

CHAPTER V: FUNGI DISEASES

2.1. CANDIDIASIS

2.1.1 DEFINITION

Candidiasis or thrush or candidosis or yeast infection is a fungal infection (mycosis) of any of the *Candida* species, of which *Candida albicans* is the most common. Candidiasis encompasses infections that range from superficial, such as oral thrush and vaginitis, to systemic and potentially life-threatening diseases. *Candida* infections of the latter category are also referred to as candidemia and are usually confined to severely immunocompromised persons, such as cancer, transplant, and AIDS patients.

Superficial infections of skin and mucosal membranes by *Candida* causing local inflammation and discomfort are however common in many human populations. While clearly attributable to the presence of the opportunistic pathogens of the genus *Candida*, candidiasis describes a number of different disease syndromes that often differ in their causes and outcomes. Commonly referred to as a yeast infection, it is also technically known as candidosis, moniliasis, and oidiomycosis.

1.2.2 CAUSE

Candida Albicans is the cause of candidiasis

A weakened or undeveloped immune system or metabolic illnesses such as diabetes are significant predisposing factors of candidiasis. Diseases or conditions linked to candidiasis include HIV/AIDS, mononucleosis, cancer treatments, steroids, stress, and nutrient deficiency. In penile candidiasis, the factors include sexual intercourse with an infected individual, low immunity, antibiotics, and diabetes. Male genital yeast infection is less common, and incidence of infection is only a fraction of that in women; however, yeast infection on the penis from direct contact via sexual intercourse with an infected partner is not uncommon. *Candida* species are frequently part of the human body's normal oral and intestinal flora. Treatment with antibiotics can lead to eliminating the yeast's natural competitors for resources, and increase the severity of the condition.

2.1.3 CLASSIFICATION

Candidiasis may be divided into the following types:

- Oral candidiasis (Thrush)
- Perlèche (Angular cheilitis)
- Candidal vulvovaginitis

- Candidalintertrigo
- Diaper candidiasis
- Congenital cutaneous candidiasis
- Perianal candidiasis
- Candidal paronychia
- Erosiointerdigitalisblastomycetica
- Chronic mucocutaneous candidiasis
- Systemic candidiasis
- Candid
- Antibiotic candidiasis (Iatrogenic candidiasis)

2.1.4 SIGNS AND SYMPTOMS

Most candidial infections are treatable and result in minimal complications such as redness, itching and discomfort, though complication may be severe or fatal if left untreated in certain populations. In immunocompetent persons, candidiasis is usually a very localized infection of the skin or mucosal membranes, including the oral cavity (thrush), the pharynx or esophagus, the gastrointestinal tract, the urinary bladder, or the genitalia (vagina, penis).

Candidiasis is a very common cause of vaginal irritation, or vaginitis, and can also occur on the male genitals. In immunocompromised patients, *Candida* infections can affect the esophagus with the potential of becoming systemic, causing a much more serious condition, a fungemia called candidemia.

Children, mostly between the ages of three and nine years of age, can be affected by chronic mouth yeast infections, normally seen around the mouth as white patches. However, this is not a common condition.

Symptoms of candidiasis may vary depending on the area affected. Infection of the vagina or vulva may cause **severe itching, burning, soreness, irritation, and a whitish or whitish-gray cottage cheese-like discharge, often with a curd-like appearance**. These symptoms are also present in the more common bacterial vaginosis. Symptoms of infection of the male genitalia include red patchy sores near the head of the penis or on the foreskin, severe itching, or a burning sensation. Candidiasis of the penis can also have a white discharge, although uncommon. However, having no symptoms at all is common, and a more severe form of the symptoms may emerge later.

2.1.5 DIAGNOSIS

In addition to clinical manifestation, the diagnosis of a yeast infection is done either via microscopic examination or culturing.

2.1.6 TREATMENT

In clinical settings, candidiasis is commonly treated with antimycotics—the antifungal drugs commonly used to treat candidiasis are topical clotrimazole, topical nystatin, fluconazole, and topical ketoconazole. For example, a one-time dose of fluconazole (as Diflucan 150-mg tablet taken orally) has been reported as being 90% effective in treating a vaginal yeast infection.

