VITAMIN A

Dr. H. Abirami
VP- ACADEMICS, DrSNSRCAS
Group Coordinator- IQAC & YP
SNS Groups

VITAMINS

- Vitamins are a class of organic compounds categorized as **essential nutrients**.
- They are **micronutrients**.
- They DO NOT yield energy, but **enable the body to use other nutrients**.
- The body generally CANNOT SYNTHESIZE THEM, so they **must be provided by food**.

VITAMINS

FAT SOLUBLE VITAMINS

Vitamin A, D, E and K

WATER SOLUBLE VITAMINS

Vitamins of B-group and Vitamin C

VITAMIN A

- Vitamin A consists of **Retinol** (pre-formed vitamin), **Retinal**, **Retinoic acid** and **ß-carotene** (pro-vitamin)
- Some of the ß-carotene is **converted** to retinol in the intestinal mucosa.
- I IU of Vit. A = 0.3 mcg of retinol
  (or 0.55 mcg of retinol palmitate)

1 mcg of retinol = 1 RE

1 mcg of ß-carotene = 0.167 mcg of RE

1 mcg of other carotenoids = 0.084 mcg of RE

1 RE = 3.333 IU of Vit. A

FUNCTIONS


Vision

- For NORMAL VISION in **dim light**.
- Maintaining the INTEGRITY AND NORMAL FUNCTIONING of **glandular and epithelial tissues** which lines **intestinal, respiratory** and **urinary** tracts as well as **skin** and **eyes**.


Skin

- Supports GROWTH (**skeletal** growth)


Bone metabolism

- Retinol and retinoic acid function as STEROID HORMONES. They regulate the protein synthesis thus involved in **cell growth and differentiation**.
- SYNTHESIS of certain **glycoproteins.**
- Essential for the MAINTENANCE of proper **immune system**

Immune function

- **CAROTENOIDS** function as **antioxidants** and reduce the risk of cancers. MAY protect against some **epithelial cancers**.

