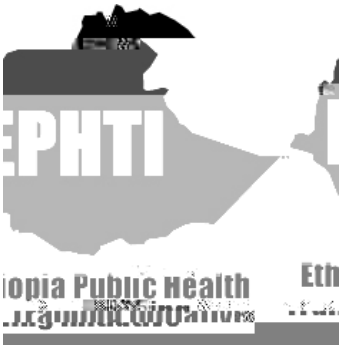
MODULE

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

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PREFACE

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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.

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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

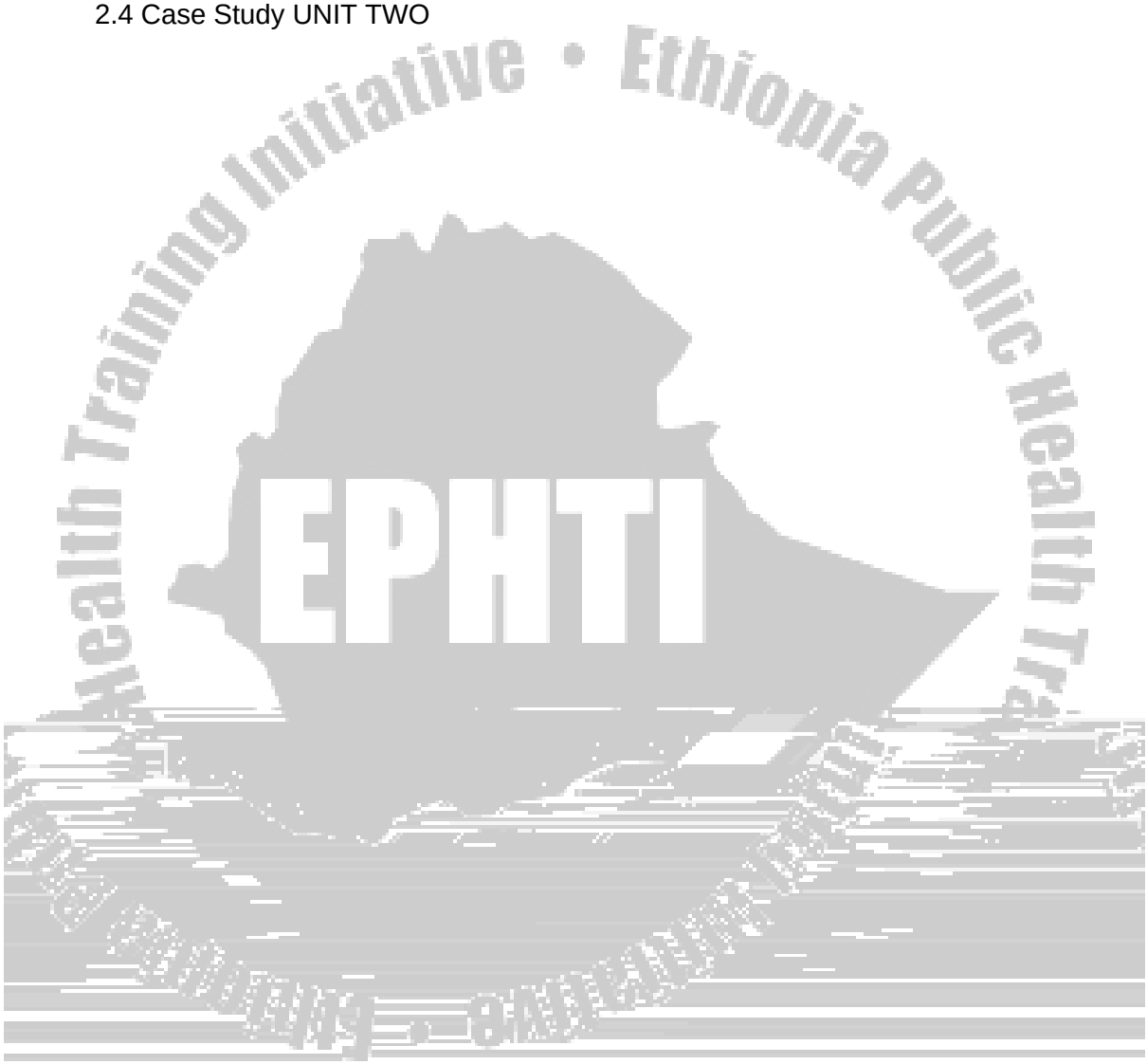
CORE MODULE

2.1 Pre test

2.2 Significance and brief description of the problem

2.3 Learning objectives

2.4 Case Study UNIT TWO



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 alse

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. Xeropthalmia 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

12. During the infertile post partum period high dose vitamin A supplementation can be given to women of childbearing age, if needed.

