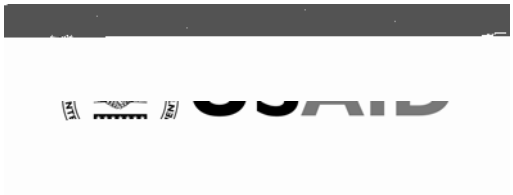
MODULE



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UNIT ONE

INTRODUCTION

1.1. PURPOSE 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, skills, attitudes and that would enable them to solve community problems Preparation of such a teaching material is an important milestone in an effort towards achieving these long-term goals.. Therefore, this module is prepared for equipping trainees with adequate knowledge, skills and attitudes through interactive teaching mainly focused on Micronutrient deficiency.

The preparation of this module has taken in to account the current guideline on the management of severe acute malnutrition, guideline on infant and young child feeding, the essential nutrition actions approach and guideline on micronutrient deficiency prevention and control of the Federal democratic Republic of Ethiopian Ministry of health.

This module can be used for the basic training of health center teams at the training institutions and training of health center teams who are already in service sectors, and by health extension workers and care givers. However, it was not meant to replace standard textbooks or reference materials but can be used as a supplement to enhance the teaching and learning process.

1.2 DIRECTION FOR USING THE MODULE

In order to make maximum use of the module the user should follow these directions:

1.1.1 Check prerequisite knowledge required to use the module

1.1.2 Do the pretest pertaining to the core module in section 2.1.1

1.1.3 Read the core module thoroughly.

1.1.4 After going through the core module try to answer the pretest questions.

1.1.5 Evaluate yourself by referring to the key given in section 7.1 and 7.2

1.1.6 Read the case study and try to answer questions

1.1.7 Use the listed references and suggested reading materials to substantiate and supplement your understanding of the problem

1.1.8 Look at the satellite module and the task analysis related to your field to understand your role in the team in managing a micronutrient deficiency.

UNIT TWO

CORE MODULES

2.1. PRE-AND POST TEST

2.1.1 PRE-AND POST TEST FOR THE HEALTH CENTER TEAM (FROM THE CORE MODULE)

Directions: Choose the letter of the choice with the right answer.

1. Which segment of the population is more predisposed to Iodine deficiency disorders?
    a. Under two years
    b. Pregnant women
    c. Adults
    d. Adolescents
    e. A and B

2. What are the different risk factors involved for the development IDD?
    a. Ignorance about the importance of iodized salt
    b. Poor consumption of seafood like fish
    c. Increased consumption of food that contain thiocyanate or cyanogenic glycoside
    d. All of the above
    e. A and C

3. Which of the following is not true about IDD?
    a. Total goiter rate is 26% in Ethiopia
    b. IDD is more common in mountainous area
    c. IDD affects also other mammals
    d. Can be prevented by fortification of foods and drinks
    e. None
4. List 4 consequences of IDD?

a. …….
b. …….
c. …….
d. …….

5. What are the basic causes of anemia?
    a. Inadequate dietary intake
    b. Excessive RBC destruction
    c. Inadequate RBC production
    d. All of the above
    e. None

6. Which of the following is a false statement?
    a. IDD is associated with the use of food like cassava
    b. Immunization can prevent IDD
    c. Xerophthalmia is more prevalent among children below 6 years
    d. IDD is non-preventable communicable disease
    e. b and d

7. What preventive measures should be taken to prevent VIT A deficiency?
    a. Diarrhea control using ORS
    b. Fortification of food with vitamin A
    c. Immunization program to control measles
    d. All of the above
    e. None of the above

8. In the clinical work up of anemia what laboratory investigations can be done in a routine laboratory setup?

    a. Hemoglobin determination
    b. Stained red blood cell morphology assessment
    c. Stool examination for ova of parasites

d. Reticulocyte count
e. All of the above

9. What is the importance of reticulocyte count in the assessment of Anemia?
    a. to diagnose anemia
    b. to diagnose polycythemia
    c. to assess the presence of abnormal red blood cell morphology
    d. to assess the status to RBC production with in the bone marrow
    9. What is thd blood cellp 306. of d. RenAig.tic6or ..u(163e)0lood Twstudyingto Rin ced cep

a. Calcitonin
b. Parathyroid hormone
c. 1,25 dihydroxycholecalciferol
d. All
e. None

