

Nutritional Dermatoses

Digital Lecture Series

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Introduction



- **Nutrition:** Dynamic process concerned with ingestion, digestion, absorption and assimilation of food for nourishment
- **Nutrients:** Constituents of food necessary to sustain the normal function of the body
 - Macronutrients: Carbohydrates, protein, fat
 - Micronutrients: Vitamins, minerals
- **Malnutrition:** Imbalance in nutrient supply and demand, characterized by inadequate intake, absorption or utilization of key nutrients

Etiology: Nutritional Deficiencies

Decreased intake

- Poverty
- Ignorance
- Food faddism
- Crash diets
- Anorexia nervosa

Increased requirement

- During growth
- Pregnancy
- Lactation
- Fever
- Hyperthyroidism

Nutritional Deficiencies



- Fat soluble vitamins (A,D,E,K)
- Water soluble vitamins (b-complex, niacin, pantothenic acid, biotin, vit C)
- Minerals
- Trace elements (zinc, iron)
- Essential fatty acids (EFA)
- PEM (protein energy malnutrition)

Fat Soluble vs Water Soluble Vitamins

Vitamins	Fat Soluble	Water soluble
Chemical property	Lipophilic	Hydrophilic
Absorption	Needs lipids and bile salts	Simple (except for vit B12)
Carrier proteins	Present	Absent (except for vit B12)
Storage	Liver	Not stored (except for vit B12)
Deficiency manifestations	Faster onset	Slower onset
Toxicity	More common	Less common (excess is excreted)

Vitamin A

- **Active forms:** Retinal, retinol and retinoic acid
- **Storage form:** Retinyl ester
- **Rich source:** Animal fats, fish liver oils, milk, butter, eggs, liver
- **Provitamin A (beta carotene):** Spinach, drumsticks, pumpkin, carrots, tomato, fruits like mango and papaya
- **Functions:**
 - Vision: Dark adaptation (rhodopsin synthesis)
 - Epithelium: Maintenance and integrity
 - Immunomodulation, anti-inflammatory action

Clinical Features: Vitamin A Deficiency: Skin



- Earliest manifestation: Asteatosis (dryness)
- **Phrynoderma (toad skin)**
 - Mixed deficiencies of vit. A, vit. E, B - complex, vit. C and EFA
 - Grouped, hyperkeratotic and pointed follicular papules with central keratotic horn spines
 - Distribution: Elbows, knees, anterolateral thighs, posterolateral arms

Phrynoderma



Clinical Features

- **Eye manifestations:**
 - Common cause of blindness in developing countries
- **Earliest symptoms:**
 - Delayed adaptation to dark
 - Nyctalopia (night blindness)
- **Xerophthalmia:**
 - Conjunctival xerosis, Bitot's spots
 - Corneal xerosis, corneal ulceration, keratomalacia
 - Phthisis bulbi, scarring, blindness

- **RDA of allowance of vitamin A:**

- Infants: 300-400 µg, children: 400-600 µg
- Adolescents: 750 µg

- **Treatment of vitamin A deficiency:**

- Oral vitamin A: <6 months: 50000 IU
- 6-12 months: 1,00,000 IU, >1 year: 2,00,000 IU
- Repeat the dosage next day and 4 days later
- Treatment of underlying cause (protein and zinc deficiency)