Antioxidant

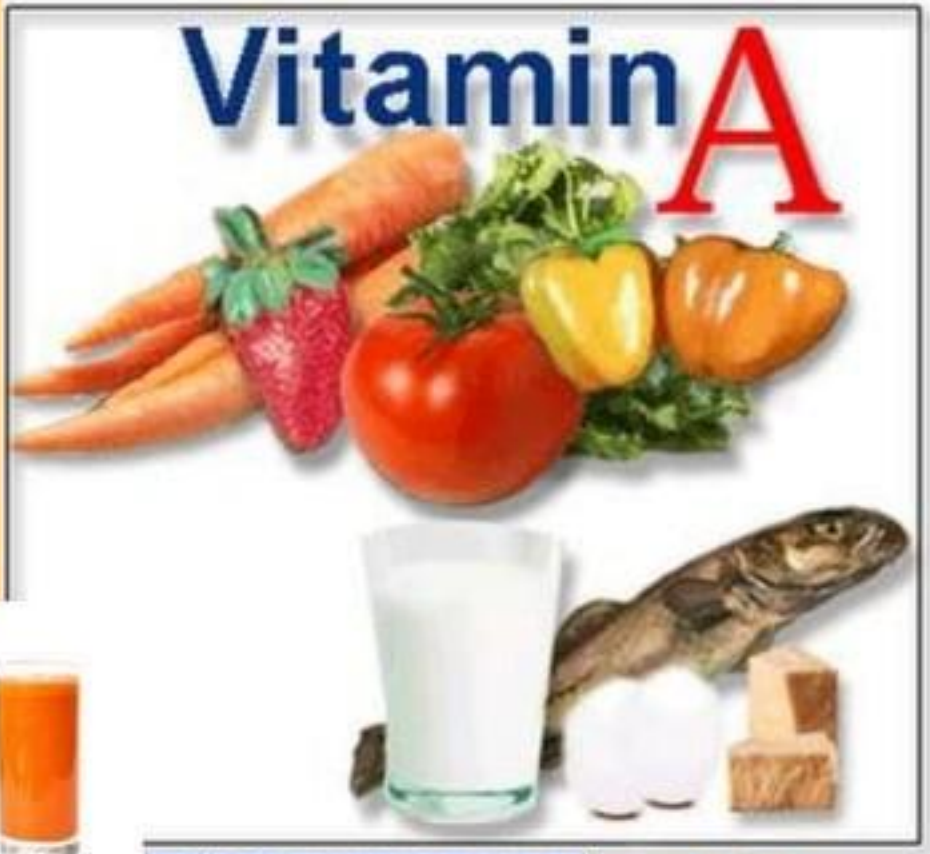
SOURCES

ANIMAL FOODS: **Liver, eggs, butter, cheese, whole milk, fish and meat**

Fish liver oil- richest natural source of retinol

PLANT FOODS: **green leafy vegetables(spinach, amaranth)**, most **green and yellow fruits and vegetables(papaya, mango, pumpkin)**, **roots**(carrot)

FORTIFIED FOODS: food fortified with Vit. A such as **vanaspati, margarine, milk**.



