is found in reptiles like lizard, which is called *Mucor Septicus*.<sup>[44]</sup> The first-ever case of yellow fungus has surfaced at a hospital in Uttar Pradesh’s Ghaziabad. Dr. Brij Pal Tyagi (ENT surgeon) has been reported the first case of Yellow fungus. It was found in the Harsh ENT hospital Ghaziabad, about 40 Km. from the national capital New Delhi and Dr. Brij Pal Tyagi is the owner of this hospital.<sup>[48]</sup>

#### Symptoms

Weight loss, reduced appetite, lethargy are the common symptoms of yellow fungus. If, it is not detected on time, symptoms can become more severe such as pus leakage, sunken eye, organ failure, slow healing of the wound and necrosis (cells in the living tissue die prematurely).<sup>[44]</sup>

#### Causes

Yellow fungus develops by the presence of molds (a type of fungi) in the environment. It may be present with unnecessary fatigue, rashes and burning sensation on the skin etc. It may be dangerous, but the focus should be on its prevention. As far as, its severity and risk factors are concerned, like any other infection, Yellow fungus can be severe if not treated early. Its development and spread in the human body depend upon the prevailing medical and physical condition of a patient.<sup>[49]</sup>

#### Potential cause of yellow fungus given below

- **Poor hygiene:** If dirt is spread around you, then you can be the next victim of the Yellow fungus. Do not let dirt accumulate around you and take special care of hygiene.
- **Contaminated resources:** If you keep household food items in a dirty places, then it can be fatal. You should place your food items in a neat and clean area.
- **Steroids:** The risk of its spread has been reported to be more in patients who use steroids. Excessive uses of steroids weak to immunity power.
- **Antibacterial medicine:** Excessive use of antibacterial drugs weakens the immunity system of your body, due to which you become a victim of yellow fungus
- **Excess moisture:** in homes with high humidity, it is common practice to spread fungal infection. According to doctors, more than 40% of moisture in your home can prove fatal.<sup>[45]</sup>

“Randeep Guleria (Director of AIIMS New Delhi) said that irrational use of steroids has been a contributing factor to rise the fungal infection. Randeep Guleria also a member of India’s COVID task force”.<sup>[48]</sup>

#### Prevention and Treatment

Since Yellow Fungus is a new fungal infection, not much information is available as of now. However, it is best to protect your health by taking precautionary measures. Fungal infection Thrive in individuals that have comprised and pre-existing conditions. Individuals with diabetes should keep blood sugar level in check. They should ensure that hygiene surrounding them. All surfaces should be disinfected. Any old food or state should be removed. Individuals should keep a check on the humidity in their rooms and house. If anyone on oxygen support should make sure that oxygen is filtered properly and the water filter clean and change regularly. The use of medications and steroids should be kept in check.<sup>[50]</sup>

More information about Yellow Fungus treatment could not be fought right now as this infection is new in India. Presently, patients have advised using some common medicines. These drugs should be used only under the supervision of Doctors. **Amphotericin B injection**, a broad spectrum Anti-fungal drug, is being used in current treatments by philanthropic Doctors. You should take

Amphotericin B injection only as advised by your Doctor.<sup>[45]</sup>

## GREEN FUNGUS

### Introduction, Cause and origin

Green fungus or *Aspergillus* is an infection caused by the *Aspergillus* a common mold (a type of fungus) that lives indoors. People can get Aspergillosis by breathing in microscopic Aspergillus spores from the environment. According to the “U.S. Centers for Disease Control and Prevention (CDC)” report that most of us people breathe in Aspergillus spores every day without getting sick. However, people with weakened the immune systems or Lung disease are at higher risk of developing health problems due to Aspergillus.<sup>[51]</sup> Labeling the same fungus with names of different colors can create confusion. According to Doctors, more research is needed on whether the nature of green fungus infection in people who have recovered from COVID is different from other patients.

However, Experts differ on the color coding of Aspergillus fungus. “Dr. P.V. Pandey (HoD of medicine department in MGM) Said that there is no color coding of fungal infection. The only thing is that it is Aspergillus fungus and Mucromycosis”.

“Dr. Ravi Dosi (HOD of Respiratory medicine in Shri Aurobindo Institute of Medical Science) said that it is not that the fungal infection gives color shades in the body. Its name is because the color appears during its culture in a lab while testing it. Dr. Anita Mutha (HOD Microbiology Department, MGM) said that fungus show color in their culture. There Green, Yellow, Black and White fungus, but these are all specimens of Mucormycosis, Ciderella and Aspergillus. She also said that Mucromycosis gives Black, while Ciderella givess White, Aspergillus gives Green and Yellow color in different species”.<sup>[52]</sup>

### Case history

Dr. Ravi Dosi said, “A 34-year-old COVID-19 survivor was diagnosed with Green fungus infection in Madhya Pradesh’s Indore and was shifted to Mumbai through the air ambulance for treatment. The patient was found to have a Green Fungus infection in his Sinuses, Lungs and Blood. This is the first-ever case reported in India. The man was being treated in Indore’s Aurobindo Hospital for the last one-and-a-half-month. He had a 90 percent lung infection. During diagnosis, Green fungus was detected in his lung which is different from Mucormycosis.<sup>[53]</sup> Another Green fungus case was reported in Punjab. A 43-year-old resident of Jalandhar was diagnosed with the disease district’s Sacred Heart Hospital in Maqsdan. While he was discharged from the hospital after being cured of the COVID on June 3. D. Ashustosh Dhanuka, (DM, pulmonology and Critical Care) practicing at Sacred Heart Hospital Jalandhar, said that Post discharged, the patient report in OPD with

complaints of low-grade fever, cough and blood in sputum was admitted on June 14.<sup>[54]</sup>

### Symptoms

There are not many cases of Green fungus because it is a rare disease but a few solid symptoms can be listed for this infection. These Green fungal infection symptoms are:

- Severe nosebleed.
- High Fever.
- Weakness.
- Severe Weight loss.

### Treatment

We are not aware of any proper treatment of Green Fungus. If you have any Green fungus. Then please visit the doctors as soon as possible. Be cautious and don’t hesitate to consult a doctor. Mumbai is treating the first patient of Green fungus then they will reveal the treatment Detail of Green fungus.<sup>[55]</sup>

## CONCLUSION

This review provides information about the Superbug, Antibiotic resistance, Yellow, Black, White and Green fungus current situation and also represent the picture all about these fungi. On the behalf of review, stop the use of steroids and multiple Antibiotics because they all weaken to our immunity. All fungi is dangerous and can lead to death but these fungal infections are not communicable. If we have any symptoms which are related to fungal infection. Directly, consult a Doctor. Higher risk of spread in that type of patient, who is suffering from diabetes and unhygienic conditions. Hygiene is very necessary to reduce the spreading risk of fungal infection. Take a proper healthy diet and regular exercise, play a major role to get a strong immune system. These fungal infections are curable and many people have been cured of it. We don’t have proper knowledge about these fungi because they are rare and new. Due to rare and new, we don’t have proper treatment for these fungal infections. So follow those guidelines, which are telling your Doctors and health experts.

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