- **Prophylactic treatment:**

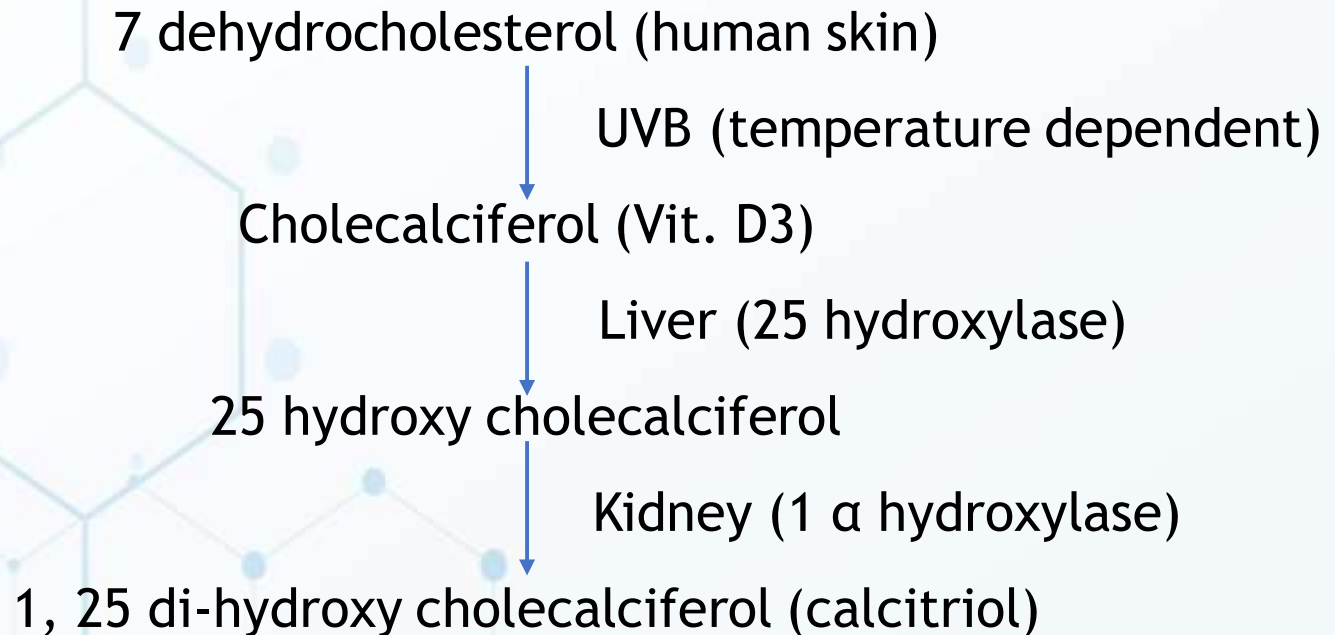
- Vit. A (2 lacs IU) every 6 months to pre-school children (orally retinyl palmitate in oil)

Vitamin D

- Vit. D is a group of antirachitic sterol derivatives, considered as a hormone
- **Skin:** Role in synthesis, storage and release of vit. D
- **Function:**
 - Maintenance of calcium and phosphorus homeostasis
 - Influences the level of serum alkaline phosphatase

Source of Vit. D and Chemistry

- Plants → ergosterol → ergocalciferol (Vit D2)
- Animal and dairy products (eggs, liver, butter, cod liver oil)
- **Vitamin D metabolism**



Clinical Features, Lab Diagnosis, Treatment



- **Children:** Rickets, tetany
- **Adults:**
 - Osteomalacia
 - Type I vit. D dependent rickets: No skin lesions
 - Type II vit. D resistant rickets: Progressive alopecia
- **Lab diagnosis:**
 - Serum 25 (OH) vitamin D3 <5 ng/ml indicate deficiency
- **Treatment:**
 - Normal daily requirement: 200 IU (infants), 400 IU (children)
 - In rickets: 5000 IU oral Vit D for 3 to 5 weeks
 - Exposure to sunlight

Vitamin B1 (Thiamine, Aneurin)



- **Sources:** Yeast (richest source), unmilled cereals, pulses, nuts
- **Function:** Thiamine pyrophosphate (active form)
 - Functions as co-carboxylase in carbohydrate metabolism and in numerous other enzyme systems
- **Dry beriberi**
 - Peripheral neuropathy, atrophic skin, red burning tongue
 - Korsakoff's psychosis, Wernicke's encephalopathy
- **Wet beriberi**
 - Peripheral oedema, high output cardiac failure
 - Skin is warm before CCF and cold, oedematous, cracked later

Diagnosis and Treatment

- **Diagnosis**

- Urinary excretion of <50 mcg of thiamine after 1 mg injection

- **Treatment:**

- Dietary requirement: 0.4 mg/1000 kcal, 0.5 to 2 mg
- Mild beriberi: Thiamine 5 mg/day
- Severely ill: Thiamine 10 mg IV twice daily