In severe infections (generally in hospitalized patients), amphotericin B, caspofungin, or voriconazole may be used. Local treatment may include vaginal suppositories or medicated douches. Gentian violet can be used for breastfeeding thrush, but when used in large quantities it can cause mouth and throat ulcerations in nursing babies, and has been linked to mouth cancer in humans and to cancer in the digestive tract of other animals.

C. albicans can develop resistance to antimycotic drugs, such as fluconazole, one of the drugs that is often used to treat candidiasis. Recurring infections may be treatable with other antifungal drugs, but resistance to these alternative agents may also develop.

2.2. PITYRIASIS VERSICOLOR

2.2.1 DEFINITIONS OF PITYRIASIS VERSICOLOR:

A common chronic, noninflammatory and usually symptomless disorder, characterized by the occurrence of multiple macular patches of all sizes and shapes, and varying in pigmentation from fawn-colored to brown. It is seen most frequently in hot, humid, tropical regions, and is caused by *Pityrosporon orbiculare*.

Tinea versicolor is a long-term (chronic) fungal infection of the skin.

2.2.2 CAUSES

Tinea versicolor is relatively common. It is caused by the fungus *Pityrosporum ovale*, a type of yeast that is normally found on human skin. It only causes problems under certain circumstances. The condition is most common in adolescent and young adult males. It typically occurs in hot climates.

2.2.3 SYMPTOMS

The main symptom is patches of discolored skin with sharp borders (edges) and fine scales. The patches are often dark reddish-tan in color. The most common sites are the back, underarms, upper arms, chest, and neck. Affected areas do not darken in the sun (skin may appear lighter than surrounding healthy skin)

In African Americans, there may be loss of skin color (hypopigmentation) or an increase in skin color (hyperpigmentation).

Other symptoms include:

- Increased sweating
- Itching

2.2.4 DIAGNOSIS

A skin scraping that is examined under a microscope should show the yeast.

2.2.5 TREATMENT

Treatment consists of applying antifungal medicines to the skin. These medications include clotrimazole, ketoconazole, and miconazole.

2.2.6 PROGNOSIS

Though tinea versicolor is easily treated, pigment changes may last for months after treatment. The condition may come back during the warm months.

2.2.7 PREVENTION

People with a history of tinea versicolor should try to avoid excessive heat or sweating.

2.3. DERMATOPHYTIASIS

2.3.1 DEFINITION

Dermatophytosis or **ringworm** is a clinical condition caused by fungal infection of the skin in humans, pets such as cats, and domesticated animals such as sheep and cattle. It is caused by fungi of several different species. The fungi that cause parasitic infection (dermatophytes) feed on keratin, the material found in the outer layer of skin, hair, and nails. These fungi thrive on

skin that is warm and moist, but may also survive directly on the outsides of hair shafts, or in their interiors. In pets, the fungi responsible for the disease survive in skin and on the outer.

Misdiagnosis and treatment of ringworm with a topical steroid, a standard treatment of the superficially similar pityriasisrosea, can result in tinea incognito, a condition where ringworm fungus will grow without typical features like a distinctive raised border.

2.3.2 CLASSIFICATION

A number of different species of fungi are involved. Dermatophytes of the genera *Trichophyton* and *Microsporum* are the most common causative agents. These fungi attack various parts of the body and lead to the following conditions:

- Dermatophytosis
 - Tineapedis (athlete's foot) affects the feet
 - Tineaunguium affects the fingernails and toenails
 - Tineacorporis affects the arms, legs, and trunk with ringworm
 - Tineacuris (jock itch) affects the groin area
 - Tineamanuum affects the hands and palm area
 - Tineacapitis affects the scalp
 - Tineabarbae affects facial hair
 - Tineafaciei (face fungus) affects the face
- Other superficial mycoses
 - Tineaversicolor caused by *Malassezia furfur*
 - Tineanigra caused by *Hortaeawerneckii*

2.3.3 SIGNS AND SYMPTOMS

Infections on the body may give rise to typical enlarging raised red rings of ringworm, infection on the skin of the feet may cause athlete's foot and in the groin jock itch. Involvement of the nails is termed onychomycosis, and they may thicken, discolour, and finally crumble and fall off. Dermatophytosis tends to get worse during summer, with symptoms alleviating during the winter. Animals such as dogs and cats can also be affected by ring worm and the disease can be transmitted between animals and humans(zoonotic disease).

