

MODULE

Vitamin A Deficiency

For the Ethiopian Health Center Team



Lisanu Tadesse, M.D; Dawit Shawel, B.Sc.; Yirga Kidanu, M.D.;
Girmay G/Meskel, M.D.; Helen Yifter, M.D.;
and Afeworki Mulugeta, B.Sc., M.Sc.

Mekelle University

In collaboration with the Ethiopia Public Health Training Initiative, The Carter Center,
the Ethiopia Ministry of Health, and the Ethiopia Ministry of Education

2005



Funded under USAID Cooperative Agreement No. 663-A-00-00-0358-00.

Produced in collaboration with the Ethiopia Public Health Training Initiative, The Carter Center, the Ethiopia Ministry of Health, and the Ethiopia Ministry of Education.

Important Guidelines for Printing and Photocopying

Limited permission is granted free of charge to print or photocopy all pages of this publication for educational, not-for-profit use by health care workers, students or faculty. All copies must retain all author credits and copyright notices included in the original document. Under no circumstances is it permissible to sell or distribute on a commercial basis, or to claim authorship of, copies of material reproduced from this publication.

©2005 by Lisanu Tadesse, Dawit Shawel, Yirga Kidanu, Girmay G/Meskel, Helen Yifter, and Afeworki Mulugeta

All rights reserved. Except as expressly provided above, no part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or by any information storage and retrieval system, without written permission of the author or authors.

This material is intended for educational use only by practicing health care workers or students and faculty in a health care field.

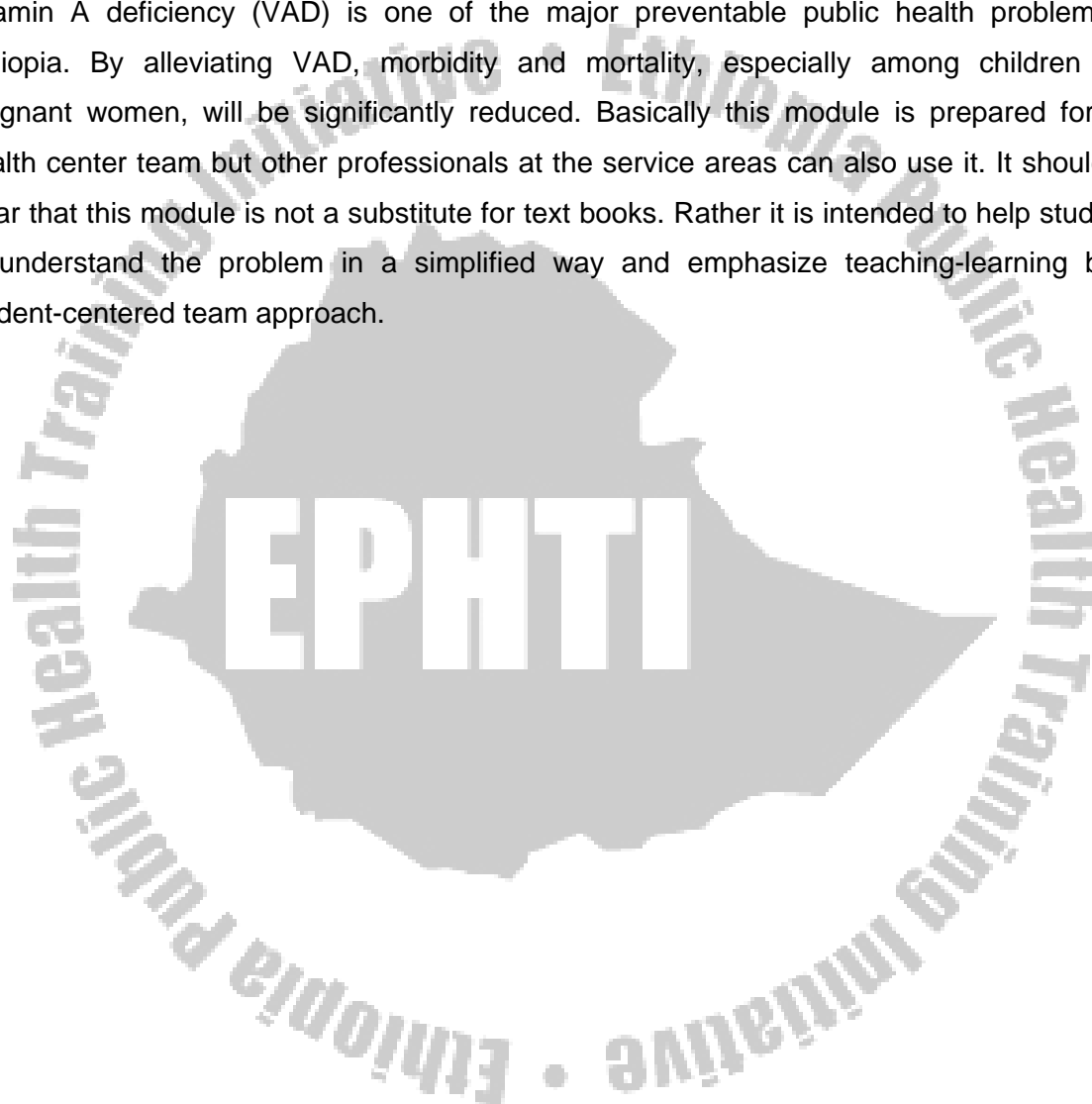
TABLE OF CONTENTS

Table of contents.....	i
Preface	ii
Acknowledgements	iii
UNIT ONE: Introduction	
1.1 Purpose and uses of this module.....	1
1.2 Directions for using the module	1
UNIT TWO: Core Module	
2.1. Pre Test.....	3
2.2. Significance and brief description of VAD	11
2.3. Learning Objectives	12
2.4. Case Study-Learning Activity I	13
-Learning Activity II	15
2.5. Vitamin A.....	16
2.6. Definition of VAD.....	18
2.7. Epidemiology.....	18
2.8. Etiology and Pathogenesis	20
2.9. Clinical features.....	22
2.10. Diagnosis	23
2.11. Case Treatment and Management of VAD.....	24
2.12. Prevention and Control	25
UNIT THREE: Satellite Modules	
3.1 Satellite Module for Public Health Officers	32
3.2 Satellite Module for Public Health Nurses	34
3.3 Satellite Module for Environmental Health Technicians	37
3.4 Satellite Module for Medical Laboratory Technicians	38
3.5 Satellite Module for Community Health Workers /Health Service Extension workers	40
3.6 Take Home Message for Caregivers/Self Care	44
UNIT FOUR: Roles and Tasks Analysis	45
UNIT FIVE: Glossary	48
UNIT SIX: Abbreviation/Acronyms	50
UNIT SEVEN: Bibliography	51
UNIT EIGHT: Annexes	52
Annex I Answer keys to pre- and post-test	52
Annex II List of Authors.....	55

PREFACE

The need for education teaching materials in addition to the usual text and reference books is increasing due to increased demands. Hence, many modules to fill this gap have been prepared and are being prepared by EPHTI/Carter Center.

Vitamin A deficiency (VAD) is one of the major preventable public health problems in Ethiopia. By alleviating VAD, morbidity and mortality, especially among children and pregnant women, will be significantly reduced. Basically this module is prepared for the health center team but other professionals at the service areas can also use it. It should be clear that this module is not a substitute for text books. Rather it is intended to help students to understand the problem in a simplified way and emphasize teaching-learning by a student-centered team approach.



ACKNOWLEDGMENTS

We would like to thank Mekelle University, College of Health Sciences and the Carter Center (EPHTI) for funding and giving us the opportunity to prepare this module. In addition to this we also thank our staff members for their valuable comments during the review of the module.

Special thanks to Ato Melkie Edris who reviewed the draft module and gave us valuable comments. We also thank Don Belcher (MD), Troy A. Jacobs (MD, MPH), Tefra Belachew (MD, MPH), and Tezera Fisseha (BSc, MD, MPH) who critically reviewed the final draft module.

Last but not least we would like to thank Dr. Hailu Yeneneh, Resident Technical Advisor, and Ato Aklilu Mulugeta, Business Manager for The Carter Center, Addis Ababa for the support and encouragement. Without their support this material wouldn't have been completed.



UNIT ONE

INTRODUCTION

1.1. Purpose and use of the module

The lack of appropriate and relevant teaching materials is one of the bottlenecks that hinders training of effective, competent task-oriented professionals who are well versed with the knowledge, attitudes and skills that would enable them to solve the problems of their communities. Preparation of such teaching material are an important milestone in an effort towards achieving these long-term goals.

The preparation of this module has considered national guidelines developed by the MOH on prevention and control of micronutrients, Essential nutrition action and strategies for infant and young child feeding and treatment of severe acute malnutrition.

The basic concepts about the disease and its causation, epidemiology, clinical features, case management, and prevention and control strategies are discussed in simple and quite understandable ways.

This module is intended to serve as general learning material about Vitamin A deficiency (VAD) by the health center team: Health Officers, Public Health Nurses, Environmental Health Technicians and Laboratory Technicians.

It can also be used by other categories of health professionals. It should be noted, however, that it is not a substitute for standard textbooks. It may also be used as training resources in trainings, workshops, and seminars for members of the health center team and community health workers and as source of information for care givers and patients.

1.2. Directions for using the module

Before reading this module, please follow the directions given below.

- ❖ Start with the pre test then read the module.
- ❖ Use a separate sheet of paper to write your answers and label it "Pretest answers".

The pretest has two sections: section 1 and section 2.

Section 1: Comprises questions to be answered by all health professionals.

Section 2: Contains the questions that are prepared for each category of health center team: health officer, public health nurse, and environmental health technicians and laboratory technician. Select and do the questions for your profession.