Vitamin A Sources

Liver

Fish

Carrot juice

Cheese

Sweet potatoes

Squash

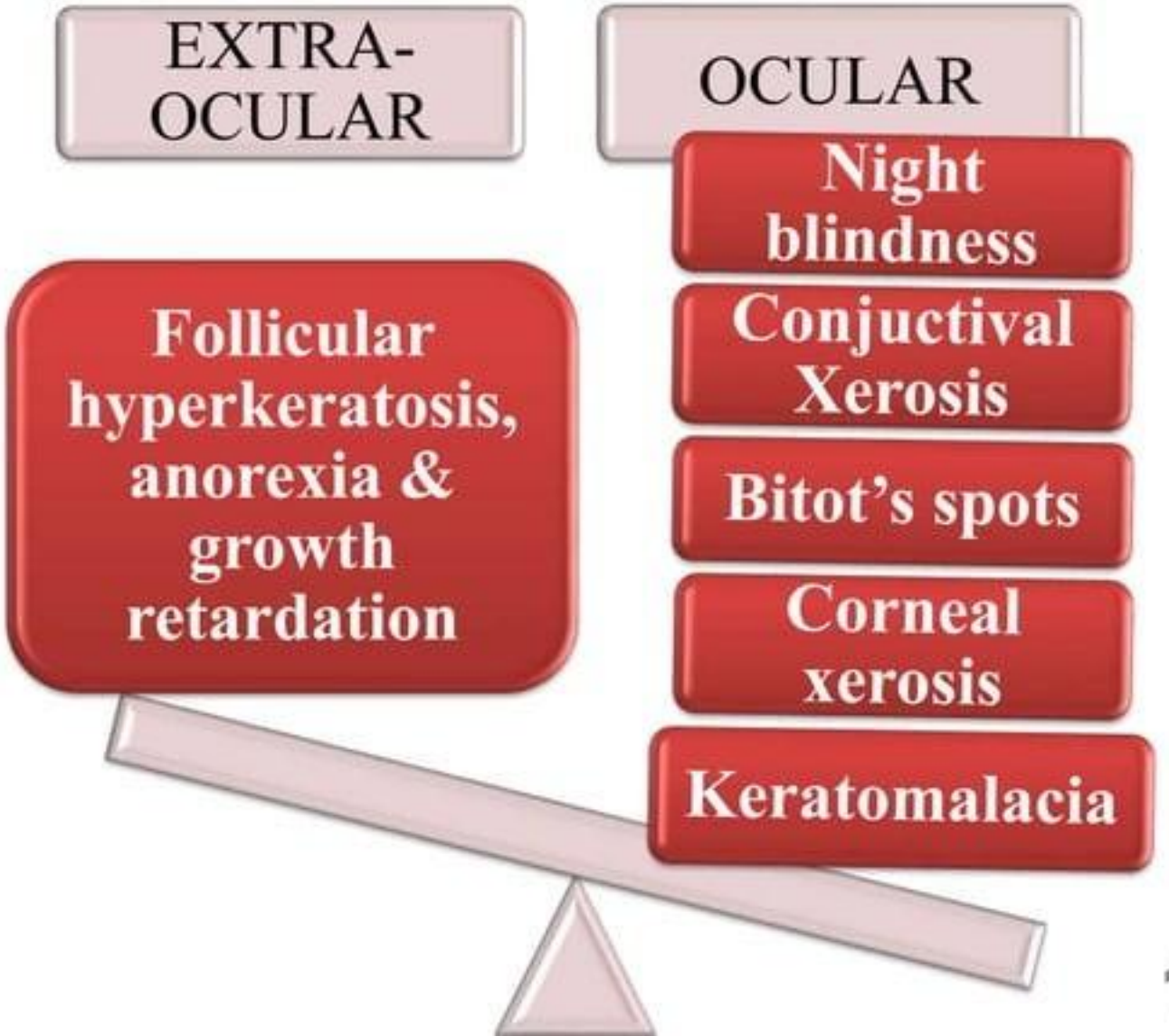
STORAGE

- **Liver** has an **enormous capacity** for **storing Vit.A** in the form of **retinol palmitate**
- Under **normal** conditions, a **well fed** person has **sufficient Vit.A reserves** to meet his needs for **6-9months or more**
- **Free retinol** is HIGHLY ACTIVE BUT TOXIC, so it is **transported** in the **blood** stream by **combining with retinol binding protein** (produced in the **liver**)
- So, in **severe protein deficiency**, ↓sed production of retinol binding protein **prevents mobilization of liver retinol reserves**.

Deficiency-WHO statistics

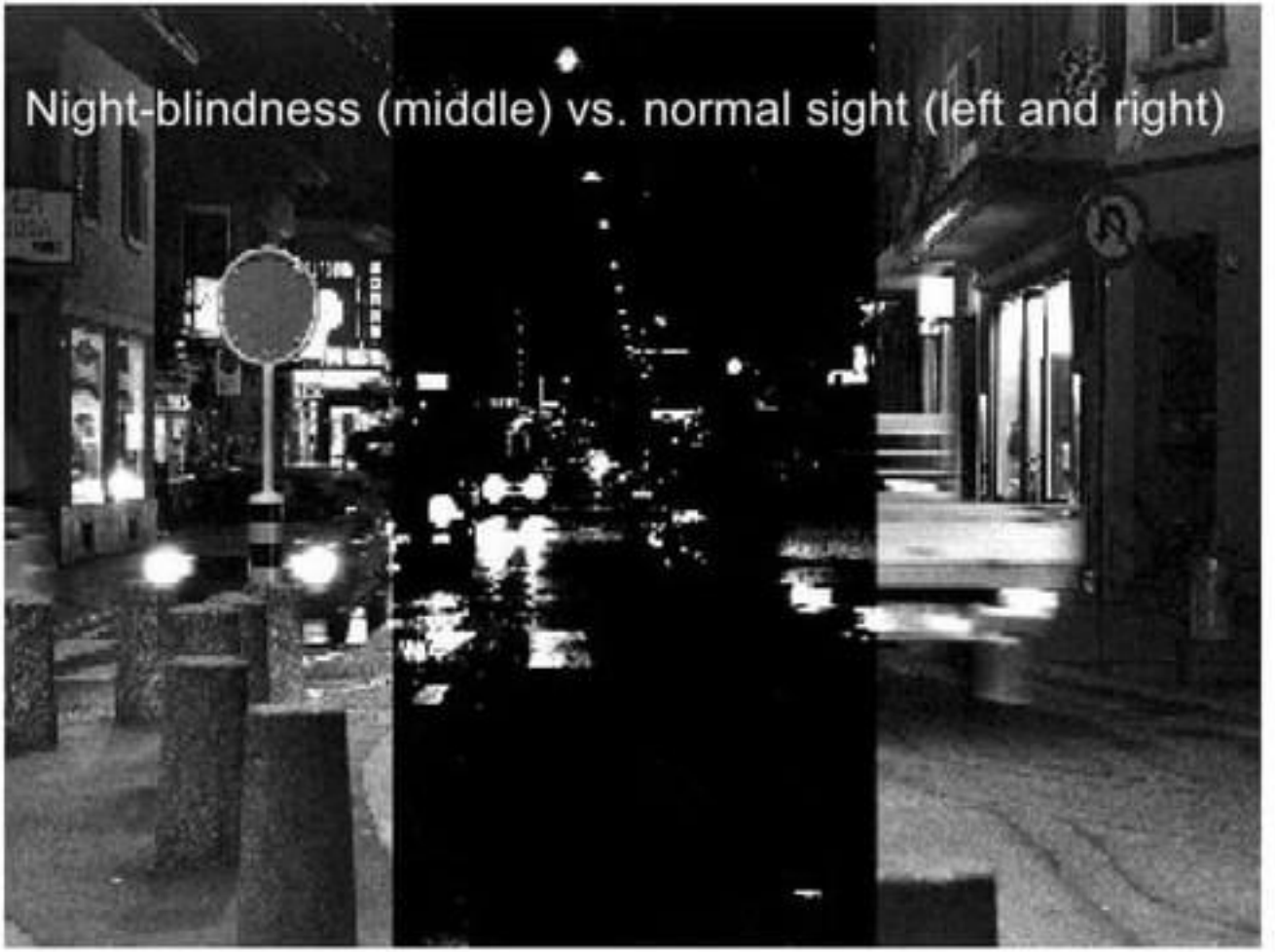
- An estimated **250 million preschool children** are **vitamin A deficient** and it is likely that in vitamin A deficient areas a **substantial proportion** of **pregnant women** is vitamin A deficient.
- An estimated **250 000 to 500 000 vitamin A-deficient children** become **BLIND EVERY YEAR**, **half** of them **DYING** within 12 months of losing their sight.