A. True B. False

13. One of the following is not true about acute vitamin A toxicity

A It may result in cranial nerve palsy

B Patient presents with nausea and vomiting

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).

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

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

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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	0-6mo	7-12mo	1-3yr	4-8yr	9-13yr	14-18yr (male)	14-18yr (female)
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

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

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)

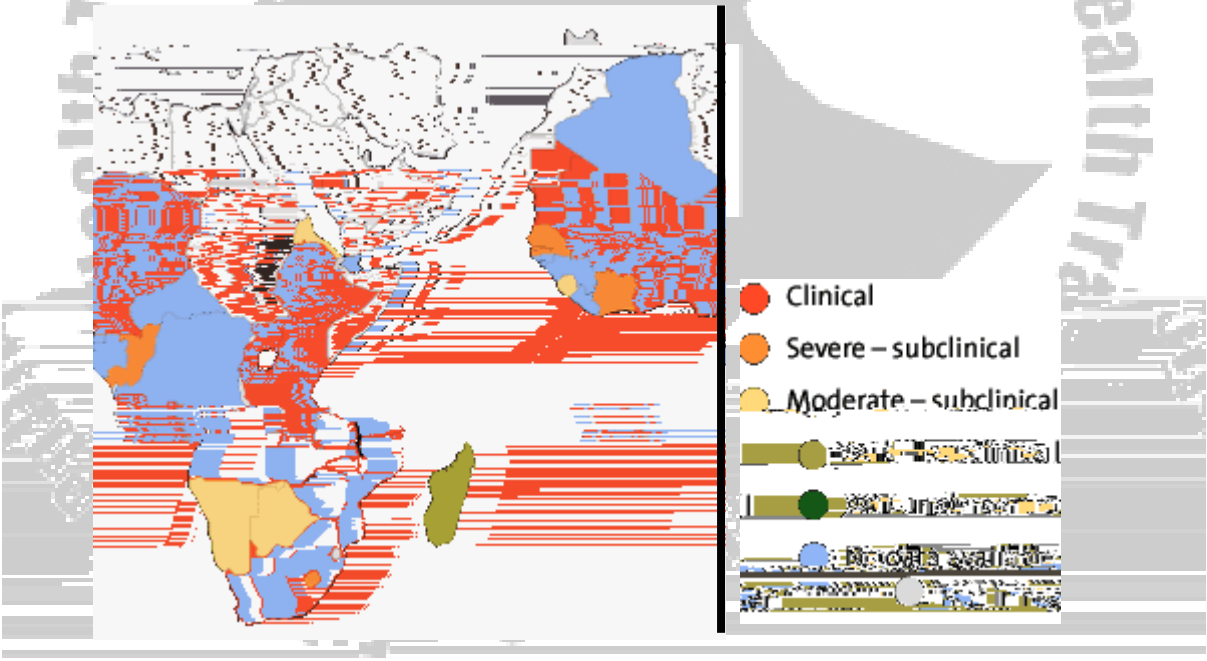

Fig. 1 prevalence of vitamin A deficiency in Africa (WHO, 2000)

WHO Indicators for Recognizing VAD as a public health problem

Sign	Prevalence < 5 year
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

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.