2.3.4 DIAGNOSIS

Microscopic testThe vet takes hairs from around the infected area and places them in a staining solution to view under the microscope. Fungal spores may be viewed directly on hair shafts. This

technique identifies a fungal infection in about 40%-70% of the infections but cannot identify the species of dermatophyte.

Culture Test: This is the most effective but also the most time-consuming way to determine if there is ringworm on a pet.

2.3.5 TREATMENT

Antifungal treatments include topical agents such as Miconazole, Terbinafine, Clotrimazole, Ketoconazole, or Tolnaftate applied twice daily until symptoms resolve usually within one or two weeks. Topical treatments should then be continued for a further 7 days after resolution of visible symptoms to prevent recurrence. The total duration of treatment is therefore generally two weeks, but may be as long as three. In more severe cases or where there is scalp ringworm, systemic treatment with oral medications may be given. To prevent spreading the infection, lesions should not be touched, and good hygiene maintained with washing of hands and the body. Treatment in pets requires both systemic oral treatment with most of the same drugs used in humans Terbinafine, Fluconazole, or Itraconazole, plus topical "dip" therapy.

2.3.6 PREVENTION

- Avoidance of sharing clothing, sports equipment, towels, or sheets.
- Washing clothes in hot water with fungicidal soap after suspected exposure to ringworm.
- Avoidance of walking barefoot, instead wearing appropriate protective shoes to the beach and flip-flops in locker rooms.
- After being exposed to places where the potential of being infected is great, one should wash with an antibacterial and anti-fungal soap or one that contains tea tree oil.
- Avoid touching pets with bald spots as they are often carriers of the fungus.

2.4. CRYPTOCOCCOSIS

2.4.1 DEFINITION

Cryptococcosis is infection with *Cryptococcus neoformans* fungus.

2.4.2 CAUSES

Cryptococcus neoformans, the fungus that causes this disease, is ordinarily found in soil.

2.4.3 PATHOGENESIS

It enters and infects the body through the lungs. Once inhaled, infection with cryptococcosis may go away on its own, remain in the lungs only, or spread throughout the body (disseminate).

Most cases are in people with a weakened immune system, such as those with HIV infection, taking high doses of corticosteroid medications, cancer chemotherapy, or who have Hodgkin's disease. In people with a normal immune system, the lung (pulmonary) form of the infection may have no symptoms. In people with impaired immune systems, the cryptococcus organism may spread to the brain. Neurological (brain) symptoms begin gradually. Most people with this infection have meningoencephalitis (swelling and irritation of the brain and spinal cord) when they are diagnosed.

Cryptococcus is one of the most common life-threatening fungal infections in people with AIDS.

2.4.4 SYMPTOMS

- Blurred vision or double vision (diplopia)
- Bone pain or tenderness of the breastbone (sternum)
- Chest pain
- Confusion
- Cough -- dry
- Fatigue
- Fever
- Headache
- Nausea
- Skin rash -- pinpoint red spots (petechiae)
- Sweating -- unusual, excessive at night
- Swollen glands
- Unintentional weight loss and Weakness

Note: People with a normal immune system may have no symptoms at all.

2.4.5 DIAGNOSIS

- Sputum culture and stain
- Lung biopsy
- Bronchoscopy
- Cerebrospinal Fluid culture and stain for *Cryptococcus*
- Chest x-ray
- Cryptococcal antigen test (looks for a certain molecule that the *Cryptococcus* fungus can shed into the blood)

2.4.6 TREATMENT

Some infections require no treatment. Even so, there should be regular check-ups for a full year to make sure the infection has not spread. If there are lung lesions or the disease spreads, antifungal medications are prescribed. These drugs may need to be taken for a long time.

Medications include:

- Amphotericin B
- Flucytosine
- Fluconazole

2.4.7 PROGNOSIS

Central nervous system involvement often causes death or leads to permanent damage.

