

Mother and child undernutrition – Vitamin A deficiency
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Undernutrition among mothers and children is the underlying cause of a third of all child deaths and more than 10% of the total global disease burden ¹. The situation is probably worse in Southern Sudan where rates of undernutrition are high ². The immediate causes of undernutrition are a nutrient-deficient diet and frequent infections. Here we describe vitamin A deficiency, future articles will cover other types of malnutrition.

Vitamin A deficiency disorders

Worldwide vitamin A deficiency (VAD) ^a:

- Affects about 25% of young children with equatorial Africa (and probably Southern Sudan) having some of the highest rates ¹.
- Causes about 6% of young child deaths ¹.
- Affects at least 6% of pregnant women ³.

^a Footnote. Vitamin A deficiency is defined as 'liver stores of vitamin A of less than 20mcg /g' ⁴.

Groups at risk of VAD are those who have:

- Diets lack vitamin A especially they are also low in fat – see Box 1.
- Frequent infections - especially diarrhoea, measles, respiratory diseases, intestinal parasites and HIV. These infections reduce appetite, damage the gut and/or increase needs.
- High needs (for their size) for vitamin A (e.g. young children and pregnant/lactating women ^{5b})

Hence VAD is seen most often among young children, pregnant and lactating women, those with HIV, and, sometimes, people in emergency situations.

^bFootnote. The units of retinol activity equivalents/day needed by: men are 600 mcg, young children 400 mcg, pregnant/breastfeeding women 800-850 mcg ⁵.

VAD results in reduced immunity (so increased mortality from infections), anaemia (due to impaired transport of iron), poor growth and, in severe cases, xerophthalmia and blindness - see Box 2.

Box 1. About vitamin A

Vitamin A occurs mainly as 'retinol' in animal foods and as 'β-carotene' in plant foods ^c. The bio-availability of carotene is about 1/12 that of retinol but is improved if the food is cooked and the meal contains fat.

Good sources include:

- As retinol: liver from animals and fish, kidney, breastmilk and colostrum, milk fat/butter, whole dried fish, egg yolk.
- As β-carotene: pumpkins and other orange fleshed vegetables (but not tomatoes), paw paws, mangoes, yellow bananas (if eaten in large amounts) and dark/medium green leaves.

^c Footnote. Vitamin A is measured in 'micrograms retinol activity equivalents' (mcg RAE). Approximately 2 mcg β-carotene in oil and 12 mcg β-carotene in mixed food converts in the body to 1 mcg RAE. Vitamin A in pharmaceutical supplements may be measured in International units (IU). 1 IU = 0.3 mcg RAE.

Diagnosing VAD

Box 2 describes how to diagnose xerophthalmia. There are no simple tests for moderate VAD but in Southern Sudan VAD is likely to affect all at-risk groups especially at times when, or in places where, VAD-rich foods are scarce, or infection and malnutrition rates high.

VAD is termed a significant health problem if:

- At least 5% of women had night blindness during their previous live-birth pregnancy *and/or*
- The under five year old death rate is >50 per 1 000 live births ⁴.

Controlling VAD

Ways to control VAD include:

1. Encouraging the consumption of more vitamin A-rich foods (including breastmilk and colostrum). So discuss with community groups:
 - Why vitamin A-rich foods are important especially for women and young children.
 - Which local foods are rich in vitamin A, and are good value for money or easy to produce.
 - Practical ways to produce, preserve and cook these foods.
2. Giving vitamin A supplements.
3. Preventing infections. For example, by breastfeeding, immunisations, impregnated bednets and deworming.

Vitamin A supplements

Vitamin A supplements are usually given orally as high dose capsules. Table 1 shows a schedule to prevent vitamin A deficiency. *Never* normally give a high dose to a woman who might be pregnant because it can harm her foetus. It *is* safe for pregnant women to take low dose supplements and to eat plenty of vitamin A foods.