- After reading the core module, you should proceed to satellite module related to your profession.
- Read the task analysis for the health center team members and compare it with that of your own.
- Do the post test after going through the whole part
- Compare your performance with the pre-test



UNIT TWO

CORE MODULE

- 2.1 Pre test
- 2.2 Significance and brief description of the problem
- 2.3 Learning objectives
- 2.4 Case Study
- 2.5 Definition of Vitamin A
- 2.6 Definition of Vitamin A deficiency (VAD)
- 2.7 Epidemiology
- 2.8 Etiologies and Pathogenesis
- 2.9 Clinical Features
- 2.10 Diagnosis
- 2.11 Case Management
- 2.12 Prevention and Control

2.1. Pre Test

2.1.1. Pre Test for the core module

Attempt all the following questions

1. Which community group has the greatest risk of developing VAD?
 - A. Children from 6-59months of age
 - B. Pregnant women
 - C. Lactating women
 - D. All of the above
 - E. None of the above
2. What is your assessment if community 'x' has 0.8% Bitot's spot prevalence?
 - A. VAD is considered as public health problem
 - B. VAD isn't considered as public health problem
 - C. There is insignificant numbers of people who have VAD
 - D. All of the above
 - E. None of the above

3. How much percent of childhood mortality can be reduced by correcting Vitamin A deficiency?
- A about 5%
 - B about 5-10%
 - C about 23-34%
 - D All of the above
 - E None of the above
4. What is a significant [the most important] source of Vitamin A during young infancy?
- A Animal diet
 - B Green leaf vegetables
 - C Breast milk
 - D All of the above
 - E None of the above
5. What are risk factors for developing VAD in children?
- A Diarrhea
 - B Respiratory infections
 - C Inadequate Intake
 - D All of the above
 - E None of the above
6. Which one of the following clinical signs and symptom comes first in VAD?
- A Corneal ulceration
 - B Keratomalacia
 - C Night blindness
 - D Corneal scarring
 - E None of the above
7. Which parts of the body are mainly affected by VAD?
- A Liver
 - B Eye
 - C Lungs
 - D All of the above
 - E None of the above
8. Vitamin A has a cyclic pattern in its deficiency with infection
- A/true false

9. Most people with VAD have clinical sign and symptom
A/true also
10. The foamy and whitish cheese like lesion that develop around the lateral eyeball, causing severe dryness in the eye is called
- A Corneal ulceration
 - B Bitot's spot
 - C Corneal scarring
 - D All of the above
 - E None of the above
11. Which of the following diseases has the greater risk for the coincident development with VAD in childhood?
- A Measles
 - B Tuberculosis
 - C Malaria
 - D All of the above
 - E None of the above
12. Which one of the following statements explains the effect of infection on VAD?
- A Increased metabolic demands
 - B Decreased appetite
 - C Decreased absorption of vitamin A
 - D All of the above
 - E None of the above
13. Almaz is a 10 year old girl who has whitish material in her eye, what are some of the common complaints expected from her ?[revisiting]
- A Repeated diarrheal disease
 - B Presence of dry and scaly skin
 - C Feeling of dryness in the eye
 - D All of the above
 - E All except C
14. Xerophthalmia is a range of clinical signs due to VAD, which includes
- A Night blindness
 - B Bitot's spots and dryness
 - C Conjunctivitis
 - D A and B
 - E None of the above

15. Which method is mainly used for the diagnosis of VAD in our country?
- A Laboratory investigation
 - B Clinical signs and symptoms
 - C Both
 - D All of the above
 - E None of the above
16. What is a late stage of VAD?
- A Corneal ulceration
 - B Night blindness
 - C Keratomalacia
 - D All of the above
 - E None of the above
17. VAD is a preventable problem
- A. True
 - B. False
18. List the main types of intervention strategies in prevention of VAD.
19. Promoting exclusive breast-feeding for the first six month is the best way to protect infants from VAD?
- A/True
 - B/false
20. Improving vitamin A status of children can reduce the risk of death from measles by 50%.
- A/True
 - /false
21. Improving vitamin A status helps in
- A Reducing birth defects
 - B Improving resistance to infection
 - C Reducing anemia through its action on cell maturation
 - D All of the above
 - E None of the above

2.1.2. Pre Test for the Public Health Officers

Attempt all of the following questions

1. VAD is one of the major public health problems in Ethiopia.
 - A. True
 - B. False
2. Preventing VAD in the public can bring about
 - A. Decreased child mortality
 - B. Decreased childhood blindness.
 - C. Decreased Maternal Mortality.
 - D. All of the above
 - E. None of the above
3. Which of the following is false?
 - A. Vitamin A is lipid-soluble.
 - B. The body cannot synthesize vitamin A.
 - C. Vitamin A is principally stored in the liver.
 - D. A zinc deficient person has difficulty in utilizing the absorbed and stored retinyl ester.
 - E. None of the above
4. All are functions of vitamin A except
 - A. It is important for growth
 - B. It has a role in reproduction
 - C. It helps for cell differentiation and proliferation
 - D. It may prevent cancer
 - E. None of the above
5. Which one of the following diets does not contain vitamin A?
 - A. Breast milk
 - B. Egg yolk
 - C. Rice
 - D. Carrot
 - E. Butter

6. Which of the following prevalence in <5 years old children shows VAD is a problem of public health importance?
- A Corneal xerosis – 0.2 %
 - B Bitot's spot – 0.3 %
 - C Night blindness – 0.8 %
 - D Corneal scarring – 0.01 %
 - E Non of the above e
7. An early sign of VAD is
- A Bitot's spot
 - B Corneal xerosis
 - C Corneal scarring
 - D Blindness
 - E None of the above
8. Which of the following are causes of VAD?
- A Fat malabsorption
 - B Inadequate intake of vitamin A
 - C Chronic intestinal disorder
 - D All of the above
 - E A and B
9. Pregnant and lactating mothers have an equal chance of acquiring VAD as women of childbearing age.
- A. True
 - B. False
10. One is true about the consequences of VAD in the body?
- A The retina is the first tissue to be affected
 - B There is an increased risk for a person with VAD to develop pancreatitis and UTI
 - C VAD may result in respiratory obstruction
 - D All of the above
 - E None of the above
11. One of the following is false.
- A VAD is the leading preventable cause of childhood blindness.
 - B Improving vitamin A status helps to reduce maternal mortality.
 - C Improving vitamin A status reduces health cost
 - D Risk of death from measles can be reduced by 50% by improving vitamin A status
 - E None of the above

8. Intervention measures for VAD include all of the following except

- A Tell the patient not to walk at night time
- B Advise patients not to rub their eyes with their hands
- C Encourage patients to have a balanced diet
- D Advise patients on their personal hygiene
- E None of the above

2.1.4. Pre Test for Environmental Health Technicians /Sanitarians/

Attempt all of the following questions

1. Children, pregnant and lactating mothers are the groups most affected by vitamin A deficiency (VAD).

- A) True
- B) False

2. Poor environmental and personal hygiene can lead to vitamin A deficiency (VAD).

- A) True
- B) False

3. Infection control is not one of the strategies in the prevention and control of vitamin A deficiency (VAD).

- A) True
- B) False

4. Which one of the following is not a cause of vitamin A deficiency(VAD)?

- A Inadequate intake
- B Increased excretion
- C Chronic diarrhea
- D All of the above
- E None of the above

5. The strategies to prevent and control vitamin A deficiency(VAD) include

- A Food fortification
- B Breast feeding
- C Vitamin A supplementation
- D Infection control
- E All of the above

6. Select the food that is not rich in Vitamin A

- A Milk
- B Liver
- C Teff
- D Carrot
- E Papaya

2.1.5. Pre Test for Medical Laboratory Technicians

Attempt all of the following questions

1. Sub clinical VAD is easily diagnosed in the ordinary health center laboratory.
A. True B. False
2. Which of the following could precipitate VAD?
A Persistent diarrhea
B Recurrent ARI
C Measles
D All of the above
3. A stool exam can be the definitive diagnostic measure for vitamin A deficiency (VAD)
A. True B. False
4. Which one of the following materials is/are not used for direct preparation of stool specimen?
A Slide
B Test tube
C Microscope
D Normal saline
E None of the above
5. After centrifuging a urine specimen, which part of the layers is used for microscopic examination?
A Sediments
B Supernatant
C .A and B
D None of the above

2.2 Significance and brief Description of the problem

Vitamin A deficiency (VAD) is one of the most common micronutrient deficiencies. It is a major public health problem in more than 118 countries. VAD affects more than 140-250 million preschool children worldwide. Where VAD exists it is responsible for as many as one out of every four-child deaths.

Clinical and sero-epidemiologic studies indicate that vitamin A deficiency is widespread throughout the developing world. Vitamin A deficiency has long been recognized in much of South and Southeast Asia (India, Bangladesh, Indonesia, Vietnam, Thailand, and the

Philippines) by the common presentation of clinical cases of xerophthalmia (night blindness to permanently blinding keratomalacia). Subsequent studies in Africa, where it had been less well recognized, indicated that a large proportion of pediatric blindness was due to acute deterioration in vitamin A status during measles and similar childhood infections. Children with VAD are also more likely to have severe measles and severe or prolonged diarrhea. Children from 6 to 59 months old and women during pregnancy and lactation have the greatest risk of developing VAD. Ethiopia has a high prevalence of VAD. In one study, the prevalence of xerophthalmia was 10.9% and Bitot's spot 8.8 % according to the 1997 survey in Arsi Zone

Vitamin A deficiency is associated with a higher childhood morbidity and mortality than recognized xerophthalmia cases as would have predicted. This discovery led to the recognition that seemingly mild biochemical deficiency, insufficient to cause xerophthalmia, accounts for large numbers of preventable childhood deaths. New research also suggests that VAD may also be an important factor affecting the risk of maternal mortality. It is now estimated that correcting VAD can reduce child mortality by about 23% - 34% and, therefore elimination of VAD, as a public health problem must be a principal element of child survival programs and strategies in Ethiopia.

In the past, VAD had been seen merely as a cause of blindness. In many countries VAD prevention objectives are still limited to blindness prevention programs. Although more than 70 countries have embraced the global goal of eliminating VAD as a public health problem, progress has been slow, largely because of the costs and challenges to changing behavior (to balanced diets), delivering large-dose supplements regularly, and fortifying traditional dietary items. New tools, such as genetically modified staple crops, could provide important strategies in the future.

2.3 Learning Objectives

At the end of this module, the student will be able to:

1. Recognize VAD as a major public health problem of Ethiopia.
2. Identify the etiology, pathogenesis and the clinical feature of VAD
3. Describe the method of diagnosis and management of VAD
4. Describe the strategies for the prevention and control of VAD
5. Describe the role and task of each category of health professional and family members related to control and prevention of VAD.

6. Describe the take home messages on VAD for care givers/self care to be delivered during different contacts.

2.4. Learning Activity

Learning Activity I: Case Study

Birhane is a seven year old child. He has just come home yesterday with his father. Their house is located in the Awo village, which is found in the North West Tigray region in the Erob woreda, where the staple diet is wheat. The village has a serious problem getting safe water and all families use pond water that is not protected. His family has been semi pastoralist for the past three years.

It is a bright summer afternoon, Lemlem, Birhane's five year old sister is sitting in the backyard of their hut, waiting for her hard-working parents to return from the fields. Lemlem has had diarrhea for the past 10 days. She is feeling a discomfort in her eye. Any way, who cares? She is playing with a doll she made in the morning. Now her elder brother comes to distract her from her play.