14. Which of the following is not the function of zinc?
a. Promotes growth
b. Enhances resistance to infection
c. Acts as antioxidant
d. Forms part of insulin
e. None

15. Which of the following is not a consequence of a zinc deficient diet during pregnancy?
a. Delivery of low birth weight baby
b. Pre-term labor
c. Precipitated labor
d. Post partum hemorrhage
e. None

16. Which of the following foods are **excellent** sources of zinc?
a. Diary products
b. Dark red beef
c. Green leafy vegetables
d. Cereals
e. Legumes

17. One of the following is not the consequence of folate deficiency?
a. Megaloblastic anemia
b. Spinal cord and peripheral neural disease
c. Aggravates immunity in HIV infected patients
d. Neural tube defect during fetal period

e. None

18. Vitamin A is useful for the following body functions?
    a. Epithelial tissue replication
    b. Bone growth
    c. Vision
    d. Reproduction
    e. All

19. Which of the following vitamins cause hypervitaminosis?
    a. Vitamin B-9 (folate)
    b. Vitamin A
    c. Ascorbic acid (vitamin C)
    d. Vitamin D
    e. b and d

20. One of the following is not true about folic acid?
    a. Found in good amount in liver, kidney, and fish
    b. Important for the synthesis of hemoglobin during RBC synthesis
    c. Needed most during growth and pregnancy
    d. Important for myelin sheath synthesis
    e. Its' deficiency causes pernicious anemia

21. Which one of the following is the clinical manifestations of rickets?
    a. Frontal bossing
    b. Double malleoli
    c. Delayed fontanelle closure
    d. Bow legs
    e. All

22. One the following deficiencies causes megaloblastic anemia: -
    a. Vit D deficiency

b. Iron deficiency anemia
c. Folic acid deficiency
d. Vit B-12 deficiency
e. c and d

23. Which of the following is the correct order of vitamin A deficiency clinical manifestations?
    a. Night blindness, Bitot's spot, corneal xerosis, corneal ulceration, corneal scar
    b. Bitote's spot, corneal xerosis, night blindness, corneal scar, corneal ulceration
    c. Night blindness, corneal xerosis, corneal ulceration, Bitot's spot ,corneal scar
    d. Bitot's spot, night blindness, corneal xerosis, corneal ulceration, corneal scar
    e. Corneal xerosis, night blindness, Bitote's spot, corneal ulceration, corneal scar

24. Osteoporosis is not caused by:
    a. Vit B 1 deficiency
    b. Vit D deficiency
    c. Steroid treatment
    d. Calcium deficiency
    e. Menopause

25. Which of the following nutrients are not anti – oxidants?
    a. Vitamin A
    b. Vitamin E
    c. Vitamin C
    d. Zinc
    e. Iron
26. Which of the following nutrients are suitable for fortification?
    a. Vitamin A

b. Vitamin D
c. Vitamin B2 (Riboflavin)
d. Iodine
e. All

27. Which of the following nutrients affects bone integrity?
    a. Vitamin A
    b. Vitamin C
    c. Vitamin D
    d. Calcium
    e. All

28. One of the following causes of anemia does not match the type anemia listed?
    a. Microcytic hypocromic anemia – iron deficiency
    b. Microcytic hypochromic anemia – Hookworm infection
    c. Macrocytic anemia – Folate deficiency
    d. Normocytic normochromic anemia – Bone marrow failure
    e. Pernicious anemia – Diphylobotrium latum infection

2.1.2. PRE AND POSTTEST FOR SPECIFIC CATEGORIES OF THE HEALTH CENTER TEAM (FROM THE SATELLITE MODULES)

2.1.2.1. PRE AND POST TEST FOR HEALTH OFFICERS

Directions*: -* Circle on any of the following choices that you think is correct answers.

