

FUNGAL INFECTIONS

Dr. V. S. Swathi
Assistant Professor

Definition

Fungal infections are caused by agents like yeasts and moulds can affect skin, mucus membranes and in some cases it can affect lungs and brain



Epidemiology

Global estimates found:

- 30,00,000 cases of Chronic Pulmonary Aspergillosis
- 2,23,000 cases of Cryptococcal Meningitis
- 7,00,000 cases of Invasive Candidiasis
- 5,00,000 cases of Pneumocystis jirovecii Pneumonia
- 2,50,000 cases of Invasive Aspergillosis
- 1,00,000 cases of Disseminated Histoplasmosis
- 10,00,000 cases of Fungal Asthma
- 10,00,000 cases of Fungal Keratitis

In India, 13,80,000 lakh people are affected with bronchopulmonary aspergillosis

Risk factors

Patient related factors

- Patients undergone Abdominal surgery
- Patients using central venous catheters
- Patients using Endotracheal tube

Patients suffering with:

- Immature immune system
- Skin/ Mucosal breakdown
- Fungal dermatitis
- Necrotising enterocolitis
- Intestinal perforation
- Hyperglycemia
- Persons having moist skin surface

Organism related factors

- High virulence properties
- More number of organisms
- Multiple site colonisation
- High adherence properties

Medication use like:

- Chronic use of antibiotics
- Chronic use of H₂ Receptor antagonists
- Post natal steroid use
- Parenteral nutrition
- Lipid emulsions

Etiology

Yeast

- *Candida* species
- *Cryptococcus neoformans*
- *Saccharomyces cerevisiae*
- *Blastomyces dermatidis*
- *Coccidioides immitis*
- *Histoplasma capsulatum*

Moulds

- *Rhizopus*
- *Mucor*
- *Aspergillus*
- *Trichophyton* species
- *Microsporum* species