Birhane asked, "Hey, Lemlem, do you want to play 'hide and seek'? You can never catch me!"

Lemlem's face brightened with a lovely smile as she got up to take the challenge. She knew she could find Birhane anywhere he hides. However, after three or four minutes when Lemlem couldn't find her tricky brother, she breezed into the bunch of trees found in the backyards. It was one of Birhane favorite hiding spots. Strangely, that day Lemlem could not see anything in the small forest. Then she heard a faint sound from a corner. Certain that it was Birhane; she started walking fast towards the sound.

Then it happened. BOOM! CRASH! Lemlem found herself flat in the middle of the little forest, which felt like pieces of wood piled up. Lemlem didn't know about the pile of firewood in the little forest her father had cut before going to work that morning.

"OUCH! Birhane, come! Where are you?" screamed Lemlem.

Birhane came running and lifted his sister up, taking her to the hut. Luckily Lemlem only had a few scratches and bruises.

When their pregnant mother returned from the field, she allowed Lemlem to cuddle on her big tummy. Lemlem forgot about her pain and wanted to know when her little brother or sister would come out.

The next days, their friendly Community Health Worker came to visit Lemlem's mother to check on her pregnancy. The Community Health Worker noticed the scratches on Lemlem's forehead and asked, "What is the matter? Were you fighting with your brother?"

Lemlem's mother explained how she fell in the little forest at the back yard last evening. Lemlem's brother giggled and added mockingly, "She couldn't even see the pile of fire wood. Ha, ha!"

The Community Health Worker advised Lemlem's mother to bring her daughter immediately to health center. The next day Lemlem's mother brought her child to health center



Exercise I

Attempt to answer the following questions.

1. What is Lemlem's health problem?
2. What predisposing factors did you recognize for Lemlem's ill health?
3. What public health problem do you recognize?
4. What community actions should be taken for the problems you recognized on question three?

Learning Activity II: Case Study

The next day Lemlem came to the Erob health center with her mother. At the OPD the health professional asked Lemlem's mother about her problem.

Lemlem's mother said "I think Lemlem has been falling down and bumping into things in the store room more often "

The health professional again asked, "Did Lemlem have any other illness before this?"

Lemlem's mother said "Yes, she recovered from measles recently and also she has had diarrhea for the past 11 days"

Then the health professional noticed bruises and scratches on her forehead.

Exercise II

Attempt to answer the following questions

1. What is the likely diagnosis?
2. a. what physical examinations might clarify the problem?
b. What laboratory investigation is needed to identify the precipitating causes?
3. What should be done for Lemlem at the health center level?

2.5 Vitamin A

2.5.1 Definition of Vitamin A

Vitamins are organic compounds required in minute amounts to catalyze cellular metabolism essential for the growth or maintenance of the organism. They must be supplied exogenously.

Vitamin A is a fat-soluble vitamin which the body gets from the diet, and is able to store (principally in the liver) surplus amounts until required. The recommended daily allowance (RDA) for vitamin A varies by age and gender and for women depends on whether they are pregnant or breast feeding. RDA for is 5000 international units (IU) for adults and 8000 IU for pregnant or lactating women

Dietary intakes of retinol for children in international units:

Age	<u>0-6mo</u>	<u>7-12mo</u>	<u>1-3yr</u>	<u>4-8yr</u>	<u>9-13yr</u>	<u>14-18yr (male)</u>	<u>14-18yr (female)</u>
RDA	1333 IU	1667 IU	1000 IU	1333 IU	2000 IU	3000 IU	2333 IU

2.5.2 Absorption and Transport of Vitamin A

Retinyl esters from animal sources present in the diet are hydrolyzed in the intestinal mucosa, releasing retinol and free fatty acids. Retinyl esters contained in chylomicra are taken up by, and stored in, the liver. When needed, retinol is released from the liver and transported to extra hepatic tissues by the plasma retinol-binding protein (RBP). Zinc is an important component of the transport protein, so a person deficient in zinc will have difficulty in utilizing the absorbed and stored retinyl ester. Retinol derived from the cleavage and reduction of vegetable or plant carotenes is re-esterified to long-chain fatty acids in the intestinal mucosa and secreted as a component of chylomicra into the lymphatic system.

The bioavailability of dietary retinol or preformed retinyl esters is more than 80%, whereas the bioavailability and bioconversion of carotenes (plant source) are lower. The bioavailability of the different sources of vitamin A may be affected by species, molecular linkage, and amount of carotene, nutrition status, genetic factors, and other interactions. In general the body absorbs retinoids (animal sources) and vitamin A more efficiently than carotenoids. The body lacks the mechanisms to destroy excessive loads of Vitamin A. Thus, the chances for hypervitaminosis toxicity exist unless intake is regulated carefully.

2.5.3 Functions of Vitamin A

- Important for vision
- Important for growth.
- It helps spermatogenesis in the male.
- Essential for normal differentiation and mucus secretion of epithelial tissues.
- For differentiation and maturation of different organ systems in the fetus
- Antioxidant function
- Decreases vertical transmission of HIV from mother to child.

2.5.4 Sources of Vitamin A

Sources of vitamin A can be divided into two groups:

1- Plant sources:

Dark green leaves (yabesha gomen, green pepper, salad)

Yellow and orange roots and tubers (like carrot, sweet potatoes)

Yellow and orange fruits (like papaya, mangoes)

Red palm oil, Yellow corn, tomato

2- Animal sources:

Liver

Fish liver oil

Egg yolk

Milk and milk products (whole milk, whole milk yogurt, butter, cheese)

Fish

Breast milk

Butter

Vitamin A is transferred during the last trimester of pregnancy from the mother to the fetus. Third trimester demand for vitamin A increases for both, but especially for the child as it is time for maturation of different organ systems. Small store/ reserve of Vitamin A in fetus/newborn relies on maternal status, if the mother deficient the fetus/newborn will also too.

But different from dietary sources for older children and adults, the only good source of vitamin A for young infants is breast milk (or equivalent formulas). At birth the liver has low

vitamin A content, which will be rapidly augmented by colostrum and breast milk. Unless the mother suffers from severe protein-energy malnutrition, the volume of breast milk is roughly similar around the globe. However the concentration of vitamin A in that milk varies dramatically with the vitamin A status of the mother. When mothers are vitamin A deficient, breast milk concentrations will be low. Without supplemental vitamin A, their infants will become deficient.

2.6. Definition of VAD

Vitamin A deficiency (VAD) is a disease caused by lack of adequate vitamin A intake. It is manifested by night blindness, xerophthalmia, and if deficiency is severe and prolonged results in keratomalacia.

2.7. Epidemiology

Some countries have carried out assessments using clinical ocular indicators such as Bitot's spots. However, these ocular signs are associated with advanced stages of VAD. Women and children may have sub-clinical VAD long before any eye problems are evident. One of the first clinical signs of VAD is difficulty or inability to see in dim light, such as dusk or at night. This condition is called 'night blindness' or 'Dafint in Amharic where VAD is present. However, the vast majority of children with VAD have no clinical signs or symptoms (i.e. they show no eye damage).

Vitamin A deficiency causes many children to become blind each year. Globally, 3 million children suffer from clinical VAD (exhibiting the signs and symptoms of eye damage and xerophthalmia), half of them dying within 12 months of losing their sight. However, the full extent of VAD often remains hidden: an estimated 140-250 million children under five years of age are at risk of sub-clinical VAD, mainly in Asia and Africa. Though showing no VAD ocular signs or symptoms these children suffer a dramatically increased risk of illness and death, particularly from measles and diarrhea.

About 30% of the world's childhood blindness is due to VAD. Six hundred thousand women die during childbirth due to complications from VAD, which could be reduced through better nutrition, including provision of vitamin A.

In rural South and Southeast Asia, night blindness is common among women in the latter half of pregnancy, affecting 10-20%. The extent of maternal night blindness in Africa and Latin America, however, is not yet known. Cut-off values have not yet been established for night blindness during pregnancy as a public health indicator of vitamin A deficiency. In some cultures, night blindness is thought to be a normal consequence of pregnancy since it tends to occur frequently and disappears without treatment shortly after birth. Nevertheless night blindness is not normal during pregnancy!. It is associated with poor vitamin A status, which increases the risk of maternal morbidity and mortality.

Vitamin A deficiency is a major public health problem in Ethiopia. According to WHO standards, a prevalence of Bitot's spots greater than 0.5 % in under five children indicates that VAD is a significant public health problem. In the 1980s, the prevalence of Bitot's spots in Ethiopia was reported to be 0.87 % nationwide and in the 1990s prevalence was 1 % in school children. Data from recent local studies demonstrated that Bitot's spots prevalence was as much as two to forty times greater than the WHO cut of point in the East Hararge and Tigray areas, suggesting that the problem of VAD in Ethiopia is extremely severe.(fig 1)

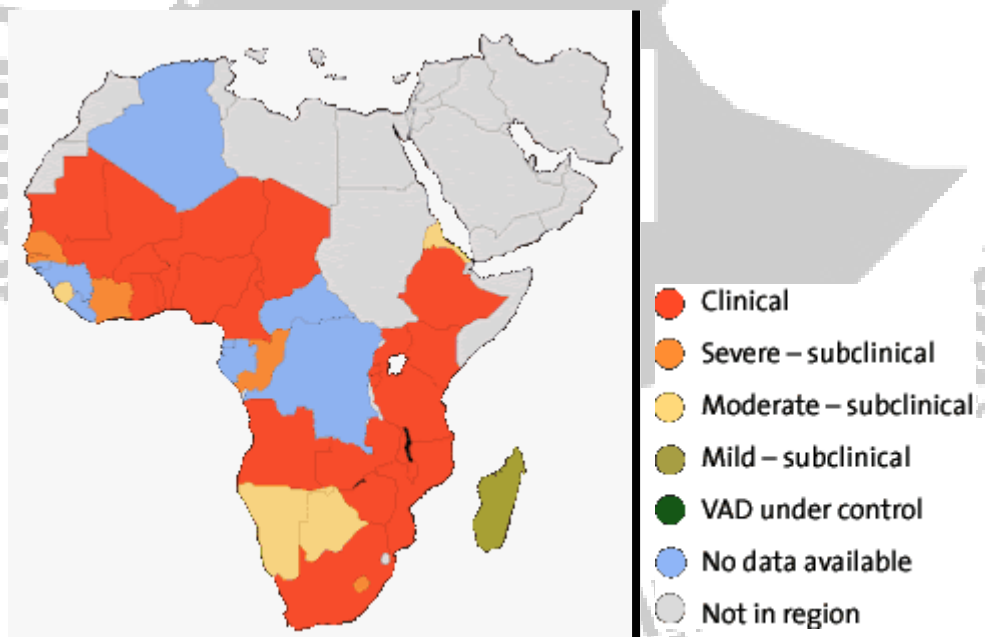


Fig. 1 prevalence of vitamin A deficiency in Africa (WHO, 2000)