1. One of the following is a nutritional problem of public health importance in developing countries,
    a. Protein energy malnutrition
    b. Iron deficiency anemia (IDA)
    c. Iodine deficiency disease (IDD)
    d. Vitamin A deficiency (VAD)

e. Vitamin D deficiency

2. Which groups of the population are more predisposed to IDD?
    a. Under two years of age
    b. Pregnant ladies
    c. Adults
    d. Adolescents
    e. A and B

3. What are the different risk factors involved in the development Iodine deficiency disorder?
    a. Low socioeconomic conditions
    b. Ignorance of about the importance of iodized salt
    c. Infections like measles, Pertussis, diarrhea
    d. Use of some drugs
    e. All of the above

4. How prevalent is IDD in Ethiopia?

5. List 3 different types of health problems encountered because of IDD?
    a. ……..…….
    b. ……
    c. ……

6. What are the basic causes of anemia?
    a. Inadequate dietary intake
    b. Excessive RBC destruction
    c. Inadequate RBC production
    d. All of the above
    e. None

7. Which of the following is a false statement?

a. IDD is associated with the use of food like cassava
b. Immunization can prevent IDD
c. Exophthalmia is more prevalent among children below 6 years
d. IDD is a non-preventable communicable disease
e. B and D

8. What preventive measures should be taken to prevent VIT A Deficiency
    a. Diarrhea control using ORS
    b. Fortification of food with vitamin A.
    c. Immunization program to control measles
    d. All of the above
    e. None of the above

9. In the clinical work up of anemia, what laboratory investigations can be done in a routine laboratory setup?

b. It enables the classification of anemia
c. To diagnose iron deficiency anemia
d. All of the above

12. What pathogens contribute indirectly to the development of anemia?
    a. Viruses
    b. Bacteria
    c. Parasites
    d. All of the above

13. The basic objective of managing a child with Vit A deficiency: -
    a. Treating superimposed infections
    b. Supplying therapeutic dose of Vit A
    c. Managing complications
    d. Provision of immunization (Vit A)

14. The commonest type of malnutrition in Ethiopia
    a. Iodine deficiency disorders
    b. Vitamin A deficiency
    c. Iron deficiency anemia
    d. Rickets
    e. None

15. Indication for atherapeutic dose of vitamin A is a case of
    a. Xerophthalmia
    b. Measles
    c. Severe PEM
    d. Severe ARI

e. A and B

16. Which of the following diseases have a very close relationship with protein energy malnutrition

    a. Tuberculosis
    b. Measles
    c. Diarrhea
    d. Pertusis (whooping cough)
    e. Common cold

Abebech brought her 3 years old male child called Temtime to the pediatric OPD of Jimma Hospital. She told you that the child hasintermittent diarrhea, loss of appetite. Besides she stated that the child is not interested in his surrounding and sits miserably. On physical examination you found out that the child is apathetic, hypotensive, has gray easily pluckable hair, edema, weighs 9kg when he is expected to weigh 14kg. He also

he child is also

18. What will be your approach to the mother to prevent a recurrence of the situation?

    a. Nutrition education on child feeding and meal planning

    b. Counseling her on the importance of mixing different foods cereals, legumes, animal products, sea foods; fruits and vegetables in child feeding to prevent micronutrient deficiency

    c. Tell her the importance of gardening in her yard-garden if she has land

    d. Work with her how to improve the nutritional status of her child and appoint her for follow up (growth monitoring)

    e. All are correct

19. Other micronutrient deficiencies that co-exist with PEM include:

    a) Vitamin A deficiency

    b) Vitamin D deficiency

    c) Riboflavin deficiency

    d) Iron deficiency

1.2.1.2. PRE AND POST TEST TO PUBLIC HEALTH NURSES

Direction: Respond to the following questions accordingly.

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D._____

E._____

F._____

2. Who are at the risk of developing Vitamin A Deficiency?

A. Children at the age of six months and six years.

B. Pregnant women

C. Lactating mother

D. All of the above.

3. List down the three methods used to control vitamin A deficiency?

A._____

B._____

C._____

4. Who are at the risk of developing Iodine deficiency diseases?

A. School age children

B. women of reproductive age

C. Pregnant and lactating mothers

D. All of the above.

5. Who are at the risk of developing Iron deficiency Anemia?

A. Non Lactating mother.

B. Exclusively breast fed infant.

C. Pregnant women and children.

D. The answer is not given.

6. Which one of the following is the public health measure to control iron deficiency anemia?

A. Iron Supplementation

B. Fortifications of food.

C. De-worming

D. All of the above.

7. What is the recommended daily requirement for iodine per person to prevent IDD (Iodine Deficiency Disease)?

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8. Which one of the following vitamin enhances the absorption of Iron?