ADAM



Types of fungal infections

Superficial infections

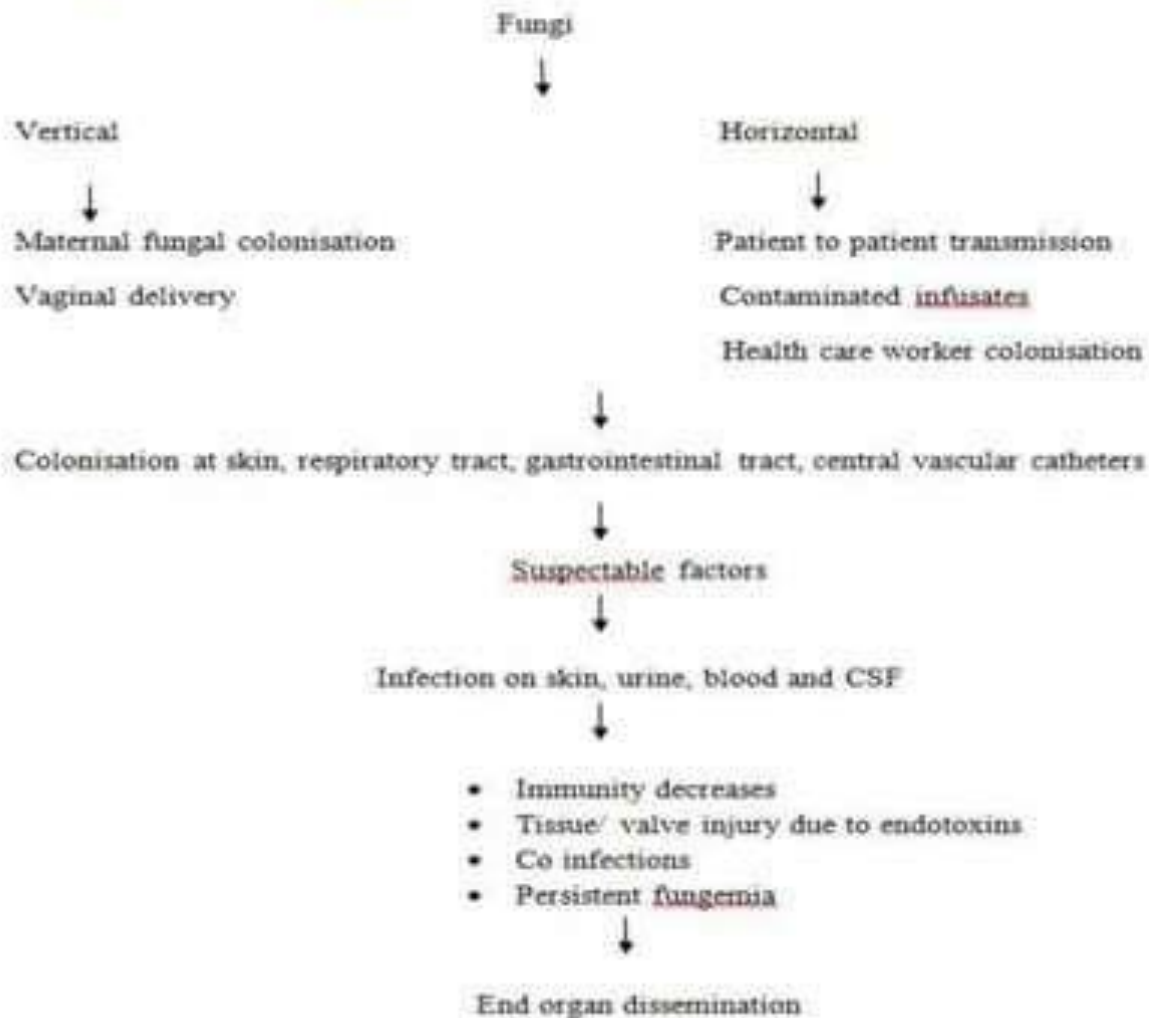
- Candida infections
- Dermatophytosis

Systemic infection

- Systemic candidiasis
- Aspergillosis
- Cryptococcosis
- Zygomycosis



Pathophysiology



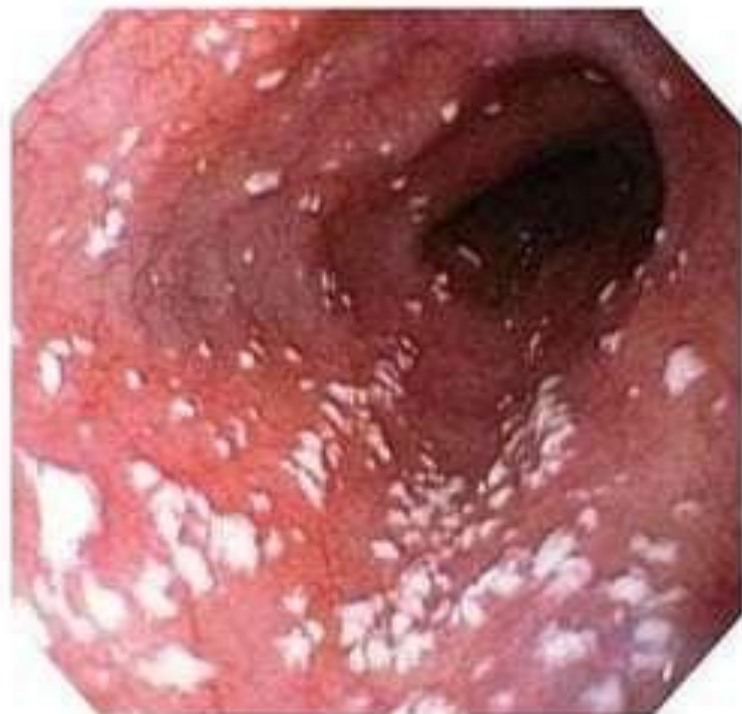
Clinical presentation

Oral Thrush

- Sore mouth with white curd like patches on the tongue
- Oral mucosa which can bleed on scrapping

Vaginal Thrush

- Creamy vaginal discharge with itching
- Pustular body rash/ nappy rash in the moist personal area



Fungal nail infection

- White or yellow discoloration
- Thickening of the nail
- Separation of nail from nail bed
- Adjacent tissue of nail is painful, red, and swollen

Fungal oesophageal infection

- Pain or discomfort while swallowing
- Nausea
- Vomiting
- Dry mouth



Ring worm infection

- A circular, inflamed lesion with a raised edge with associated skin itching between the toes and on the body
- Patchy hair loss