WHO Indicators for Recognizing VAD as a public health problem

<u>Sign</u>	<u>Prevalence < 5 year</u>
Night Blindness	> 1%
Bitot spot	>0.5%
Corneal xerosis/ ulceration	>0.01%
Corneal scarring	>0.05%
Plasma Vitamin A < 10µg/dl	>5%

Source: *A field guide to detection vitamin A deficiency, WHO 1993*

2.8. Etiology and Pathogenesis

As discussed earlier vitamin A, like other vitamins, should be supplied exogenously. One way deficiency of vitamin A occurs is lack of adequate intake of vitamin A from food. But other conditions exacerbate the deficiency:

- 1- Children begin life with an urgent need for vitamin A. Full-term infants — even those of well-nourished mothers in wealthy countries — are born with barely enough vitamin A to sustain them during the first few days of life. Young children in developing countries are deficient in vitamin A. Their greatest risk of becoming vitamin A deficient is during the first few years of life, when their diets are the least diverse, growth rate is greatest and they are at highest risk of life-threatening infections.
- 2- Pregnancy and lactation compromise vitamin A status. It poses additional burden on a woman's vitamin A stores. Vitamin A deficiency is most severe and night blindness most common during the latter half of pregnancy. Even though pregnancy-related night blindness spontaneously disappears during the early postpartum period, the underlying deficiency persists unless treated. As a consequence these women suffer an increase in mortality for at least one year postpartum.
- 3- VAD is common in population groups with decreased or absent intake of green leafy vegetables and limited animal sources. Loss of it in cooking, canning and freezing of foodstuffs is small unlike other vitamins but oxidizing agents destroy it.
- 4- Vitamin A deficiency also results from inadequate intestinal absorption, with chronic intestinal disorders or fat malabsorption as can occur with prolonged diarrhea.

- 5- Low intake of fat also results in low vitamin A absorption
- 6- Vitamin A excretion is increased in cancer, urinary tract disease and chronic infectious disease.
- 7- Low protein intake or protein energy malnutrition results in deficient retinol-binding protein and high plasma vitamin A concentrations. This results in retinol in the blood not being delivered to tissues to use. It is related with the most rampant PEM in the country.

Deficiency of vitamin A causes the following changes in the body:

- 1- The first tissues to be affected in the retina are the light responsive cones and rods. The pathology develops gradually first with low adaptation to dark and then to light.
- 2- Characteristic changes in the epithelium include proliferation of basal cells, hyperkeratosis, and the formation of stratified, cornified squamous epithelium. That will lead to the formation of cornified (keratinized) epithelium. This occurs especially on the cornea .This causes corneal wrinkling and laceration due to friction with the dry and cornified conjunctiva.
- 3- Epithelial changes in the respiratory system may result in bronchiolar obstruction. Squamous metaplasia of the renal pelvis, ureters, urinary bladder, and the pancreatic and salivary ducts may lead to increased vulnerability to infections in these areas.
- 4- Vitamin A and infection interact in cyclic pattern of exceeding availability and increasing susceptibility to infection. In its deficiency all of which are in the vicious circle. The following diagram shows the cycle in vitamin A deficiency.
- 5- Increased severity of some diseases like measles, severe acute malnutrition, diarrheal diseases and ARI resulting in increased toll of mortality from these diseases. This has to do with role of vitamin A both in the non specific immunity (epithelial barrier) and the cell mediated immunity that will be compromised during VAD. Additionally, the anti-oxidant property of vitamin A will enable the body to cope up with the stress of infection which will be impaired in VAD.

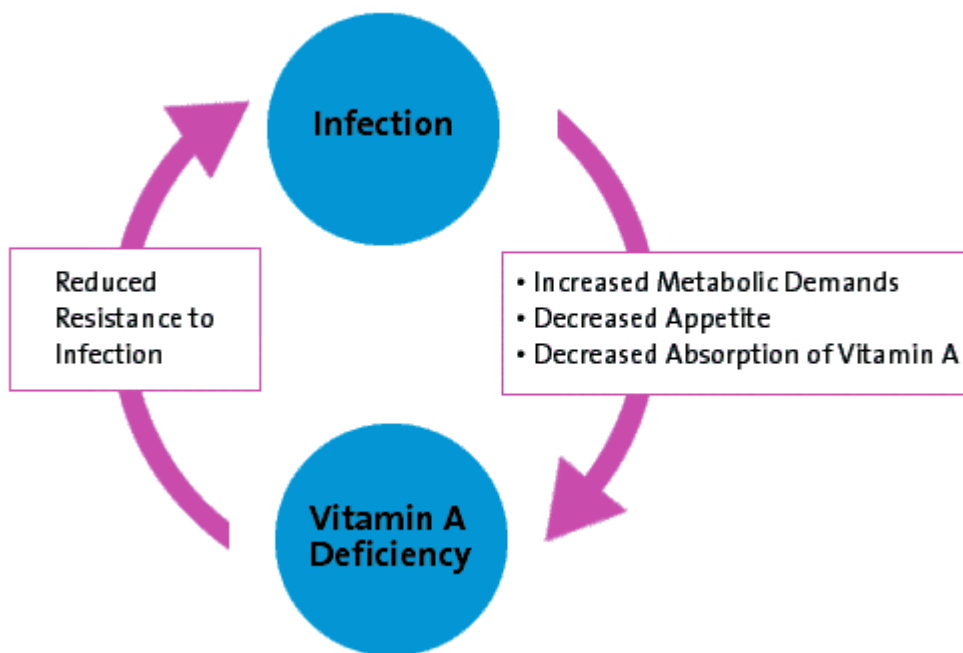


Fig. 2 Cycle of Disease and Vitamin A Deficiency

2.9. Clinical manifestations of Vitamin A deficiency

Before the clinical signs and symptoms occur the person has to go through different sub clinical vitamin A deficiency states. People with sub-clinical VAD have higher rates of infections like diarrhea or measles.

A. Ocular

Eye lesions develop insidiously, with an impairment of dark adaptation resulting in night blindness. This is locally called as “daint” or “chicken eye” because chickens cannot see at night. This is the commonest VAD chief complaint the parents tell about the child.

Later comes dryness of the conjunctiva and cornea. The patient may tell he is feeling dryness in the eyes.

Dryness of the conjunctiva is called “xerosis conjunctivae”, and

Dryness of the cornea is called “xerosis cornea.”

The parents may describe the presence of whitish material in the child's eye. Clinically it is called Bitot's spot. These are foamy and whitish cheese-like tissue spots that develop in the lateral side of the eyeball. These spots do not affect vision in the daylight.

More severe VAD will lead to corneal ulceration or extensive wrinkling and cloudiness of the cornea called “keratomalacia”.

Xerophthalmia is a range of clinical signs secondary to VAD: It includes night blindness, Bitot spots, corneal dryness and ulcerations, and finally the occurrence of full-blown blindness.

The parent may notice the following when they compare their child to their peer group.

B. Skin

Dry and scaly skin and follicular hyperkeratosis may be seen on shoulders, buttocks, and extensor surface of the extremities.

C. Organ Systems.

Epithelial metaplasia in the urinary tract may be associated with infections, reflected by pyuria and hematuria.

Late in the disease state, wide separation of the fontanel and increased intracranial pressure may occur.

2.10. Diagnosis

Diagnosis is based on mainly history and physical examination

The patient may have the following symptoms and signs

Symptoms:

- Night blindness
- Feeling of dryness in the eye
- Sometimes parents may complain of whitish plaque in the child's eye
- Blindness

Signs:

- Poor dark adaptation
- Bitot's spots
- Bruises and scratches (from injuries attributed to poor vision)

2.11. Case Management and Treatment

2.11.1 Treatment of a child with clinical vitamin A deficiency

For a child less than 6 months 50,000 IU on the first, second and seventh (or 14th or 21st) day. This should only be given for the infant's VAD treatment. Otherwise the infant should receive adequate Vitamin A through his mother's breast milk, if the mother was given 200,000-300,000 I.U vitamin A post partum.

For a child 6 to 12 months 100,000IU on the first second and seventh or 14th or 21st day.

In a child more than 12 months and adults 200,000IU on the first second and seventh or 14th or 21st day.

2.11.2 Treatment of Women with Clinical VAD

Women of reproductive age with night blindness or Bitot's spots during pregnancy should be treated with a daily oral dose of 5,000-10,000 IU of vitamin A orally for at least 4 weeks once daily. This low dose schedule over a period of 4 weeks is to reduce any toxicity risks to the fetus. Such a daily dose should never exceed 10,000 IU, although a weekly dose not exceeding 25,000 IU may be substituted once weekly for 04 weeks.

When severe signs of active xerophthalmia (i.e. acute corneal lesions) occur in a woman of reproductive age it is necessary to balance the possible effects of a high dose of vitamin A to the fetus against the serious consequences of VAD. In these circumstances the high-dose treatment for corneal xerophthalmia should be administered. (Table 1)

Maternal night blindness during the time they are not pregnant should be treated with mega doses 200,000 IU of vitamin A. Balancing the risk to the fetus with the risk to the mother when a woman has more active signs of xerophthalmia, low dose vitamin A; that is 25,000 to 50,000IU orally the 1st, 2nd and 7th days can be given.

For a child less than 6 months 50,000 IU on the first second and seventh or 14th or 21st day, this should only be given for treatment otherwise for supplementary therapy the infant should receive through his mother's breast milk; that is after supplementing the mother with vitamin A post partum.

For a child 6 to 12 months 100,000IU on the first second and seventh or 14th or 21st day.

In a child more than 12 months 200,000IU on the first second and seventh or 14th or 21st day.

2.12. Prevention and Control of Vitamin A deficiency

Why do we need to prevent and control VAD?

The following are advantages that the public gets with prevention and control of VAD:

Improving the vitamin A status of deficient children (6-59 months) increases their chances of survival.

Improving vitamin A prevents the development of blindness.

Eighty five percent coverage of vitamin A can result in a 90% reduction in the prevalence of severe xerophthalmia. Note that: coverage below 25% is unlikely to have an impact on xerophthalmia.