DEFICIENCY


EXTRA-OCULAR
OCULAR
Night blindness
Conjuctival Xerosis
Follicular hyperkeratosis, anorexia & growth retardation
Bitot's spots
Corneal xerosis
Keratomalacia

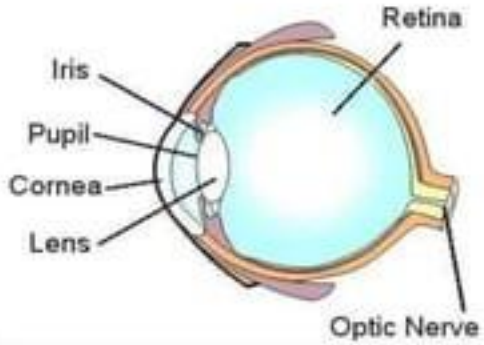
A) NIGHT BLINDNESS

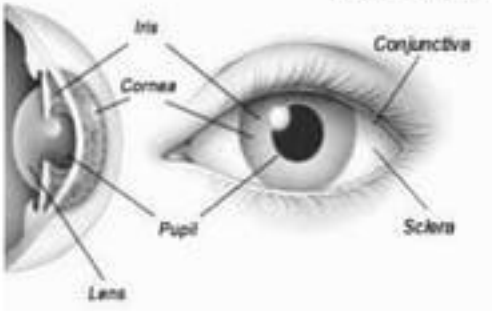
- **Lack of Vit. A** FIRST causes Night blindness.
- It is the **inability to see in** DIM LIGHT.
- It occurs due to **impairment in dark adaptation.**
- The condition may get **worse** if **Vit. A is not taken**, especially if they suffer from **diarrhoea** and other infections.


Night-blindness (middle) vs. normal sight (left and right)