Vit. B2 (Riboflavin)

- **Riboflavin:** Flavoprotein widely distributed in plants
- **Sources of vit. B2:**
 - Milk, milk products, eggs, liver, cereals, pulses, green leafy vegetables
 - Deficiency of vit.B2 affects metabolism of free fatty acids, tryptophan, folic acid
- **Function:**
 - Role in intracellular oxidation-reduction reactions (flavin adenine mono and dinucleotide)

Clinical Features: Vit B2 Deficiency

- Onset: 3-5 months of inadequate diet
- **Oral manifestations:**
 - Angular stomatitis (perleche) with maceration
 - Cheilosis: Lip involvement with vertical fissuring
 - Glossitis: Smooth, magenta coloured tongue, atrophic filiform papillae, enlarged fungiform papillae

Clinical Features: Vit B2 Deficiency: Skin

- **Seborrheic dermatitis like rash:**
 - Nasolabial folds, alae nasi, nasal bridge (nasolabial dyssebacia)
 - Forehead, cheeks, post auricular, eyelids, scrotum, vulva (oro-oculo-genital syndrome)
 - Involved areas: Red, greasy, sometimes hyperpigmented (dyssebacia or shark skin)
- **Dysriboflavinosis:** Dyskeratotic follicular papules with scaly erythema, patchy alopecia, scalp and eyebrow scaling

Vit B2 Deficiency: Extra Cutaneous



- **Eyes:**

- Photophobia, lacrimation, blepharospasm, conjunctivitis, decrease in visual acuity, corneal vascularization

- **CNS:** Psychomotor, intellectual development impaired in children

Diagnosis and Treatment

- **Diagnosis:** Markers of deficiency
 - RBC glutathione reductase activity coefficient >1.2
 - Urinary excretion <30 mcg of vit.B2/gm of creatinine
- **Treatment:**
 - Normal requirement: 1-2 mg/day
 - Therapeutic dose: Infants: 1-3 mg, adults: 10-30 mg/day
 - Correct the associated tryptophan, FA, EFA deficiency

Vitamin B3 (Nicotinic Acid, Nicotinamide, Niacin)

- **Pellagra (deficiency of niacin)**
 - Italian word pelle - skin, agra - rough
 - Niacinamide (active form) → NAD, NADP (coenzymes)
- **Function:** Plays a vital role in cell, fatty acid, carbohydrate metabolism
- **Sources:**
 - Meat, fish, eggs, milk, cheese
 - Cereals, grains, legumes, coffee and tea
- **Endogenous production:**
 - 60 mg of tryptophan → 1 mg of niacin

Aetiology of Vit B3 Deficiency

- Staple diet of maize and jowar with less animal proteins
- **Maize:** Poor source of nicotinic acid and tryptophan, niacin is present but not bio-available
- **Jowar:** High content of leucine (inhibits tryptophan uptake)
- Imbalance in leucine and isoleucine → inhibition of NAD
- Tryptophan → niacin
- **Chronic alcoholics:** Unbalanced diet, impaired niacin absorption
- **Hartnup disease:** Impaired reabsorption of tryptophan
- **Carcinoid syndrome:** 60% dietary tryptophan → serotonin
- **Drugs:** Isoniazid, azathioprine, anticonvulsants

Clinical Features

- Characteristic 4 “D’s”:
 - Dermatitis, diarrhoea, dementia, death
- Skin:
 - **Distribution:** “Photo exposed areas”
 - Acute: Well-demarcated patches of erythema with pruritus, burning and pain resembling sunburn
 - Redness and maceration in the intertriginous areas
 - Chronic: Reddish brown, rough, scaly, thickened, and pigmented skin lesions

Clinical Features

- **Pellagrins nose:**
 - Dull erythema, butterfly rash with scaling on bridge of nose
- **Casal's necklace:**
 - Sharply demarcated lesion on upper central chest, neck
- **Cravat:**
 - Anterior continuation of necklace on chest
- **Scrotal erythema:**
 - Symmetrical lesions, clear line of demarcation