If a child has:

- Prolonged or severe diarrhoea, acute respiratory infection, chicken pox, severe malnutrition and other severe infections, give one high dose as in Table 1 (unless the child has had a dose within the previous month). If the child is under 6 months give a single dose of 50,000 IU (one white capsule).
- Measles but no eye signs give a second dose the following day.
- Any signs of xerophthalmia and/or severe malnutrition give another dose after 2 weeks (see Box 2).

When giving high dose capsules:

- Explain why they are needed and that they are safe.
- Cut the capsule near its base of the nipple and squeeze the contents into the mouth.

Side effects (e.g. bulging fontanel or vomiting) are rare, and not serious or long lasting.

Table 1. Vitamin A supplements to prevent vitamin A deficiency

Group	Dose	Type of capsule supplied by UNICEF
Infants 6 to 11 months	100,000 IU Every 4-6 months	Three drops from red capsule or One blue capsule
Children 12 to 59 months	200,000 IU Every 4-6 months	One red capsule or Two blue capsules
Post partum women	200,000 IU single dose <i>within 8 weeks of delivery</i>	One red capsule or Two blue capsules

Based on data in reference 6.

Box 2. Xerophthalmia

The term 'xerophthalmia' describes all the eye signs of VAD – see Table 2.

Table 2. Signs of xerophthalmia

Sign	Description
Night blindness	Inability to see in dim light (e.g. at dawn or dusk). Often occurs in the later part of pregnancy.
Conjunctival xerosis	The conjunctiva looks dry and slightly rough instead of smooth and shiny.
Bitot's spots	White foamy patches on the conjunctiva. Not always present.
<i>Active corneal lesions: At this stage the condition can worsen within a few hours and complete or partial blindness can result.</i>	
Corneal xerosis	The cornea looks dry and cloudy.
Ulcers on the cornea	Often on the edge of the cornea.
Keratomalacia	The cornea is cloudy and soft like jelly. Rare.

To diagnose:

- Ask about night blindness. This is a useful sign especially if there is a local word for it.
- Examine each eye *very gently* for the signs in Table 2.

To treat:

- If there are *any* signs of xerophthalmia give high dose vitamin A as in Table 3.
- Active corneal lesions are a *medical emergency* so *immediately* start the treatment schedule in Table 3 - even for pregnant women. If you have no high-dose capsules give any other vitamin A supplement and refer.
- If the eyes have ulcers or look soft or cloudy⁷:
 - put 1 drop of 0.1% atropine into the affected eye to relax it and prevent the lens pushing out. Do this 3 times/day for 3-5 days.
 - instil chloramphenicol or tetracycline eye drops (as required 2-3 hourly for 7-10 days). Never use ointment containing steroids.

- put 0.9% saline soaked pads on the affected eye(s) and bandage.
- if necessary bandage the hands to prevent a child touching the eyes.

Table 3. Treatment schedule for those with xerophthamia or severe acute malnutrition⁶

	Vitamin A IU		
	Immediately*	Next day (day 2)	Day 14
Children:			
- Under 6 months	50,000	50,000	50,000
- 6-11 months	100,000	100,000	100,000
- 12 months and over	200,000	200,000	200,000
All adults except reproductive-age women**	200,000	200,000	200,000
Reproductive-age women	10,000 daily or 25,000 weekly for at least 4 weeks		

See Table 1 for colour of capsule to use.

* Unless received a dose in the previous month.

** Do give high doses to reproductive-age women *if there are corneal lesions*. Then the risk of blindness outweighs the risk of damage to the foetus if she is pregnant.

References

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Useful websites on VAD: Helen Keller International www.hki.org; Micronutrient Initiative www.micronutrient.org; Micronutrient Forum <http://www.micronutrientforum.org>; SIGHT AND LIFE www.sightandlife.org.

I declare I have no conflict of interest.

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Thanks to:

- Paluku Bakwere, Cicely Clarke, Nicky Dent, Philippe Donnen and Bertha Jackson for contacts and comments.

- SIGHT AND LIFE (www.sightandlife.org) for permission to use their photographs.

Captions for photographs:

1. "Giving a high dose vitamin A capsule (from SIGHT AND LIFE)"
2. "Child with severe xerophthalmia (from SIGHT AND LIFE)"



