

Microbiology

1. Oral Candidiasis:- (10 Mark)

→ An acute or chronic, opportunistic fungal infections of the oral cavity, primarily caused by the normal commensal yeast, Candida albicans

→ pathogenesis:-

- Candida albicans is a dimorphic fungus (existing in both yeast and pseudohyphae).
- It is part of the normal oral flora but becomes pathogenic under certain conditions like in case of Immuno compromised body.

Normal Oral flora (Candida albicans in commensal yeast form)

(Presence of predisposing factors: Immunosuppression (HIV/AIDS), Broad spectrum Antibiotics, Diabetes Mellitus, Denture Wearing, Extreme aging, Cancer treatment (chemo))

Overgrowth of Candida Species

(Dimorphic transition)

Transformation from Yeast form to pathogenic Pseudohyphal form

Adherence to oral mucosal epithelial cells

Tissue invasion and robust inflammatory response

Clinical Lesion (Eg: Pseudomembrane formatⁿ or Erythema)

→ Clinical Features :- (3 Mark)

- Acute Pseudomembranous Candidiasis (Thrush) :-
 - White, curdy patches resembling curdled milk on the oral mucosa.
 - Can be scraped off, leaving a raw, red bleeding underlying surface.
- Acute Erythematous Candidiasis :-
 - Painful, red-looking lesions, often associated with broad-spectrum anti-biotics use (antibiotic sore mouth)
- Chronic Hyperplastic Candidiasis (Candidal Leukoplakia) :-
 - Firm, white patches that cannot be scraped off, Has premalignant potential.
- Chronic Erythematous Candidiasis (Denture stomatitis) :-
 - Localised diffused redness strictly under the fitting surface of the maxillary denture.
- Angular Cheilitis :-
 - Erythema and fissuring at the commissures (corners) of the mouth.

→ Labrotary Diagnosis

1. Specimen Collections:-

- Swabs from the lesions (using sterile cotton swabs).
- Scrapings from the pseudomembrane

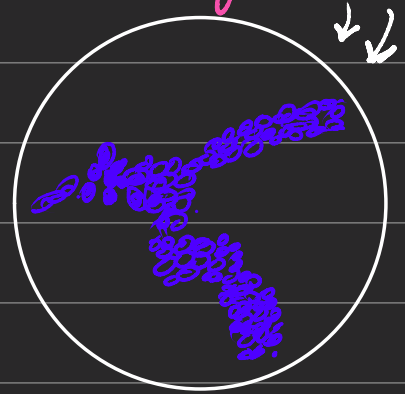
- Saliva or blood (in case of disseminated candidiasis)

→ systemic infection that entered to the blood stream.

2. Microscopy (Direct Examination):-

- Gram Staining:- *Candida* is gram positive, seen as oval, budding yeast cells measuring 2-4 μm , along with elongated pseudohyphae.
- KOH Mount (10% to 20% KOH):-

Clears the cellular debris to reveal budding yeast cells and pseudohyphae.

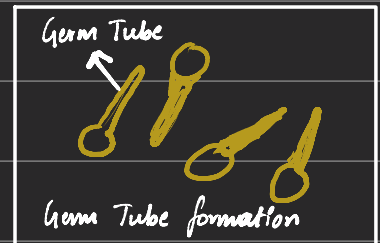


3. Culture:-



- Media:- Sabouraud Dextrose Agar (SDA) supplemented with antibiotics (like Chloramphenicol) to inhibit bacterial growth.
- Incubation:- Kept at 37°C and 25°C for 24-48 hrs.
- Colony Morphology:- Creamy, white, smooth and pasty colonies with characteristic "yeasty" odor.

4. Specific Identifier Tests:-



1. Germ Tube Test (Reynolds - Braude Phenomenon):-

→ When *Candida albicans* is incubated in human or sheep serum at 37°C for 2 hrs, it produces short, straight, non-septate cylindrical extensions called Germ Tubes.