Pellagra



Pellagra



DR. MALCOLM PINTO

Clinical Features

- **Mucous membrane**
 - Angular stomatitis, cheilitis
 - Scarlet glossitis
 - Tongue is red, smooth, atrophy of filiform papillae, erosions, ulcerations, fissures
- **GIT:** Anorexia, nausea, vomiting, abdominal pain, bloody diarrhoea
- **CNS:** Depression, psychosis

Treatment

- Daily requirement: 10-20 mg/day
- **Therapeutic dose:**
 - 250-500 mg niacinamide orally or intramuscular in divided doses (niacin precipitate flushing, itching, burning)
 - Supplement with B complex, animal proteins eggs, milk
 - Balanced diet
 - Reduce alcohol

Vitamin B6 (Pyridoxine)

- **Animal sources:** Liver, egg yolk, meat
- **Vegetable sources:** Pulses, cereals, peas, soya beans
- **Drugs producing vit B6 deficiency:** INH, hydralazine, cycloserine, penicillamine
- **Function:**
 - Coenzyme in transaminase and decarboxylase reactions and in the metabolism of cysteine, tryptophan and EFA

Clinical Features (Vit B6 Deficiency)

- **Children:** Anaemia, convulsion
- **Adults:**
 - Seborrheic dermatitis like rash
 - Cheilitis, angular stomatitis, glossitis, peripheral neuritis
- **Chinese restaurant syndrome**
 - Inability to metabolize monosodium glutamate
 - Headache, sensation of pressure in chest, palpitation, feeling of warmth, tingling, numbness

Diagnosis and Treatment

- **Diagnosis:**

- Serum pyridoxal phosphate levels $<20 \mu\text{g/ml}$

- **Treatment:**

- Daily requirement: 1.5-2.5 mg

- Therapeutic dose: 30-100 mg/day orally

Vit B12: Cobalamin, Cyanocobalamin



- **Forms:** Cyanocobalamin, deoxyadenosyl cobalamin, methylcobalamin
- **Sources:**
 - Liver, kidney, heart , meat, fish, cheese, eggs, milk
 - Vegetables, fruits, legumes - nil
- **Absorption:** Specific receptor mediated process in the ileum involving glycoprotein (intrinsic factor)
- **Function:**
 - Nucleoprotein synthesis, maturation of red cells
 - DNA synthesis and methyl group transfer

Aetiology: Vit.B12 Deficiency



- Strict vegetarian diet
- Gastric atrophy (achlorhydria) and decreased intrinsic factor (pernicious anaemia)
- Diphyllbothrium latum infestation
- Malabsorption syndromes (coeliac sprue, intestinal TB, Whipple's disease)
- Elderly individuals, chronic alcoholism

Clinical Features: Vit.B12 Deficiency

- **Skin:** Symmetrical generalized hyperpigmentation (flexures, palmar creases, soles, knuckles)
- **Mucous membrane:** Hyperpigmentation, cheilitis, glossitis with beefy red tongue, glossodynia, aphthae like lesions
- **Nails:** Pigmented streaks
- **Hair:** Premature graying
- **Other manifestations:** Peripheral neuritis, impaired memory

Vit. B12 Deficiency



Diagnosis and Treatment

- **Diagnosis:**

- Serum vit. B12 <150 pg/ml
- Hemogram, bone marrow examination
- Schilling's test: Detects malabsorption

- **Treatment:**

- Daily requirement: 1 mcg
- Dose: 1000 mcg/week for 1 month; 1000 mcg/month thereafter
- Supplement folic acid 1-5 mg
- Course: Cutaneous changes improve within 1 year

Vit B9 (Folic Acid, Pteroylglutamic Acid)

- **Sources:**

- Liver, meat, green leafy vegetables, milk
- Produced by colonic bacteria (inadequate)

- **Active form:**

- Folic acid $\xrightarrow{\text{Vit C}}$ folinic acid

- **Function:**

- Coenzyme for normal RNA and DNA synthesis
- Neurotransmitter production (serotonin)
- Reduction in blood homocysteine levels