Improving vitamin A status of children reduces childhood mortality

- Risk of death from measles can be reduced by 50 percent and also faster recovery with fewer post-measles complications
- Risk of death from diarrhea can be reduced by 33 percent
- Risk of all cause mortality can be reduced by 23 percent

Improving vitamin A status of children reduces the severity of childhood illnesses:

- Less strain on clinic and outpatient services
- Fewer hospital admissions
- Contributes to the well-being of children and families

Improving Vitamin A status also:

- May reduce birth defects
- May prevent epithelial and perhaps other types of cancer

Improving vitamin A status reduces maternal mortality:

- Improves resistance to infection
- Helps to reduce anemia through its action on cell maturation

Improving vitamin A status is cost-effective:

- Costs just a few cents per capsule
- Reduces health costs by decreasing hospital and clinic visits
- Easily integrated into existing public health/immunization programmes if these are well organized.

The elimination of VAD can best be achieved through a comprehensive approach that combines strategies. There are five main types of intervention for VAD as suggested by WHO:

- A. Promoting breast milk
- B. Supplementation
- C. Food fortification
- D. Dietary modification
- E. Infection control

A- Promoting Breast Milk

Breast milk is a natural source of vitamin A, and it is readily available too. Exclusive breastfeeding should be promoted up to 6 months and continued breast feeding up to 24 months. Mothers should be given supplementary vitamin A during their first 6 weeks of postpartum period. Breast milk vitamin A is the best way to protect babies from VAD and the risk of side effects of oral vitamin A for infants.

B- Supplementation of Vitamin A

Vitamin A (retinol) supplements naturally occurring (as in cod liver oil) or synthetically derived (multivitamin preparations) have long been used to prevent vitamin A deficiency. Because vitamin A can be stored in the liver, high doses can be given through oral supplements once every 4-6 months for prevention of VAD.

Major Delivery outlets of Vitamin A supplementation:

A. Universal supplementation

Targets for universal supplementation are:

- Children 6-59 months
 - Distribution through routine health services
 - E.g. Post natal care and Family planning
 - Immunization days
 - GMP and well baby visit
 - Sick baby clinic
- Women in the child bearing age group within 6 weeks of delivery

B. Disease targeted supplementation

- 1, Measles – 3 doses (1st, 2nd, 14th days)
- 2, ARI, Diarrheal disease, PEM – single dose on first contact

WHO recommendations call for the administration of 200,000 IU every 4 to 6 months to all children 12 to 59 months of age. This can be done in special vitamin A days held twice a year or together with other campaigns like are being done with polio vaccination campaigns.

Periodic supplementation is the most widely implemented intervention for controlling vitamin A deficiency in the developing world. This program is easy and quick to initiate at relatively modest marginal cost, particularly if it is integrated with the EPI program and childhood clinical services.

To better use existing delivery channels, many countries have piggybacked vitamin A distribution onto regular immunization efforts. In particular, 25,000 or 50,000 IU of vitamin A is given to young children at ages 6, 10, and 14 weeks when they receive their diphtheria, pertussis and tetanus immunizations. A fourth dose (100,000 IU) is administered at age 9 months with measles immunization. The rationale for this schedule is that an existing distribution mechanism is available, minimizing the marginal cost of delivery; a high risk of deficiency exists during the first year of life (200,000 IU is given to mothers 6 to 8 weeks postpartum to boost breast milk vitamin A concentration); and infants are at greatest risk for the consequences of deficiency, particularly mortality.

After infancy, provision of vitamin A supplements every four to six months is an inexpensive, quick, and effective way to improve vitamin A status and save children's lives.

Ideally, children at risk should receive high-dose supplements twice a year (i.e. every 4-6 months).

Table 1. Potential target groups and immunization contacts in countries with vitamin A deficiency

Target group	Immunization contact	Vitamin A dose
All mothers irrespective of their mode of infant feeding up to six weeks postpartum if they have not received vitamin A supplementation after delivery	BCG, OPV-0 or DTP-1 contact up to six weeks	200 000 IU
Infants aged 9–11 months Children aged 12 months and older	Measles vaccine contact	100 000 IU 200 000 IU
Children aged 1–4 years	Booster doses Special campaigns Delayed ^{1°} immunization doses	200 000 IU

Source: *Strategies for prevention of blindness, WHO 1997*

- The optimal interval between doses is four to six months. A dose should not be given too soon after a previous dose of vitamin A supplement: the minimum recommended interval between doses for the prevention of vitamin A deficiency is one month (the interval can be reduced in order to treat clinical VAD and measles cases).
- Postpartum supplementation of vitamin A improves the stores of vitamin A in women, increases vitamin A in breast milk and improves the vitamin A status of infants through the first few months of life. Postpartum women should receive vitamin A supplements through routine health services rather than mass campaigns so that careful screening for pregnancy is possible.

Table.2 summary of the supplementation of vitamin A in special conditions

Diagnosis	Dosage	Timing
Measles		
< 12 months old	100,000 IU	On diagnosis and treatment days
≥ 12 months old	200,000 IU	On diagnosis and treatment days
Severe PEM	Same as measles	Second dose only if the condition worsens
Persistent diarrhea	Same as measles	One dose for each episode with at least a month interval between doses
Other prolonged febrile conditions	Same as measles	One dose for each episode with at least a month interval between doses

Source: *Strategies for prevention of blindness, WHO 1997*

Side effects and safety during vitamin A supplementation

Mild symptoms of intolerance such as **loose stools, headache, irritability, fever, nausea and vomiting** may be experienced by 1.5 -7% of the children who receive vitamin A supplements. These side-effects disappear within 24-48 hours and require no special treatment.

In neonates and young infants under the age of 6 months vitamin A supplementation has been associated with increased incidence of transient bulging fontanels that resolves itself within 24-72 hours. Depending on the age and dosage received, the rate of occurrence has been found to be between 0.5-10%. However while current recommendations are to give vitamin A with immunization services to infants under 6 months of age, a preferred strategy is to supplement the postpartum mother thereby benefiting the infant less than 6 months of age via the breast milk.

Teratogenicity

Very large doses of vitamin A during the first trimester of pregnancy can be teratogenic So high-dose supplementation of child bearing aged women is only recommended during the infertile postpartum period. Pregnant women with night blindness or severe xerophthalmia (e.g. corneal ulcer) can be given low doses of vitamin A. (see 2.10.2)

Vitamin A toxicity or Hypervitaminosis A

Acute toxicity, although harmless and transient, can result in nausea and vomiting. An often-expressed concern is that a child might receive three or even four high-dose supplements within a month, for example, a regular distribution, a dose during measles, plus a third or fourth from an overly zealous local health worker unaware of vitamin A status. The worst result, however, would be a day or two of nausea and vomiting. This risk pales in comparison with the millions of children who would otherwise die or would be blinded due to VAD. To minimize side effects, supplement size is adjusted for the child's age. From a practical standpoint, however, serious or sustained side effects require very high, frequent and persistent dosing (50,000 to 100,000 IU daily for 3 to 6 months).

A person with **acute vitamin A toxicity** clinically may present as follows:

Symptoms and signs

- Nausea, vomiting, drowsiness and bulging of fontanel
- Diplopia, papilledema., and cranial nerve palsies and other symptoms suggestive of brain tumor (psuedotumor cerebri) can occur.
- The acute toxicity may occur with the vitamin A supplementation during vaccination campaign

A person with **chronic vitamin A toxicity** presents with the following conditions

Signs and symptoms are:

- Anorexia, pruritis, lack of weight gain. The child may also have increased irritability, limitation of motion and tender swelling of bones.

Vitamin A toxicity is managed symptomatically and is reversible by stopping intake of the vitamin.

C- Fortification for Vitamin A

Fortification means adding extra amounts of a previously non-existing component of a natural product from external source. The food to be fortified should be the major food in use by the affected population. Besides, it should be centrally produced and the fortification should not alter its taste, colour, shelf life and cost. Examples could be sugar, salt and flour. This may be a long term strategy but not easy to implement.

D-Dietary Diversification

Behavioral change communication for changing the attitudes of the public towards vitamin A rich foods is mandatory through:

- Nutrition education for dietary diversification
- Horticulture interventions including home gardening
- Promotion of the consumption of locally available vitamin A friendly foods such as carotene rich, green leafy vegetable foods and yellow fruits is important.

Dietary practices and improvements are affected by complex factors including food availability, socio-economic status and food preferences. Furthermore fortification of foods with preformed vitamin A has achieved better results than carotene rich diets.

E-Infection Control

Infection control through the provision of safe drinking water and sanitation, early diagnosis and treatment, immunizations, health education will reduce excretion of vitamin A. Infections increase secretion of vitamin A from the body.



UNIT THREE

SATELLITE MODULE

3.1. Satellite Module for Public Health Officers

- 3.1.1. Direction for using this module
- 3.1.2. Learning Objectives
- 3.1.3. Learning Activity III
- 3.1.4. Etiology and Pathogenesis
- 3.1.5. Clinical Features
- 3.1.6. Diagnosis
- 3.1.7. Management of Vitamin A deficiency
- 3.1.8. Prevention and Control

3.1.1. Direction for using this module

Before you got to this module be sure that you have completed the pretest and have read the core module.

3.1.2. Learning Objectives

At the end of this course, you will be able to:

- Identify the etiology of VAD
- Describe the pathogenesis of VAD
- State how to diagnose VAD
- Describe Treatment of VAD
- List of the methods of prevention and control of VAD

3.1.3. Learning Activity III: Case study

(This is continuation of the case study in section 2.4 of the core module)

Finally the health officer prescribed Vitamin A to Lemlem. Also he advised Lemlem's mother on how to prevent such kinds of health problems. He described how to care for her at home.

While taking medication, Lemlem developed loose stools, headache, irritability, fever, nausea and vomiting.

The lab examination (stool examination) revealed no ova of parasite.

Exercise

1. What are the diagnoses for this patient?
2. What should be done for the illness that developed after medication?
3. What will be the dose and timing of vitamin A for Lemlem?

3.1.4. Etiology and Pathogenesis

Refer to the core module unit 2, section 2.8

3.1.5. Clinical Features

Refer to the core module unit 2, section 2.9

3.1.6. Diagnosis

Refer to the core module unit 2, section 2.10

3.1.7. Management of Vitamin A deficiency

Refer to the core module unit 2, section 2.11

3.1.8. Prevention and Control

Refer to the core module unit 2, section 2.12

3.2. Satellite Module for Public Health Nurses

3.2.1 Direction for using this module

- Before reading this satellite module, be sure that you have completed the pre-test & read the core module.