A..Vitamin A

B. Vitamin B

C. Vitamin D

D. Vitamin C

9. List some of food items that are of animal origin and that improves iron availability in the body?

_____

_____

_____

_____

10. List at least five causes of iron deficiency anemia?

A. ……..

B. ……

C. ……

D. ……

E. ……..

11. What does the term “Xeophtalmia`mean”?

2.1.2.3. PRE AND POST TEST FOR MEDICAL LABORATORY TECHNICIANS

1.2.1.4. PRE AND POST TEST ON PEM FOR THE SANITARIANS

Direction. Circle on any of the following choices which you think is the best answer.

1. Asebech always wraps her eight months old child with cloths and the child had no a chance to be exposed to sunlight for fear of cold and evil eyes. As a result the child's legs were weak and not straight. What will be the possible cause(s) of the problem?
    A. Lack of fish intake
    B. Evil eyes
    C. Cold
    D. Inadequate sun light resulting in vitamin D deficiency
2. What type of environmental health intervention shall be implemented in areas where iron deficiency anemia is highly prevalent?
    A. Proper human waste management
    B. Food hygiene
    C. Provision of safe water supply
    D. All
3. Animut, a fisherman who is living in Gorgora at the edge of Lake Tana, was visiting Gorgora clinic with a complaint of body weakness. The physical examination and laboratory test revealed that Animut's problem was anemia. What will be the possible cause(s) of anemia based on the explanation given above?
    A. Lack of fish intake
    B. High fish intake
    C. Schistosomiasis
    D. Lack of *Teff*
4. Inhabitants of Kitimbile Pesant association in Jimma zone lead a subsistence life where it is to buy vegetables and animal products. Which deficiency disease is likely to occur?
    A. Anemia
    B. Night blindness
    C. Rickets
    D. Marasmus

2.1.2.5. PRETEST FOR HEALTH EXTENSION WORKERS (HEWS)

1. The causes of micronutrient deficiency is (are)
    a. Germs
    b. Evil eye
    c. Not proper child feeding practices
    d. Tooth extractions
    e. None of the above

2. One of the following is not a method of preventing iron deficiency anemia: -
    a. Maintaining personal hygiene and proper waste disposal
    b. G wastTT1 1 T02 Tc T*[(c.)160o1x waste dislm prmrdN m .735ically

b. Corneal scar
c. Growth retardation
d. Poor school performance
e. Susceptibility to Infection

6. Folic acid deficiency causes all of the following except,
   a. Night blindness
   b. Neural tube defect during pregnancy
   c. Neuropathy in adults
   d. Anemia (Megaloblastic)
   e. None

2.2. SIGNIFICANCE AND BRIEF DESCRIPTION OF THE PROBLEM

2.2.1. IODINE DEFICIENCY DISORDER

Iodine deficiency disorder refers to medical conditions ranging from simple goiter to deafness, mutism, squint and profound metal retardation called cretinism. Iodine is part of the hormone thyroxin, which controls energy metabolism. The deficiency diseases are goiter and cretinism. Iodine occurs in seafood and in foods grown on land that was once covered by oceans. The daily requirement for a normal person is 150 micrograms. The term iodine deficiency disorders' (IDD) has been adopted to describe the spectrum of effects of iodine deficiency that include goiter, endemic cretinism psychomotor delays, and subsequent increased pre-and post-natal mortality.

Universal salt iodization (USI) is the most widely practiced intervention in eliminating iodine deficiency disorders (IDDs). Salt iodine testing is an impcreato describe -1.725erven0 m. Salt

bone. However, its clinical significance is mainly due to the effect the disease has on general child health. Developmental delay is a commonly observed finding in rickets. Moreover, rickets is associated with increased morbidity and mortality. There is ample evidence demonstrating increased rates of diarrhoeal diseases and acute respiratory infections, in rickets. An increased susceptibility to infection associated with rickets may be mult-ifactorial: the chest wall deformity of late rickets alters immune status and the association of rickets with Protein-energy malnutrition (PEM) are some of the factors involved.