Clinical Features: Folic Acid Deficiency

- **Skin:**
 - Diffuse hyperpigmentation
- **Mucous membrane:**
 - Glossitis, superficial erosions, cheilitis
- **Others:**
 - Megaloblastic anemia (fatigue, tiredness)

Diagnosis and Treatment

- **Diagnosis**

- Serum folate <3 ng/ml (normal >6 ng/ml)

- **Treatment:**

- Daily requirement: 50-100 mcg
- In pregnancy: 400 mcg
- Therapeutic dose: 1-5 mg/day
- Correct concomitant vit. B12 deficiency

Vitamin C (Ascorbic Acid)

- Scurvy: Deficiency of vitamin C
- **Sources:**
 - Fresh fruits - oranges, grapes, lemons
 - Fresh vegetables - Green leafy vegetables, potatoes, cabbage
- **Functions:**
 - Antioxidant, reducing agent
 - Role in collagen and ground substance formation, wound healing, immune response
 - Required for iron absorption

Aetiology: Vit C Deficiency

- Diet poor in vitamin C (elderly men, alcoholics)
- Gastro-intestinal diseases
- Malnourished children with scurvy (Barlow's disease)
- Cigarette smokers

Clinical Features

- **Skin:**

- Follicular hyperkeratosis: Earliest change, corkscrew hair (swan neck deformity) - due to reduced disulfide bonds
- Perifollicular purpura, haemorrhage
- Sites: Upper arms, buttocks, shins, trunk, thighs
- Petechiae, ecchymosis
- “Woody” oedema of legs
- Delayed wound healing

Scurvy



Vitamin C (Ascorbic Acid)

- **Oral cavity:**
 - Haemorrhagic gingivitis (spongy gums)
 - Loosened teeth, foul odour
- **Internal haemorrhage:**
 - Haematuria, epistaxis, melena, hematemesis
- **In infants:**
 - Excessive crying
 - Pseudo paralysis
 - Scorbutic rosary

Diagnosis and Treatment

- **Diagnosis:**

- Capillary fragility test: Positive
- Serum vitamin C assay <0.1 mg/dl
- Serum vitamin C leukocyte assay <7 mg/dl

- **Treatment:**

- Daily requirement: Adult: 50 mg, children: 25 mg
- Therapeutic dose: 100-300 mg/day

Minerals and Trace elements: Zinc



- **Zinc:**

- Very important micronutrient
- Component of metalloenzymes for carbohydrate, protein, lipid and nucleic acid metabolism
- Role in immunological functions and wound healing

- **Sources:**

- Shellfish, legumes, nuts, whole grains, green leafy vegetables

- **Zinc deficiency:**

- Genetic: Acrodermatitis enteropathica
- Acquired: Acquired zinc deficiency

Acrodermatitis Enteropathica



- Inheritance: Autosomal recessive
- First description: Danbolt and class in 1943
- **Aetiology:**
 - Mutation in SLC39A4 (Solute carrier family 39 member A4) gene (zinc transporter gene)
 - Locus on chromosome: 8q
 - Defect in intestinal zinc transporter: ZIP4 protein

Clinical Features: Acrodermatitis Enteropathica

- **Classical presentation:** During time of weaning in infants who are breastfed and earlier when they are formula-fed
- **Triad:** Dermatitis, alopecia, diarrhoea
- **Dermatitis:**
 - Acute phase: Eczematous, erosive dermatitis favouring acral areas: Perioral, periocular, anogenital, hands, feet
 - Chronic deficiency: Psoriasiform dermatitis
- **Oral cavity:** Angular stomatitis, glossitis, Superadded candidiasis
- **Nails:** Paronychia, leukonychia
- **Hair:** Alopecia
- **Eyes:** Photophobia, conjunctivitis
- Diarrhoea, lethargy, growth failure

Acrodermatitis Enteropathica



Acrodermatitis Enteropathica



Diagnosis and Treatment

- **Diagnosis**

- Serum zinc levels <80 mcg/dl (80-120 mcg/dl)

- **Treatment:**

- Daily requirement:

- <6months : 3 mg

- 6months-1yr : 5 mg

- 1-7 yrs : 10 mg

- 7 yrs, adults : 16 mg

- Pregnant and lactating mothers: 20-25 mg

Treatment

- Dose

- Oral zinc: 2mg/kg/day for 1-2 weeks
 - 30 to 55 mg of elemental Zn for 1-2 weeks (220 mg ZnSo₄ = 55 mg of elemental Zn)
- Hereditary type requires life long treatment

Iron Deficiency

- **Sources:**

- Green leafy vegetables, pulses, meat products
- Vitamin C rich foods improve absorption; tea and tamarind inhibits absorption

- **Clinical features:**

- Generalized pruritus, increased hair loss, koilonychia
- Angular stomatitis, cheilitis, glossitis
- Hypochromic microcytic anaemia
- Plummer-Vinson syndrome

Iron Deficiency: Koilonychia



IADVL ACADEMY



Treatment

- **Therapeutic dose:**

- Ferrous sulphate or gluconate 300 mg thrice daily
- Treat underlying cause: Chronic blood loss, parasitic infestations, malaria
- Supplementation with vitamin C
- Supplementation during pregnancy

Protein Energy Malnutrition (PEM)

- PEM is most common form of malnutrition
- Age: 1-3 years
- Commonly seen during weaning and post weaning period
- **Marasmus:**
 - Patient with 60% of expected body weight without oedema
- **Kwashiorkor:**
 - Patient who weighs 60-80% of expected body weight for that age with severe protein malnutrition with relative carbohydrate excess

Marasmus: Clinical Features

- **Skin:**
 - Dry, inelastic, thin, wrinkled, loose
 - Follicular hyperkeratosis (adults)
- **Hair:**
 - Slow growth, lustreless
 - Growth of lanugo hair occurs
- **Nails:**
 - Fissured
- **Facies:**
 - “Monkey facies”- wrinkled skin with loss of buccal fat pad
 - Child is alert



Kwashiorkor: Clinical Features

- Skin:

- “Flaky paint” or “crazy pavement” dermatoses, extensive peeling of skin with erosions
- “Enamel paint” dermatoses
- Sites: Pressure sites
- Sharply demarcated hyperpigmented plaques with burnt out appearance and waxy feel (sparing feet and dorsa of hands in contrast to pellagra)



Clinical Features

- **Mucosa:**

- Angular stomatitis, glossitis
- Cheilitis with fissuring on lips

- **Nails:** Soft and thin

- **Hair:**

- Sparse, thin, brittle, easy pluckable
- Dyschromotrichia: Golden, blonde, rust
- Flag sign: Alternating bands of pale and dark hair corresponding to periods of poor nutrition interspersed with good nutrition
- Eyelashes: Broomstick appearance

Treatment

- High protein, high caloric diet
- Topical zinc paste, oral zinc supplements
- Correction of other associated deficiency
- Treatment of infection and infestation

Q.1) The typical sites of affection in riboflavin deficiency are:

- A. Sun exposed areas
- B. Frictional sites
- C. Seborrheic areas
- D. Flexural sites

Q.2) Corkscrew hairs with perifollicular purpura are features resulting from deficiency of

- A. Vitamin A
- B. Vitamin D
- C. Vitamin E
- D. Vitamin C

Q.3) Hair changes, such as alopecia and decreased hair pigmentation, can be seen with which nutritional dermatoses?

- A. Scurvy
- B. Kwashiorkor
- C. Beriberi
- D. Marasmus

Q.4) A 50 yr old male, chronic alcoholic presented with pruritic, sharply demarcated, erythematous rash over the anterior chest and forearms. The most likely vitamin deficiency implicated in this patient:

- A. Niacin
- B. Riboflavin
- C. Vitamin
- D. Biotin

Q.5) Which of the following is a common micronutrient deficiency found in patients with eating disorders?

- A. Vitamin C
- B. Zinc
- C. Vitamin A
- D. Vitamin B12

Photo Quiz



Q. Identify the condition?

Photo Quiz



Q. Identify the condition?

Photo Quiz



Q. Identify the distribution of lesions in this image

Thank You