3.2.2 Learning Objectives

At the end of this module, you will be able to:

- Identify the common causes of VAD
- Explain the clinical features of VAD
- Describe appropriate nursing interventions for a patient with VAD.
- Describe preventive & control activities for VAD.

3.2.3 Learning activity IV: Case Study

Assessment of Lemlem by a PHN

(This is the continuation of section 2.4 of the core module)

From the history, Lemlem's mother told the nurse that her daughter has difficulty seeing at dusk, she also told her what happened in the forest. She explained that all of this started to appear after Lemlem's recovery from her recent measles and with Lemlem now also having diarrhea. Additionally, the nurse noticed that the living conditions of the family (including housing & nutrition) has made the child at high risk of developing VAD.

On physical examination, the PHN observed Lemlem and found the following:

General appearance – healthy looking

HEENT- there was a whitish, foamy, heaped up lesion on lateral aspect of the eye.

Integumentary System- there was bruises & scratches over the lower and upper extremities.

Lemlem was given vitamin A capsules and ORS sachets for her problems. She was given an appointment for two weeks from now.

Answer the following questions

1. State the nursing diagnosis for patients with VAD
2. State the nursing diagnosis other than VAD
3. Identify the major nursing interventions
4. Identify the preventive approaches for Lemlem's problems.

Nursing Case Management

Assessment

- Patients should be assessed for the presence the following characteristics.

Subjective data (symptoms)

- Eye lesions that develop insidiously causing difficulty seeing during dim light in the local language is called “Dafint or Chicken eye”; the single most important complaint told by the parents.
- When the parents compare their children with children of similar age, they may tell of reduced growth and activity, and poor appetite
- Dietary history: the food items commonly consumed by the family
- History of recurrent respiratory infections, diarrheal diseases, measles.

Objective data (sign)

Eye examination

- Bitot’s spots – foamy, cheese- like tissue spot that develop around the lateral eyeball.
- Corneal ulcerations, which is wrinkling of the cornea with ulceration, mainly seen on the nasal side.
- Keratomalacia – is softening of the cornea with subsequent destruction of the eye ball.

Integumentary

- There could be bruises & scratches over the body.

Nursing diagnosis

- The possible nursing diagnosis for a patient with VAD
 - Night blindness
 - Altered conjunctival & corneal findings related to the disease
 - Altered nutrition less than the body’s requirements related to inadequate intake of vitamin A.
 - Recurrent diarrhea, acute respiratory infections.
 - Knowledge deficits regarding the nature of the problem & how to prevent it.

Plan

Goals: patient will

- have good vision at night
- have normal conjunctiva
- maintain adequate nutrition

- demonstrate absence of infection & complications
- be aware of the disease process & its preventive measures

Interventions

- avoid walking at night until vision is fully restored
- avoid rubbing the eye even if it has a burning or itching sensation
- practice good hand washing & personal hygiene
- advice to maintain a well balanced diet

Vitamin A rich foods like:

- ✓ exclusive Breast feeding until 6 months and continue breast feeding until 24 months or beyond
- ✓ Animal food sources like
 - Liver
 - Fish liver oil
 - Egg
 - Milk & milk products...
- ✓ plant sources
 - Dark green leafy vegetables
 - Yellow & orange tubers and roots
 - Fruits like Papaya, mango...
 - Green paper, tomato....
- Recommend seeking health care early
- supply vitamin A capsules
- For a child less than 6 months, 50,000IU on the 1st, 2nd & 7th day
- For a child between 6-12 months, 100,000IU on the 1st, 2nd & 7th day
- For a child greater than 12 months, 200,000IU on the 1st, 2nd & 7th day

Patient teaching

- advice patient on nutrition

Evaluation

Expected outcomes

Patient or patient and family/parents will:

- Demonstrate good vision at darkness.
- Have normal eye examination findings

- Develop awareness about the nature of the disease, duration of therapy & prevention.
- Attain adequate nutrition.

3.2.5. Prevention & Control

Refer to the core module unit two, section 2.12

3.3. Satellite Module for Environmental Health Technicians (Sanitarians)

3.3.1. Direction for using this module

- Before reading this satellite module be sure that you have completed the pre test and read the core module.

3.3.2. Learning Objectives

At the end of this course, you will be to :

- Identify the causes of VAD
- Identify the preventive and control measures of VAD

3.3.3. Causes of VAD

- Inadequate intake of vitamin A
- Environmental conditions, such as the absence of safe drinking water, poor personal and environmental hygiene leading to infections and recurrent diarrhea, which will decrease the intake and absorption of vitamin A or increase the excretion of vitamin A

3.3.4. Prevention and control of VAD

Refer to the core module unit two, section 2.12

But due attention should be given to the following activity

Health Education

Vitamin A is an important vitamin that the body gets from the food we eat. The points that should be mentioned during health education are:

- Importance of a balanced diet
- Vitamin A rich foods
- Since VAD is common in children, lactating and pregnant women, the nutrition of these groups should be targeted.

Promotion of exclusive breast feeding for the first 6 months, continuing for at least 2 years and supplementation of mothers with vitamin A in first 6-8 weeks post partum are the important points to target. Vitamin A deficiency is common in the age groups 6 months to 59 months which indicates that children in this age are vulnerable due to the improper complementary feeding and increased demands.

In the prevention and control of VAD the main component should be creating awareness in the population. This is important because our efforts become successful with community participation in vitamin A supplementation programs, in dietary modifications and in infection control. Health education on the consequences of VAD (such as childhood blindness, increased morbidity and mortality associated with VAD) is important. We should also educate the community on the early symptoms of VAD (such as night blindness that can be corrected by vitamin A supplementation before eye disease gets worse).

3.4. Satellite Module for Medical Laboratory Technicians

3.4.1. Direction for using this module

- Before reading the satellite module be sure that you have completed the pretest and read the core module.

3.4.2. Learning Objectives

3.4.2.1 General

The aim of this satellite module is to enable the learner to acquire knowledge, attitudes and skills concerning the laboratory diagnosis of VAD and the supportive laboratory diagnostic measures for the precipitating causes of VAD.

3.4.2.1 Specific

At the end of this course, you will be to:

- ❖ Perform the possible tests for diagnosing the precipitating causes of VAD

3.4.3. Collection of Stool Specimen

Proper collection and reliable processing of stool specimens helps in the diagnosis of the causes of persistent diarrheas that precipitate VAD.

A clean container is given to the caretaker or the patient for collection of a fresh specimen

3.4.3.1 Safety Precautions

- Stool specimens should be handled with care during processing of the specimen
- Protective rubber gloves must be wore
- Clean slides should be used to prepare wet mounts or concentration methods.

Materials required

- clean transparent containers
- applicator sticks
- normal saline
- clean slides
- cover slides
- microscope
- test tubes
- rubber gloves
- centrifuge

Procedure

- Put a drop of normal saline on a clear slide
- Take a small stool by an applicator from the container
- Spread / mix with the normal saline on the slide by the applicator
- Put a cover slide carefully to avoid bubble formation
- Observe the slide under microscope
- Record the result and report carefully

3.4.4 Collection of Urine Specimen

Proper collection of a urine specimen can help in the diagnosis of urinary tract infections and loss of transport proteins for vitamin A. Clean catch mid stream is obtained from the patient to avoid contamination

3.4.4.1 Precautions

- Urine specimens should be processed immediately
- During processing of a urine specimen, wear a pair of gloves to avoid contamination
- A clean slide should be used for the examination of urine

Materials used

- slides
- cover slides
- test tubes
- microscope
- centrifuge

Procedure

- Pour urine specimen in to a tube to centrifuge
- Centrifuge for 5 minutes at a moderate speed
- Decant the supernatant
- Shake the precipitate
- Transfer the urine sediment to a clean slide
- Cover with the cover slide carefully to avoid bubbles
- Examine under microscope
- Record the result and report carefully

3.5. Satellite module for Community Health Workers /Health Service Extension Workers

3.5.1 Purpose & use of the module

This satellite module on VAD is prepared for community health workers. It emphasizes mainly the involvement of CHWs (HSEWs) in detection, early referral & prevention of VAD. Moreover it will help in their active participation in dissemination of information about vitamin A to the community. However, in order for this module to be very effective, it should be

3.5.4. Learning Objectives

At the end of this module, you will be able to:

- List the causes of VAD
- Identify patients with symptoms of VAD
- Describe the management of VAD
- Discuss the methods of prevention and control of VAD.

3.5.5. Significance and Brief Description of VAD

Vitamin A deficiency (VAD) is one of the major health problems all over the world. It is more common in developing countries, including Ethiopia, than developed countries. Therefore, VAD is our health problem. Children, pregnant & lactating women are commonly affected by VAD. In areas where respiratory infections, diarrhea, malnutrition & measles are common, the problems related to VAD are more serious. When it occurs in children it causes problems with the eye's function and structure, and results in death from the above diseases.

3.5.6. Cause & development of VAD

3.5.6.1. Causes of VAD

- Failure to exclusively breast-feed infants until 6 months of age.
- Sub optimal complementary feeding with vitamin A deficient foods
- Recurrent respiratory infections, diarrhea and measles
- Under nutrition

3.5.6.2. Disease development process

- When the person's diet lacks vitamin A, the person develops an inability to see during dim light ("Dafint") that might result in total loss of sight over a period of time if not treated.

3.5.7. Clinical Feature

The patient with VAD will present with the following clinical features:

- ✓ Night blindness / in local language called "Dafint"
(The single most important complaint the parents describe)
- ✓ Foamy, cheese like tissue that develops around the eyeball.

Patients with the above presentation should go to the health center / health post for an examination.

3.5.8. Management

Vitamin A deficiency can be treated with medications given from health center/ health post, vitamin A supplements and advice about vitamin A rich foods. Therefore the CHW/HSEWs should encourage the patients to eat foods rich in vitamin A. In addition, if the patient's complaints are not better or if they get worse, the CHW/ HSEWs should persuade the patient to visit the health unit again.

3.5.9. Prevention & Control

- Childhood immunizations
- Nutritional Education
 - Promoting exclusive breast-feeding until six months & timely complementary feeding practice (after 6months) with vitamin A rich foods.
 - People should be advised to take food items which have high vitamin A content such as liver, fish liver oil, egg, milk & milk products.
 - They should also be encouraged to take green leafy vegetables & fruits such as “Yabesha gomen”, green pepper, and tomato.
 - Misconceptions on feeding of pregnant women (e.g. some communities restrict the pregnant lady from eating egg, milk or even advise her to eat less food than she would eat if she were not pregnant. Bad misconceptions like these should be discouraged.
- Encouraging pregnant women to have regular visits to the health center/post.
- Practice good hand washing & personal hygiene.
- Identify people with symptom of VAD & send them to the health center/ health post early.
- Encouraging the community to grow vitamin A friendly foods and to consume them.