Vitamin D deficiency is the commonest cause of rickets in children and vitamin D supplementation has brought down the incidence of rickets to a virtually non-existent level in the developed world. The infant with rickets in the United States, for instance, is typically a black breast-fed infant who does not receive supplemental vitamin D and usually lives in northern areas of United States with lower levels of sulight. In developing countries where there is a high proportion of sunny weather, the occurrence of rickets in a significant proportion of children is largely attributed to social and cultural factors. Keeping children indoors because of the fear that they will catch cold, fear of evil eyes, and the tradition of wrapping children in swaddling clothes contribute to lack of adequate sunlight exposure. Calcium administration is appropriate in all cases of rickets. The preventive measures for rickets may also need to be modified. Calcium supplementation along with sunlight exposure is a more effective strategy.

2.2.4. VITAMIN A DEFICIENCY AND XEROPHTHALMIA

Vitamin A deficiency is one of the major nutritional problems in Ethiopia as well as many developing countries. In spite of the potential to produce a wide variety of fruits and vegetables containing beta-carotene, most people do not consume them due to the reason that they tend to sale them (E.g. Carrots, mangos, Papayas) on the one hand and the traditional belief that these foods are low class foods(Kale, Cabbage). As a result mostly children under the age of 59 months are affected by the tolls of morbidity, disability and mortality due vitamin A deficiency. Severe vitamin A deficiency (VAD) has been known to cause xerophthalmia (X). Xerophthalmia (X) literally means “dry eye” in Greek.

Vitamin A deficiency is considered to be a problem of public health importance if one of the following is observed in children under five of that area (Table1*)*

Table 1. Threshold for making VAD a problem of public health Importance

INDICATOR	**LEVEL**	**PREVALENCE OF VAD IN UNDER FIVE CHILDREN THRESHOLD (%)**
Xerophthalmia	Night blindness (XN)	1.0
	Bitot's spot (XIB)	0.5
	Corneal xerosis(X2) or corneal ulceration/ Keratomalacia < 1/3 of corneal surface(x3A), or corneal	

Short study of children with/without non-corneal xerophthalmia in Indonesia (Sommer et al 1983)

Type of Xerophthalmia	Relative Risk of dying in next 3 months
XN night blindness only	2.4
XIB (Bitot's spot only)*	6.6
Both Night blindness and bitot's spots (XN and XIB)	8.6

** See glossary*

Risk in children with xerophthalmia divided by risk in children without xerophthalmia. Clinical vitamin A deficiency is strongly associated with subsequent mortality in young children. Vitamin A supplementation increases child survival by decreasing the severity of diseases like measles, acute respiratory infections, diarrheal disease and acute

Due to the overwhelming evidence of folacin's impact on preventing neural tube defects, the FDA is now recommending food fortification of this vitamin. It found in green leafy vegetables cereals and legumes.

2.3. LEARNING OBJECTIVES: -

For effective prevention and management of a case with micronutrient deficiencies the students at the end of the training will have the following knowledge, attitudes and behavioral outcomes: -

1. Define and identify the types of micronutrient deficiencies
2. Enumerate the causes and factors contributing to micronutrient deficiencies
3. Describe the magnitude and contribution of micronutrient deficiencies to the overall child health problems in the country and locally.
4. Identify and describe the clinical manifestations of various micronutrient deficiencies and its complications.
5. Demonstrate the process of assessing a child with micronutrient deficiencies
6. Identify the degree of micronutrient deficiencies
7. List the diagnostic methods and procedures for a case with micronutrient deficiencies.
8. Describe the principles and methods of treating micronutrient deficiencies
9. Select the appropriate treatment for a case of micronutrient deficiencies
10. Describe methods of preparing dietary treatment for a case of micronutrient deficiencies.
11. Identify and manage or refer timely when needed, a case of severe micronutrient deficiencies
12. Demonstrate the appropriate management of a case with micronutrient deficiencies
13. Learn how to monitor their growth (growth monitoring) and take action

14. Promote hygienic preparation and storage of weaning foods.
15. Identify methods and targets for health education in the prevention of micronutrient deficiencies
16. Describe proper growth monitoring activities and their importance in the prevention of micronutrient deficiencies
17. Promote breast feeding and proper weaning practice
18. Promote immunization of children

2.4. CASE STUDY: A LEARNING ACTIVITY

Case study 1. Micronutrients can be plenty out there but inhibitory prices make them Unavailable to the consumers!

On the edge of a large city was a poor neighborhood called Village X. There was no space for gardens so people bought all their food in markets and stores but food prices were so high the families were never able to buy enough. The main cause of the high prices was middlemen. The middlemen were people between the farmers in the country who raised the food and the families in Village X who ate it.