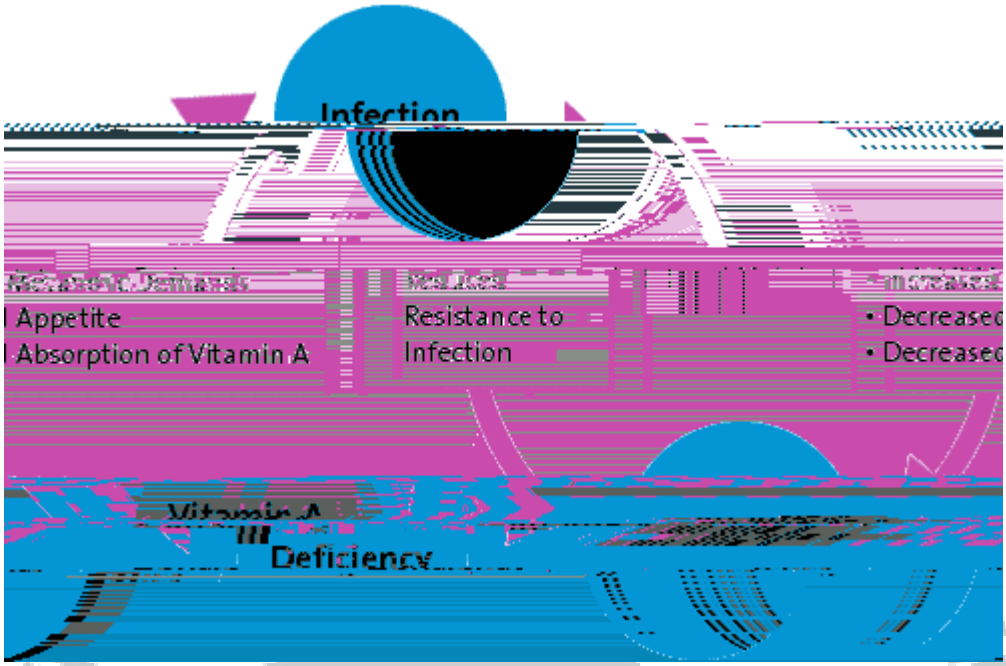

Fig. 2 Cycle of Disease and Vitamin A Deficiency

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 “dafint” 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.

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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.

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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 (1^{st}, 2^{nd}, 14^{th} days)

2, ARI, Diarheal 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 Delayed1° 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

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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

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

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
-

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 ayA def(o 59)]TJT0.0013 T

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

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

translated to the local languages. Meanwhile the health center team should take the responsibility of conveying the message of this module to the CHWs (HSEWs).

3.5.2. Direction for using this module

- start by attempting all the pre-test questions; write your answers on a separate sheet of paper.
- read the whole text of this part of the module in the sequence of its appearance including the task analysis.
- do the post test on a separate sheet & compare your answer with the key.

3.5.3. Pre –test

Answer the following questions.

1. VAD can be prevented.
   A. True B. False
2. Breast-feeding & timely weaning practices with the introduction of vitamin A rich foods such as “Yabesha gomen” prevent VAD in small children.
   A. True B. False
3. VAD is the common health problem in Ethiopia
   A. True B. False
4. The causes of VAD include
   A. Failure to exclusive breast-feeding until 6 months
   B. Eating foods which are poor in vitamin A
   C. Recurrent respiratory infection
   D. All of the above
5. One of the following is a symptom of VAD
   A. Night Blindness
   B. Excessive lacrimation
   C. Protruded eye
   D. All of the above

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

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
-

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 curablity 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 ACTITIVITIES

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 2e i..2(n)-on6339her e TD0.0008sul0 Tw92i2.2o

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

ABBREVATION/ACRONYMS

ANC - Antenatal Care

BCG - Bacillee 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

UNIT SEVEN

BIBLOGRAPHY

1. Pamela C. Champe. Biochemistry, Lippincott's Illustrated Review, Philadelphia, 1987.
2. Harrison. Principles of Internal Medicine, 15th Edition, publisher, 2000
3. Dr. F. Jackob. Lecture Note for Course in Applied Nutrition, Gondar College of Medical

UNIT EIGHT

ANNEX

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

Answers for the core module

1. D
2. A
3. C
4. C
5. D
6. C
7. B
8. A
9. B
10. B
11. A
19. A
20. A
21. D

12.D
13.D
14.D
15.B
16.C
17.A
18.A.Promoting breast milk
B. Supplementation
C. Food fortification
D. Dietary modification
E. Infection control

Answers for pre test of health officers

1. A
2. D
3. E
4. E
5. C
6. A
7. E

8. D
9. B
10. D
11. E
12.A
13.D

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 Taddesse (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.