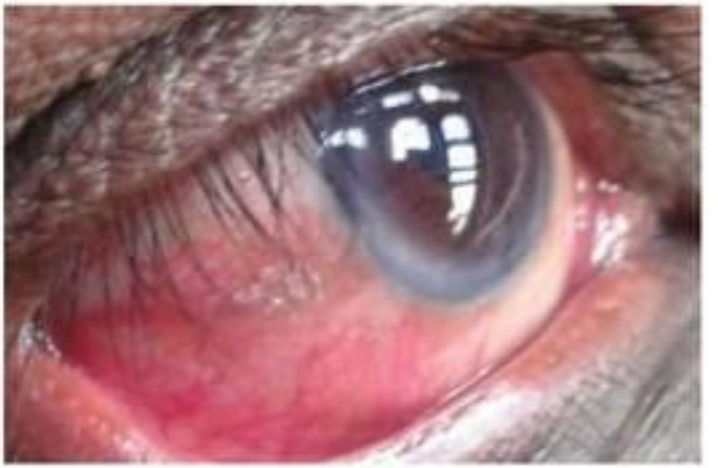
B) CONJUNCTIVAL XEROSIS

- It is the FIRST SIGN of Vit.A deficiency.
- The conjuctiva becomes **dry** and **non-wettable**
- It appears **muddy** and **wrinkled** (instead of smooth and shiny)





Conjunctival xerosis is described as
"emerging like sand banks at receding tide"



C) BITOT'S SPOTS

- They are **triangular**, **pearly white** or **yellowish**, **foamy spots** on the BULBAR CONJUCTIVA on either side of the CORNEA.

- Usually **bilateral**
- In YOUNG children, it indicates **Vit.A deficiency**
- In OLDER individuals, it is often an **inactive sequelae** of earlier disease.

BITOT'S SPOT

Triangular pearly white or yellowish foamy spots on bulbar conjunctiva on either side of the cornea.

D) CORNEAL XEROSIS

- The cornea appears **dull**, **dry** and **non-wettable** and eventually **opaque**. This stage is VERY SERIOUS.
- In more SEVERE DEFICIENCY, there maybe **corneal ulceration**
- The ulcer may **heal** leaving a **corneal scar** which may **affect vision**.

Corneal xerosis
with corneal ulcer

Corneal Scar

E) KERATOMALACIA

- It is the **liquefaction of the cornea**. This is an MEDICAL EMERGENCY.
- The cornea(a part or the whole) may become **soft** and may **burst open**.
- This process is **rapid** and if the **eye collapses**, **vision is lost**.

XEROPTHALMIA (dry eye)

- It refers to **ALL the ocular manifestations** of Vit.A deficiency.
- It is a serious nutritional disorder **leading to blindness** particularly in **South-East Asia**.
- It is MOST COMMON in children aged **1-3yrs**, and often related to **weaning**
- It is associated with **PEM**

- Associated risk factors include i**gnorance, faulty feeding practises** and **infections** (diarrhoea and measles)
- **Andra Pradesh, Tamil Nadu, Karnataka, Bihar** and **West Bengal** are BADLY AFFECTED.
- The rest of the **North Indian states** have LESSER cases of xeropthalmia.

EXTRA-OCULAR MANIFESTATIONS

- Consists of **follicular hyperkeratosis, anorexia and growth retardation**.
- Even a MILD Vit.A deficiency causes an **increase in morbidity and mortality** due to RESPIRATORY & INTESTINAL INFECTIONS?

Follicular hyperkeratosis
(Thorny skin / Phrynoderma)
Cone shaped elevated papules due to thickening of Stratum corneum.

TREATMENT

- Vit. A deficiency should be **treated urgently**
- Nearly ALL the early stages of Xeropthalmia can be REVERSED by:

  Administration of MASSIVE DOSE of **200,000 IU** (or 110mg) of **retinol palmitate** ORALLY on **2 successive days.**

- ALL children with **corneal ulcers** are given **Vit. A** whether or not a deficiency is suspected,

Timing	Vitamin A dosage
Immediately on diagnosis	
<6months of age	50,000 IU
6-12 months of age	1 lakh IU
>12months of age	2 lakh IU
Next day	Same age specific dose
At least 2 weeks later	Same age specific dose

PREVENTION & CONTROL

SHORT TERM	• Administration of large doses of **Vit.A**
MEDIUM TERM	• **Fortification** of food
LONG TERM	• **Reduction** or **elimination of factors** contributing to ocular disease

❖ SHORT TERM ACTIONS

NATIONAL INSTITUTE OF NUTRITION
Hyderabad, INDIA.

- A simple technology was developed by the **National Institute of Nutrition** (Hyderabad) .
- The strategy is to administer SINGLE MASSIVE DOSE of **Vit. A** in oil(**retinol palmitate**) ORALLY.