3.6. Take home messages for mothers/care givers

Causes of VAD

- Inadequate intake of vitamin A in diet
- Increased losses of vitamin A due to concurrent illnesses especially diarrhea and measles

Food sources of vitamin A

- Breast milk
- Animal sources such as liver, milk and milk products, fish liver oil and egg
- plant sources such as dark green vegetables (like yabesha gomen), yellow and orange tubers and roots (like carrot, sweet potatoes), yellow and orange fruits (like papaya, mangoes), tomato, yellow corn

Who are affected more by VAD

- Children
- Pregnant and lactating women

Manifestations of VAD

- Night blindness
- Eye lesions
- Blindness, if severe and prolonged deficiency

Consequences of VAD

- Vitamin A deficiency causes blindness
- Increases frequency of sickness
- Increases death from sickness

Management of VAD

- Visit early a nearby health center or health post for advice and help

Prevention of VAD

- Exclusive breast feeding for the first six months
- Child immunizations
- Vitamin A supplementation of lactating mothers during the first six to eight weeks after delivery
- Intake of vitamin A rich foods
- Environmental sanitation and Personal hygiene

UNIT FOUR

ROLE AND TASK ANALYSIS

4.1 Knowledge, Objectives, and Learning tasks

No.	Learning objectives	Learning Activities			
		HO	PHN	EHT	MLT
1.	To explain the etiology and pathogenesis of VAD	Study the causes of VAD Study the mechanism of the development of VAD	Study the different risks for the development of VAD, particularly in children, pregnant women and lactating women.	Study the different risks to develop VAD	Study the different risks to develop VAD
2.	Describe the epidemiology of VAD	Study the prevalence of VAD	Same	Same	Same
3.	To explain public health significance of VAD	Recognize consequences of VAD and implications	Same	Same	Same
4.	To identify the clinical features of VAD	Learn the signs and symptoms of VAD	Same	Same	Same
5.	To explain the methods of detection of VAD	Study the techniques of history taking and physical examination in diagnosing VAD	Study the common signs and symptoms of nursing diagnosis of patient with VAD		Study the supportive laboratory procedures and interpretation of results
6.	To identify the risk groups and predisposing factors of VAD	Know the population groups at risk of developing VAD Learn the various predisposing factors of VAD	Same	Same	Same
7.	To describe the management of VAD	Understand the need for the early detection, early treatment and balanced diet	Understand the nutritional management of VAD	Understand the need for environmental sanitation, safe drinking water and balance diet for the community	
8.	TO explain the preventive and control methods of VAD	Study the preventive and control methods of VAD	Study the preventive and control methods of VAD	Study the preventive and control methods of VAD	Study the preventive and control methods of VAD

4.2. Attitude, Objectives, and Learning activities

No	Learning objectives	Learning Activities			
		HO	PHN	EHT	MLT
1	To recognize that VAD is a significant public health problem	Realize that VAD is a significant public health problem	Same	Same	Same
2	To give emphasis for detecting VAD	Give value to the need of detecting of VAD	Advocate the need of detecting VAD	Same	Same
3	To appreciate the sign and symptoms of VAD	Focus on the importance clinical features of VAD Recognize the need of advocacy for early detection of VAD of the sub clinical forms of VAD	Focus on the importance of clinical features of VAD	Give emphasis on the sub clinical forms of VAD Prevention by early detection	Same
4	To give attention to people at a high risk of developing VAD	Pay attention to high risk groups for the of VAD	Same	Same	Same
5	To give value to supportive diagnostic techniques of VAD	To appreciate the magnitude VAD Appreciate the importance of supportive diagnostic techniques of VAD	Believe on the need for the advocacy to increase public health awareness of VAD	Appreciate the magnitude of sub clinical forms of VAD AND the need for prevention	Appreciate the magnitude of VAD and the need for prevention
6	To give value to the management VAD	Give important emphasis to appropriate treatment regimen to raise the vitamin A level in a patient having VAD	Give value about the curability of early detected VAD through proper medical and nursing management	Realize the value for the need of appropriate management to avoid the consequences of VAD	Same
7	To give emphasis to prevention and control measures of VAD	Give more emphasis on the importance of health education to prevent VAD	Give more emphasis to health education as a main preventive and control measures of VAD	Believe that there are specific measures to prevent and control VAD Give attention to health education and the role of supplementation of vitamin A capsules	Believe that health education is the most important measures to prevent VAD

4.3. PRACTICE, OBJECTIVE AND LEARNING ACTIVITIES

No	Learning objectives	Learning Activities			
		HO	PHN	EHT	MLT
1	To perform appropriate diagnostic measures of VAD	Take appropriate history, perform proper physical examination needed for the diagnosis of VAD. Include questions about the possible precipitating causes of VAD	Utilize the nursing process to diagnose the patient with VAD	Give health education about VAD and its preventive measures	Conduct appropriate laboratory tests when necessary to diagnose precipitating causes of VAD
2	To detect the different precipitating factors of VAD	Assess for the possible precipitating causes of VAD through physical examination and stool and urine examination	Assess the VAD patient for the possible precipitating factors	Give health education on the precipitating factors of VAD	Carry out the stool and urine examination to detect the precipitating factors of VAD. Record and report the result to appropriate person
3	To carry out screening methods to identify the high risk groups to develop VAD	Perform history taking and thorough physical examinations on children (0-59 months), pregnant and lactating women	Using the nursing process assess and identify the high risk groups that develop VAD	Give health education in the advantages of vitamin supplementation (clinics, NIDs) and balance diet (e.g green leafy vegetables)	Participate in identification of the high risk groups for the development of VAD
4	To apply proper management of VAD	Prescribe Vitamin A capsules and advice on the proper follow up Detect and manage underlying and precipitating causes of VAD	Carry out the appropriate nursing management for the patient with VAD	Teach about advantage of balanced diet or vitamin A to prevent the development of VAD	

UNIT FIVE

GLOSSARY

Bronchiole - smallest branches of the respiratory tract distal to the bronchus.

Capsule - form of drug which is rounded & containing powder, fluids. **e.g** Ampicillin capsule

Chylomicrons – fat transporting molecules

Colostrum - the first breast milk which is expressed after birth.

Diplopia - double vision

Fontanelle - membranous part of the skull found in children under 18 months of age.

Fortification - adding extra amount of previously non existing component of a natural product from external source

Full-term – delivery of a fetus which has completed 37weeks of pregnancy

Hematuria - blood in the urine

Hypervitaminosis - excess amount of vitamin in the body

Lactation - process of production of breast milk by the mother & feeding of the infant

Macronutrients - nutrients which are needed by the body in large amount

Metaplasia - transformation of epithelial cover of an organ from one type to another

Micronutrients - nutrients which are needed by the body in small amount

Morbidity - risk of being sick / ill

Mortality - risk of death from a disease process

Palsy - paralysis/dysfunction of nerves (e.g weakness of extremity)

Papilledema - swelling on the retina located around the optic nerve which is seen by fundoscopic examination

Preterm/Premature - delivery of a fetus between 28-37weeks of gestation

Postpartum - the period from delivery of the baby up to 6weeks.

Pyuria - pus in the urine

Renal pelvis - part of the kidney found at its outlet to the ureter

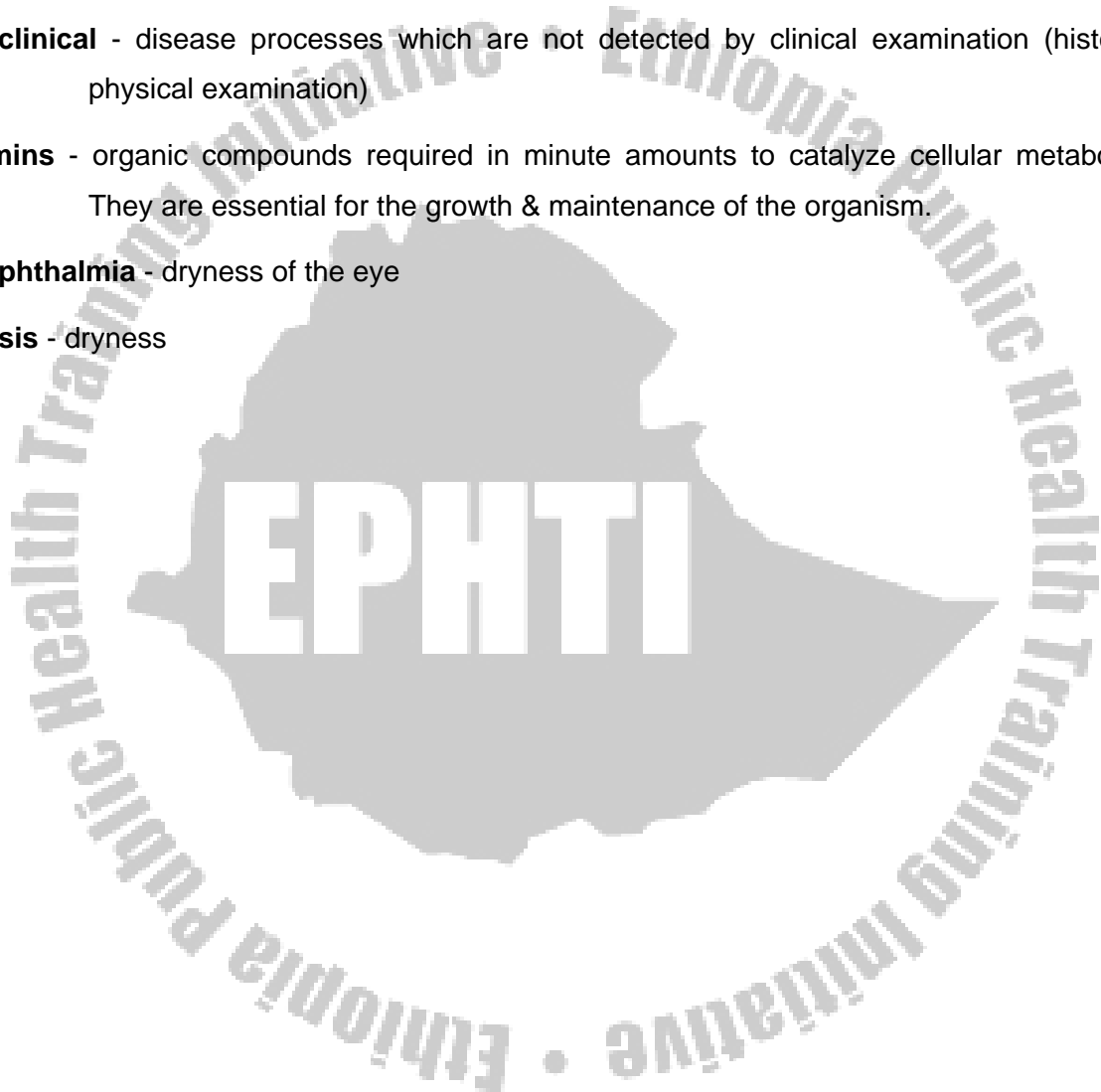
Spermatogenesis - the process of production of sperm cells by the testis

Sub-clinical - disease processes which are not detected by clinical examination (history & physical examination)

Vitamins - organic compounds required in minute amounts to catalyze cellular metabolism. They are essential for the growth & maintenance of the organism.