2. Chlamydospore Formation:- Grown on Corn Meal Agar (CMA) or Rice Extract Agar at 25°C *C. albicans* produces thick-walled, highly refractile, terminal chlamydospores

3. Biochemical Tests:- *Candida albicans* ferments glucose and maltose, producing both acid and gas.

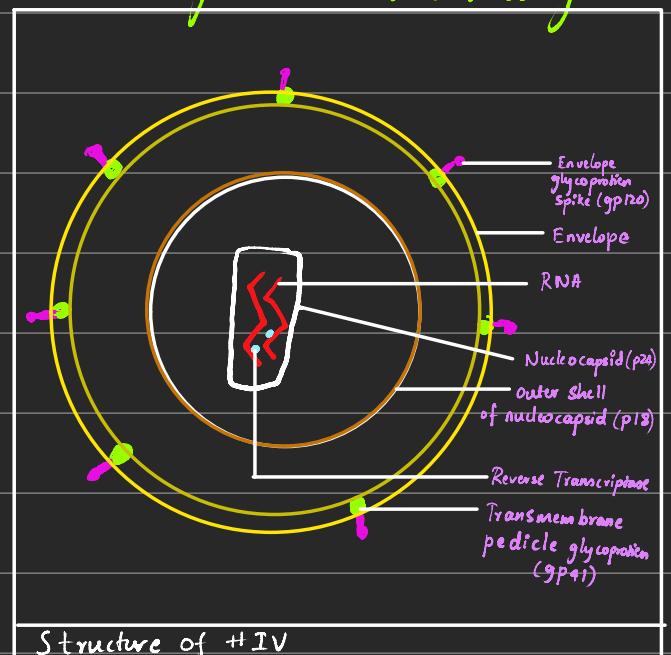
5. Serology:- Detection of *Candida* antigens (Eg:- Mannan Antigen) or antibodies using ELISA, though less common for superficial oral candidiasis.

2. HIV (Retroviruses) / AIDS :-

→ HIV (Human Immunodeficiency Virus) belongs to the family Retroviridae. It causes AIDS (Acquired Immunodeficiency Syndrome), characterised by profound immunosuppression and susceptibility to opportunistic infections and malignancies.

→ Morphology of HIV Virus

- Size and Shape:- Spherical, enveloped virus measuring 90-120 nm in diameter.
- Viral Genome:- Contains a diploid genome (2 identical copies of single-stranded positive-sense RNA).
- Viral Enzymes:- The core contains 3 crucial enzymes:- Reverse transcriptase, Integrase, Protease.
- Capsid:- primarily composed of the p24 antigen.
- Envelope:- A membrane bilayer derived from the host cell membrane. It contains virus-specific glycoprotein spikes.
 - gp120:- The outer knob-like structure (responsible for attachment to the host cell).



- gp41 :- The transmembrane pedicle (responsible for fusion with the host cell).

→ Mode of Transmission

- Sexual Contact :- Most common mode of Transmission.
- Parenteral :- Transfusion of infected blood, sharing of unsterilized needles / syringes (common in IV drugs) accidental inoculation.
- Perinatal (Vertical transmission) :- From an infected mother to her child across the placenta (Transplacentally) or Perinatally.

→ Pathogenesis

Entry of HIV into bloodstream

↓
Attachment :- Viral gp120 binds to the CD4 receptor on T-helper cells (and Macrophages)

↓
Co-receptor Binding :- Binding to chemokine co-receptors (CCR5 or CXCR4)

↓
Fusion and Uncoating :- Viral gp41 mediates fusion with host membrane; viral RNA is released into Cytoplasm.

↓
Reverse Transcription :- Viral RNA is converted into double stranded DNA by Reverse Transcriptase.

↓
Integration:- Viral DNA enters the nucleus and integrates into the host cell chromosome via Integrase enzyme
(forms a Pro Virus)

↓
Transcription & Translation:- Proviral DNA is transcribed into mRNA, leading to the synthesis of viral proteins

↓
Assembly & Budding:- New Virions assemble at the cell membrane, acquire their envelope, and bud off.

↓
Destruction of CD4+ T-cells:- Leads to a steady decline in the CD4+ count and leads to profound Immunosuppression.

→ Clinical Features:-

- HIV infects all cells expressing at their surface the CD4 antigen, which is the receptor for the virus.
- It infects primarily the CD4+ lymphocytes

• Classifⁿ System for HIV Infection and AIDS (CDC, USA classⁿ)

1. Group I - Acute HIV Infection:-

- The illness is characterised by acute onset of fever, malaise, sore throat, myalgia, arthralgia, skin rash and lymphadenopathy.