Fungal ear infection

- Pain and itching in auditory canal
- Discharge from ear
- Reduction in hearing



Fungemia

- Fever
- Low blood pressure
- Shock

Fungal Pneumonia

- Chest pain
- Non productive cough
- Respiratory distress

Fungal Meningitis

- Head ache
- Confusion
- Focal neurological signs
- Alteration in mental state

Fungal infection on skin

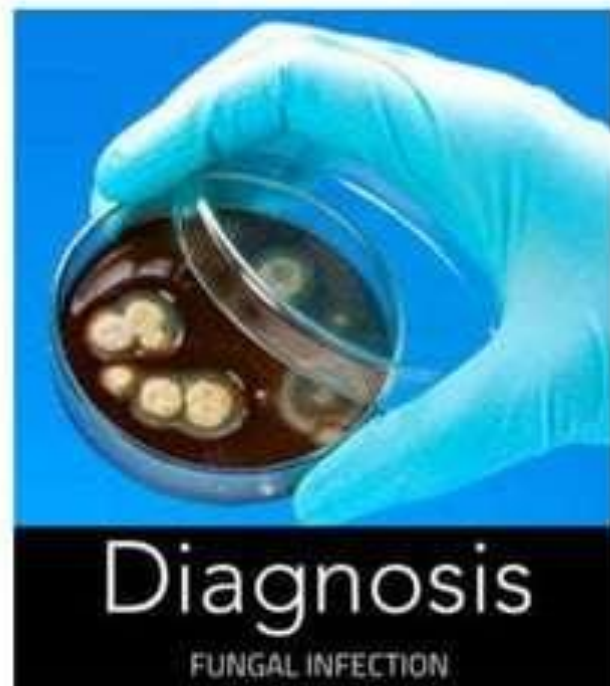
- Papules/ pustules on the trunk or face of an HIV infected individual

Complications of Fungal Infections

- Endocarditis
- Renal bladder abscess
- Meningitis
- Encephalitis
- Endophthalmitis
- Liver abscess
- Splenic abscess
- Cutaneous abscess
- Osteomyelitis
- Septic arthritis

Diagnosis

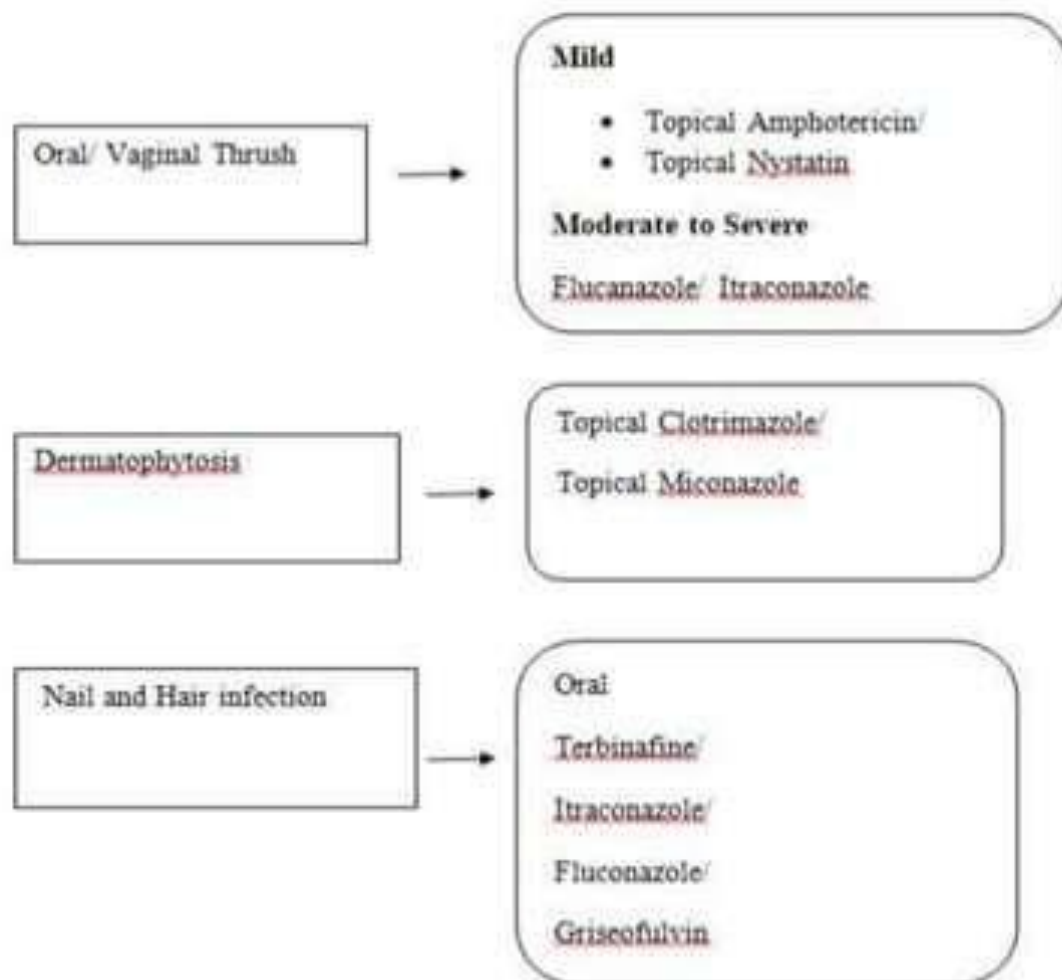
- Clinical presentation
- Microscopic examination
- Culture test
- Lab tests