Xerophthalmia - dryness of the eye

Xerosis - dryness



UNIT SIX

ABBREVIATION/ACRONYMS

ANC - Antenatal Care

BCG - Bacille Calmette Gurién

DPT - Diphtheria, Pertussis and Tetanus

EPI - Extended Program for Immunization

HSEWs - health service extension workers

ICP - Intra Cranial Pressure

IU - International Unit

NIDs - National Immunization Days

OPD - Out Patient Department

OPV - Oral Polio Virus

PEM - Protein Energy malnutrition

RBP - Retinol Binding Protein

RDA - Recommended Daily Allowance

UTI - Urinary Tract Infection

VAD - Vitamin A Deficiency

WHO - World Health Organization

μgm - 10^{-6} gram

UNIT SEVEN

BIBLIOGRAPHY

1. Pamela C. Champe. Biochemistry, Lippincott's Illustrated Review, Philadelphia, 1987.
2. Harrison. Principles of Internal Medicine, 15th Edition, publisher, 2000
3. Dr. F. Jakob. Lecture Note for Course in Applied Nutrition, Gondar College of Medical Sciences, 1978.
4. Tefera Belachew. Human Nutrition For Health Sciences Students. Carter Center, Addis Ababa, Jan.2003.
5. Ministry of Health, Ethiopia. National guideline for control and prevention of micronutrient deficiency. June 2004
6. Nelson. Text Book of Pediatrics, 16th edition, Saunders. Philadelphia (2000).
7. Guyton and Hall. Text Book of Medical Physiology, tenth edition, 2000.
8. Alfred Sommer. Vitamin A Deficiency Disorders: Origins of the Problem and Approaches to Its Control. The Johns Hopkins University, Bloomberg School of Public Health, 2001.
9. Vitamin A Toxicity. World Medical Library. 2002 (Med line)
10. Unite for Sight On Line Vitamin A Deficiency Module. Unite for Sight, 2004(Med line).
11. WHO. Vitamin A Deficiency Advocacy, WHO.INT Health Topics Page, 2003(Med line).
12. WHO. Vitamin A Deficiency Science Page, WHO.INT Health Topics, 2003(Med line).
13. WHO. WHO.org Vaccines Immunizations and Biologicals, Vitamin A supplementation Page, 2003(Med line).
14. WHO. WHO Nutrition, Micronutrient Deficiency Page, October 2004 (Med line)
15. MOH Ethiopia. Module on essential nutrition approach, April, 2004
16. MOH Ethiopia. Manual for management of severe acute malnutrition, April, 2004.

UNIT EIGHT

ANNEX

Annex I-Answers to the Pre and Post-test questions

Answers for the core module

- | | |
|-------|----------------------------|
| 1. D | 12.D |
| 2. A | 13.D |
| 3. C | 14.D |
| 4. C | 15.B |
| 5. D | 16.C |
| 6. C | 17.A |
| 7. B | 18.A.Promoting breast milk |
| 8. A | B. Supplementation |
| 9. B | C. Food fortification |
| 10. B | D. Dietary modification |
| 11. A | E. Infection control |
| 19. A | |
| 20. A | |
| 21. D | |

Answers for pre test of health officers

- | | |
|------|-------|
| 1. A | 8. D |
| 2. D | 9. B |
| 3. E | 10. D |
| 4. E | 11. E |
| 5. C | 12.A |
| 6. A | 13.D |
| 7. E | |

Answers for pre test of public health nurse

1. B
2. B
3. Subjective Data
 - Difficulty to see in the dim light.
 - Nutritional history
 - History of recurrent respiratory tract infection, diarrheal disease, measles.
4. Objective Data
 - Bitot`s spot
 - Corneal ulceration
- 5.-Dark green leaves (Yabesha gomen, green pepper, salad)
 - Yellow and Orange fruits (Like Papaya, Mango)
 - Red palm oil, tomato, potato
6. C
7. D
8. A

Answers for pre test of Environmental health

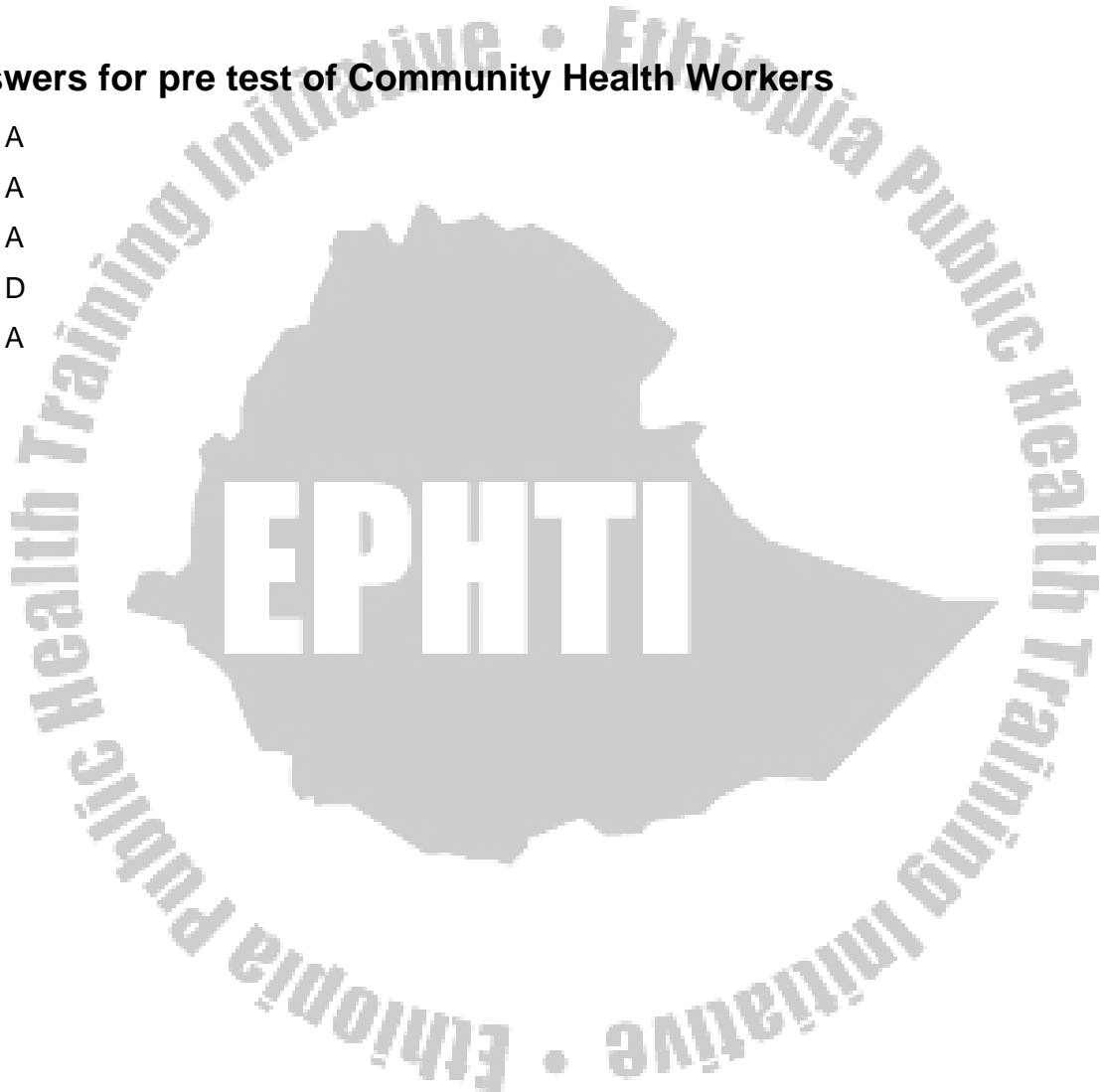
1. A
2. A
3. B
4. E
5. E
6. C

Answers for pre test for Laboratory Technicians

1. A
2. D
3. B
4. B
5. A

Answers for pre test of Community Health Workers

1. A
2. A
3. A
4. D
5. A



Annex II - List of Authors

1. Lisanu Tadesse (M.D), Assistant Lecturer in the Dep't of Physiology, College Of Health Sciences, Mekelle University. Currently he is the clinical coordinator of the college. He obtained his M.D. degree from Gonder College of Medical Sciences.
2. Dawit Shawel (B.Sc in Public Health), Graduate Assistant in the Dep't of Public Health, College Of Health Science, Mekelle University. Currently, he is a Vice Dean of the Student of Mekelle University. Obtained his B.Sc degree from Alemaya University.
3. Yirga Kidanu (M.D), Assistant Lecturer in the Dep't of Physiology and head of the Dep't, College Of Health Science ,Mekelle University. He obtained his M.D. degree from AAU.
4. Girmay G/Meskel(M.D)), Assistant Lecturer in the Dep't of Anatomy, College Of Health Science, Mekelle University. He obtained his M.D. degree from AAU.
5. Helen Yifter (M.D), Assistant Lecturer in the Dep't of Medical Biochemistry and head of the Dep't, College Of Health Science, Mekelle University. Obtained her M.D. degree from Gonder College of Medical Sciences.
6. Afeworki Mulugeta (B.Sc, M.Sc), Assistant Professor in the Dep't of Chemistry. Currently he is A/Vice President for Academic and Research of Mekelle University. He obtained his B.Sc and M.Sc degree from AAU. He has also a postgraduate diploma in Nutrition from Ghent University, Belgium.