2. Group II - Asymptomatic infection:-

- Includes all infected individual who are usually well.
- Show positive HIV antibody tests, and are infectious.

3. Group III - Persistent generalised lymphadenopathy:-
• Characterised by enlarged lymph nodes (non painful) lasting for more than 3 months.

4. Group IV - Symptomatic HIV infection:-

• CD4+ T lymphocytes count falls below 400 per mm^3 , the patient may develop symptoms like fever, diarrhoea, weight loss, night sweats and opportunistic infections.

• When CD4+ cells falls below 200 per mm^3 , the titre of Virus increases markedly and there is irreversible breakdown of immune defence mechanisms.

→ Subgroup A - Constitutional disease - ARC

→ Subgroup B - Neurological disease

→ Subgroup C - Secondary infectious diseases
C1 & C2

→ Subgroup D - Secondary Cancers

→ Subgroup E - Other conditions

• Most of the patients with HIV disease die of infections other than HIV eg:- Opportunistic infection & Malignancies.

• Opportunistic Infections and Malignancies (common in HIV)

I. Bacterial:-

1. Mycobacterial infections - Tuberculosis & non-TB inf

2. Salmonellosis.

3. M. avium complex.

II Viral:-

1. CMV (Cytomegalovirus)
2. Herpes simplex.
3. Varicella - zoster.
4. Epstein - Barr (EB) virus.

III Mycotic:-

1. Pneumocystis jiroveci pneumonia.
2. Candidiasis
3. Cryptococcosis
4. Histoplasmosis.

IV Parasitic:-

1. Toxoplasmosis
2. Cryptosporidiosis.
3. Isosporidiosis.

V Malignancies:-

1. Kaposi's sarcoma
2. B-cell lymphoma or non-Hodgkin's lymphoma.

• AIDS is the end stage of HIV infection.

• Oral Manifestations:-

- Patients with AIDS are at greater risk for bacterial, viral and fungal infections of the mouth. Dental Caries, gingivitis may occur.
- Acute necrotizing ulcerative gingivitis may act as an indicator that patient may have AIDS.
- Herpes simplex infections may be present as multiple, deeper more painful oral lesions in patients with AIDS.

- These lesions heal slower than the herpes simplex lesions in immunocompetent individual.
- Hair leukoplakia is an early sign of immunodeficiency. It appears to be induced by Epstein - barr (EB) virus, possibly in combination with papillomavirus or candida in patients with HIV infection. The lesions are generally bilateral, white, soft, hairy excrescences on the lateral margins of the tongue. However Unilateral Corrugated lesions may also occur elsewhere on the tongue or oral mucosa.
- Oral Candidiasis may be present in most patient with HIV infⁿ. Thrush is usually found on the palatal and buccal mucosa. Asymptomatic Erythematous lesions of candidiasis sometimes occurs on the palatal & lingual mucosae.
- Other Oral manifestation include angular cheilitis fissures & ulcers at the corner of the mouth and mucocutaneous candidiasis.

→ Prevention:-

- Promoting safe sex practices (use of condoms etc).
- Mandatory screening of blood, blood products, and organ donors for HIV.
- Using disposable or strictly sterilized needles & syringes.
- PMTCT (Prevention of Mother-to-child Transmission):-
Administering Antiretroviral Therapy (ART) to pregnant mothers and the newborns.
- Universal Precautions:- In dental clinic, strictly follow protocols using personal Protective Equipment (PPE) like gloves, masks, and eyewear, and ensure proper disposal of sharp items.

→ Post-Exposure Prophylaxis (PEP):-

- ⇒ Def:- Short-term antiretroviral treatment to reduce the likelihood of HIV infection after potential exposure (Eg:- a needle-stick injury)
- Timing is critical:- Must be initiated as early as possible, ideally within 2 hours and no later than 72 hours post-exposure.
- Regimen:- Usually consists of a 3-drug antiretroviral regimen (Eg:- Tenofovir + Emtricitabine + a protease inhibitor or Integrase Inhibitor) taken for 28 days.
- Protocol:- Wash the exposed area with soap and water immediately (do not squeeze the wound). Report. Baseline blood testing follow-up testings at 6 weeks, 12 weeks & 6 months.