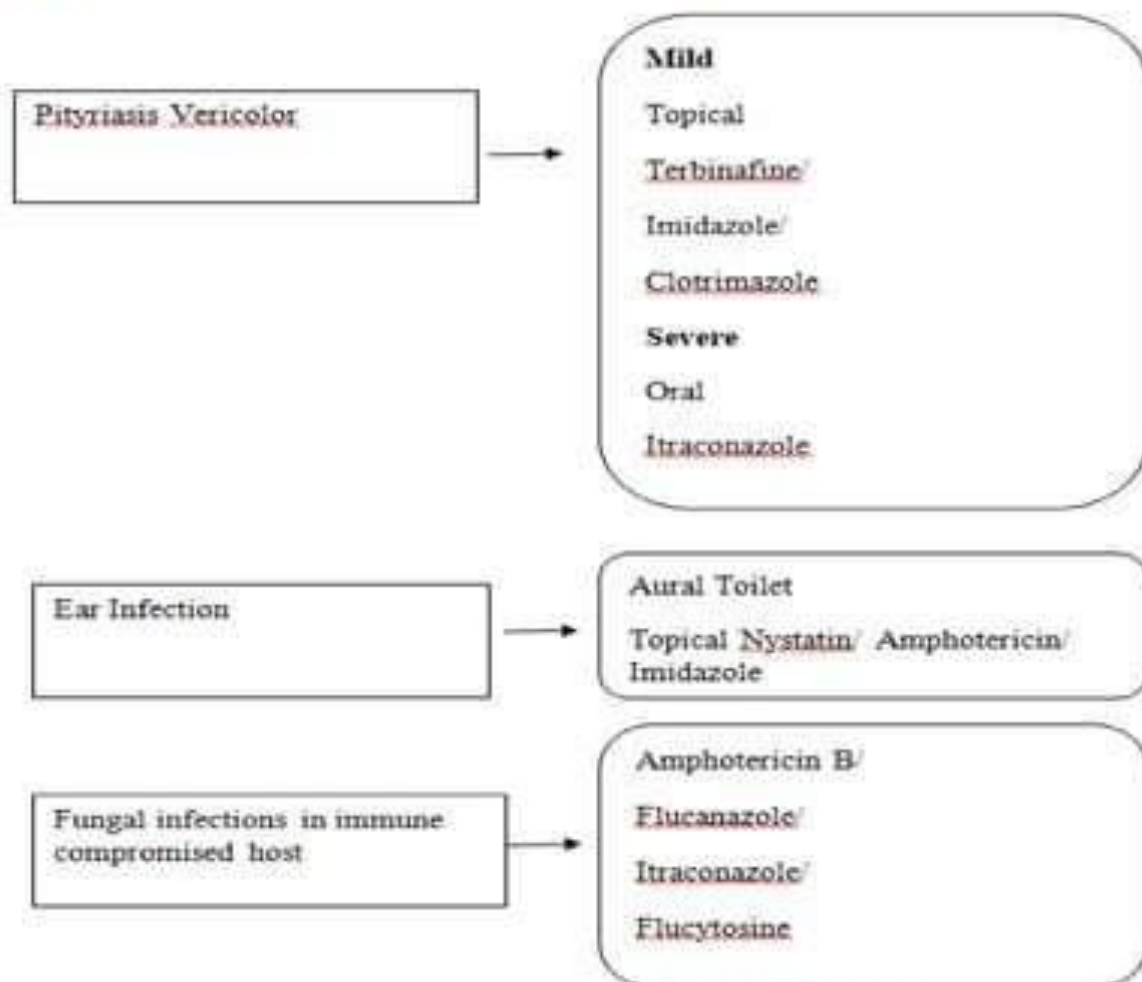
Non Pharmacological Treatment

- Always wear protective footwear when using public showers
- Clean and dry the affected area prior to applying the topical antifungal products. Massage medication in to affected area
- Always wash thoroughly after applying the product
- Use the separate towel to dry affected area
- Never share towels, clothing, personal items with someone with tinea infection
- Launder towels and clothing in hot water and dry them using high temperature setting
- Do not wear occlusive clothing or shoes that cause the skin to stay wet that trap excessive dampness

Treatment Algorithm of Fungal Infections



Treatment Algorithm of Fungal Infections



Drugs used in Treatment of Fungal Infections

Drug	Category	Mode of Action	Dose	Adverse Effects
Fluconazole	Anti fungal	Inhibit fungal cytochrome P 450 dependent enzyme lanosterol 14- α -demythylase	200mg-OD on first day 100mg-OD from second day for 2 weeks	<ul style="list-style-type: none"> • Nausea • Vomiting • Diarrhoea • Rash • Hyperkalaemia
Itraconazole	Anti fungal	Inhibit cytochrome P 450 dependent synthesis of ergosterol which in turn inhibits cell membrane formation	200mg-PO-OD for 1 to 2 weeks	<ul style="list-style-type: none"> • Edema • Nausea • Rash • Altered LFTs • Diarrhea
Terbinafine	Anti fungal	Inhibit squalene epoxidase, reducing cell membrane ergosterol synthesis, causing inhibition of fungal cell-wall synthesis and subsequently fungal cell death	250mg-PO-OD for 6 weeks	<ul style="list-style-type: none"> • Head ache • Rash • Edema • Altered LFT • Diarrhea