2.4.8 POSSIBLE COMPLICATIONS

- Infection comes back
- Meningitis
- Permanent brain or nerve damage
- Side effects of medications (such as Amphotericin B) can be severe

2.4.9 PREVENTION

Take the lowest doses of corticosteroid medications possible. Practice safe sex to reduce the risk of getting HIV and the infections associated with a weakened immune system.

2.5. ASPERGILLOSIS

2.5.1 DEFINITION

Aspergillosis is an infection, growth, or allergic response due to the *Aspergillus* fungus.

2.5.2 CAUSES

Aspergillosis is caused by a fungus (*Aspergillus*), which is commonly found growing on dead leaves, stored grain, compost piles, or in other decaying vegetation. It can also be found on marijuana.

Although most people are frequently exposed to aspergillus, infections caused by the fungus rarely occur in people with a normal immune system. The rare infections caused by aspergillus include pneumonia and fungus ball (aspergilloma).

There are several forms of aspergillosis:

- **Pulmonary aspergillosis:** allergic bronchopulmonary type which is an allergic reaction to the fungus that usually develops in people who already have lung problems (such as asthma or cystic fibrosis).
- **Aspergilloma:** is a growth (fungus ball) that develops in an area of previous lung disease or lung scarring (such as tuberculosis or lung abscess).
- **Pulmonary aspergillosis :** invasive type which is a serious infection with pneumonia that can spread to other parts of the body. This infection occurs almost exclusively in people with weakened immune systems due to cancer, AIDS, leukemia, organ transplantation, chemotherapy, or other conditions or medications that lower the number of normal white blood cells or weaken the immune system.

2.5.3 SYMPTOMS

Symptoms depend on the type of infection. For symptoms of aspergillosis-related growth, see aspergilloma.

Symptoms of allergic bronchopulmonary aspergillosis may include:

- Cough
- Coughing up blood or brownish mucous plugs
- Fever
- Generalized ill feeling (malaise)
- Wheezing
- Weight loss
- Recurrent episodes of lung airway obstruction

Additional symptoms seen in invasive aspergillosis depend on the part of the body affected, and may include:

- Bone pain
- Blood in the urine
- Chest pain
- Chills
- Decreased urine output
- Endocarditis

- Headaches
- Increased sputum production, which may be bloody
- Meningitis
- Shortness of breath
- Sinusitis
- Skin sores (lesions)
- Vision problems

2.5.4 DIAGNOSIS

Tests to diagnose *Aspergillus* infection include:

- Aspergillosis antibody test
- Chest x-ray
- Complete blood count
- CT scan
- Galactomannan (a molecule derived from the fungus, which is sometimes found in the blood)
- Sputum stain and culture for *Aspergillus*
- Tissue biopsy (see bronchoscopy with transtracheal biopsy)

2.5.5 TREATMENT

A fungus ball is usually not treated (with antifungal medicines) unless there is bleeding into the lung tissue. In that case, surgery is required.

Invasive aspergillosis is treated with several weeks of an antifungal drug called voriconazole. It can be given orally or in an IV (directly into a vein). Amphotericin B, or itraconazole can also be used.

Endocarditis caused by *Aspergillus* is treated by surgically removing the infected heart valves. Long-term amphotericin B therapy is also needed.

Antifungal drugs do not help people with allergic aspergillosis. Allergic aspergillosis is treated with immunosuppressive drugs -- most often prednisone taken by mouth.

2.5.6 PROGNOSIS

People with allergic aspergillosis usually get better gradually, with treatment. It is common for the disease to come back (relapse) and need repeat treatment.

If invasive aspergillosis does not get better with drug treatment, it eventually leads to death.

2.5.7 POSSIBLE COMPLICATIONS

- Amphotericin B can cause kidney impairment and unpleasant side effects such as fever and chills
- Bronchiectasis (permanent scarring of the small sacs in the lungs)
- Invasive lung disease can cause massive bleeding from the lung
- Mucous plugs
- Permanent airway obstruction
- Respiratory failure

2.5.8 PREVENTION

Be careful when using medications that suppress the immune system. Prevention of AIDS prevents certain diseases, including aspergillosis, that are associated with a damaged or weakened immune system.