Age group	Dose	Duration
Children <12months	1,00,000 IU	Once every 4-6months
Children >12months	2,00,000 IU	Once every 4-6months
Child bearing age	3,00,000IU	Within 1month of delivery

❖MEDIUM TERM ACTIONS

- **FORTIFICATION** of certain food [such as **dalda(vanaspati), margarine & dried skimmed milk**] with **Vit. A**
- Fortification is successful only if the **chosen food** is consumed in **sufficient quantities** by groups at risk

❖ LONG TERM ACTIONS

REDUCING or ELIMINATING the frequency and severity of **contributory factors to ocular disease** (PEM, respiratory tract infections, diarrhoea, measles)-

i. To **consume** green leafy vegetables or other Vit.A rich food

ii. Promotion of **breast feeding**

iii. Improvements in **environmental health** (such as ensuring safe and adequate WATER SUPPLY, maintenance of SANITARY LATRINES to safeguard against diarrhoea)

iv. Immunization against infectious diseases (measles), **prompt treatment** of diarrhoea and other infections

v. Better **feeding** of infants and young children

vi. Improved health services for mothers and children

vii. Social and **health** education.

VIT.A DEFICIENCY IN INDIA

- It is a major **controllable** PUBLIC HEALTH and NUTRITIONAL PROBLEM in India
- **5.7%** of children suffer from **eye signs** of Vit.A deficiency
- Even mild Vit.A deficiency probably increases morbidity and mortality in children

- In **1970**, a **national programme for prevention of nutritional blindness** was initiated to fight this deficiency.
- **Vit.A supplementation** is an integral part of **RCH programme** (now a part of NRHM). It covers children upto **5yrs** of age.

- The programme focuses on:
  a) PROMOTING **consumption of Vit.A rich food** by PREGNANT AND LACTATING WOMEN and by CHILDREN UNDER 5 YRS OF AGE and appropriate **breast feeding**
  b) ADMINISTRATION of **massive dose of Vit.A** up to **5yrs** of age.
     - **First dose** of **1lakh IU** with MEASLES VACCINATION at 9months
     - **Second dose** of **2lakh IU** after 9 months (at 16-18 months, with DPT booster)
     - **Subsequent doses** of **2lakh IU**, every 6months upto the age of 5yrs.
  c) For **sick** children
     - All children with **xeropthalmia** to be treated at **health facilities**
     - All children suffering from **measles** to be given **1 dose of Vit.A** (if they HAVEN'T RECEIVED in the previous 1 month)
     - All cases of **severe malnutrition** to be given **1 additional dose of Vit.A**

ASSESSMENT OF VIT. A DEFICIENCY

- It is done by **population surveys** employing both CLINICAL and BIOCHEMICAL criteria
- The surveys are done on **preschool children(6months to 6years)** based on **prevalence criteria**
- Presence of **any one** of the criteria should be considered as EVIDENCE of a **xeropthalmia problem** in the community.

CRITERIA	PREVALENCE IN POPULATION AT RISK (6MONTHS-6YRS)
Nightblindness	> 1%
Bitot's spots	>0.5%
Corneal xerosis/corneal ulceration/keratomalacia	>0.01%
Corneal ulcer	>0.05%
Serum retinol (< 10mcg/dl)	>5%

RECOMMENDED ALLOWANCES

GROUP	RETINOL(mcg)	ß CAROTENE(mcg)*
ADULTS		
Man	600	4800
Woman	600	4800
Pregnancy	800	6400
Lactation	950	7600
INFANTS		
0-6months	350	-
6-12months	350	2800
CHILDREN		
1-6yrs	400	3200
7-9yrs	600	4800
ADOLESCENTS		
10-17yrs	600	4800

*Conversion ratio of 1:8 used

TOXICITY

- An EXCESS intake of **RETINOL** causes **nausea, vomiting, anorexia** and **sleep disorders** followed by **skin desquamation** and then **enlarged liver** and **papillar oedema.**
- HIGH intakes of **CAROTENE** may **colour plasma** and **skin.**

THANK YOU