Flucytosine	Anti fungal	Competitive inhibition of purine and pyrimidine uptake	50-150mg/kg/day-PO	<ul style="list-style-type: none"> • Confusion • Hallucination • Drowsiness • Photosensitivity • Hypoglycemia

Drugs used in Treatment of Fungal Infections

Gresiofulvin	Anti fungal	Deposited in keratin precursor cells and is tightly bound to new keratin and this increase resistance to fungal invasion	500mg/day-PO for 2-4 weeks	<ul style="list-style-type: none"> • Rash • Urticaria • Insomnia • Photosensitivity • Dyspepsia
Amphotericin B	Anti fungal	Acts by binding to sterols in fungal cell membrane, leading to alterations in cell permeability and death	1mg/kg-20-30 min IF then 0.25-0.5mg/kg 2-6 hours IF	<ul style="list-style-type: none"> • Anorexia • Chills • Diarrhea • Fever • Hypokalemia
Nystatin	Anti fungal	Binds to sterols in fungal cell membrane , altering permeability and causing cellular contents to leak	4,00,000-6,00,000 units -QID	<ul style="list-style-type: none"> • Diarrhea • Stomach pain • Steven Johnson's syndrome • Hypersensitivity • Contact dermatitis
Clotrimazole	Anti fungal	Alters cell membrane permeability causes cellular contents to leak	1%-BD for 7-14 days	<ul style="list-style-type: none"> • Blistering • Erythema • Edema • Pruritis • Burning

Resources

- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5542425/pdf/pntd.0005534.pdf>
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6057051/pdf/12895_2018_Article_73.pdf
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4704646/pdf/1678-4405-bjm-46-04-1125.pdf>
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4411618/?report=reader>
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6014505/pdf/irnf-39-1268537.pdf>