Here is how maize and *teff* meal go to the families of Village X. Out in the country, women grew maize and *teff* in their fields. After the maize and *teff* was harvested they put it into sacks. A young man bought the sacks of maize and *teff* and took them to a small market. The owner of the store bought the sacks and kept them in his grain store. A truck came, and the truck driver picked up the sacks and took them to a mill. The mill owner ground the maize and *teff* into flour and put it back into sacks. Another truck driver took the sacks to the big markets. A young man bought a sack of maize and *teff* flour and took it on a bus to Village X. There he opened the sack and sold the meal to six market women. The market women took the maize and *teff* to the Village X market for selling.

All these people between the farmwomen and the Village X mothers were middlemen. Every time, the maize and *teff* passed from one person to another the price went up where the price of *teff* was roughly four times that of maize. The Village X people were

too poor to pay for *teff* meal or meat products,they resorted to buying maize every time because it was relatively cheaper. An Epidemiological survey in Village X revealed many residents with symptoms of loss of appetite, pallor, lassitude, weakness and children in that area were poorly attentive at schools and scored lower grades. **The problem was that mothers could afford to buy only maize which is deficient in iron leading to the development of a deficiency disease known as anemia**. This problem could be easily corrected by reducing the price of *teff* to an affordable level, which may involve controlling the middlemen by concerned authorities.

Case study 2: Night blindness

Everyday the nightfalls Adanech experienced an inability to see clearly. Her uneducated father and mother were anxious about her situation and were trying to improve her sight and took her to almost all religious settings, including an exorcism in the area. However, her sight was getting worse day by day and reached a point where she needed help to walk every time after a sunset. Village girls now labeled her as "*daphintam"*- meaning unable to see at night. As the youngest girl in a family of 10, what went wrong to her sight?

Adanech was born in a rural village located 30 km North of Addis Ababa. All her brothers and sisters before her grew up in a time where there was huge expanse of farm and grazing land and hence fruits, and dairy products were plentiful. There was always a surplus of fruits and animal products for sale to city dwellers and in return to buy salt, oil, and gasoline and other household items that are noe 1 Tf-0.007.7 re4othe1f66.06 12e472 301.0

and more than 150 million people are affected in Africa alone. In Ethiopia, one out of every 1000 is **a cretin** (severely mentally retarded dwarf), and about 50,000 peri-natal deaths are occurring annually due to IDD. Twenty two percent of the total population have goiter and 62 % of the population is at risk for IDD according to national survey conducted by the previous Ethiopian Nutrition Institute. In some pocket areas of the country the prevalence of goiter is found to be 50-95 % (WHO considers that if the goiter rate is above 5 % in the population it is a public health problem). From the various surveys conducted in many parts of Ethiopia, IDD has become one of the biggest nutritional public health concerns. Various surveys of goiter prevalence showed a particular predilection to the highlands and inland areas with the prevalence ranging from 0.4% to 63%.

2.6.2. IRON DEFICIENCY ANEMIA

Nutritional problems are common

Ascorbic acid (Vitamin C) is one of the factors in the diet that enhances absorption of non-heme iron. The influence of ascorbic acid is most substantial in inhibitory food, which means food that contains the main inhibitors of nonheme iron absorption, phytate and polyphenoles. It is effective in promoting iron absorption if eaten together with the iron. There could be a decrease in the consumption of sources of this vitamin either due to seasonally availability, economical problems or lack knowledge.

Organic acids also have similar role in promoting iron absorption. It was shown that the addition of citric, malic or tartaric acids to rice-based meal highly improved iron absorption. These organic acids are obtained from vegetables. Fermentation of foods also improves the bioavailability of non-heme iron. Demant et al 1980-noted increased absorption of iron from South-African beer made from

Rickets also contributes to increased morbidity, disability and mortality. In a case-control study done in Addis Ababa the odds of dying in rachitic patients was five times higher than that of controls.

Paradoxically, rickets is widely prevalent in many tropical and subtropical regions despite abundant sunshine. Reports from health institutions suggest that rickets is **an** important child health problem in Ethiopia. In a review of pediatric admissions in Jimma hospital about 7% of under 5 children were diagnosed with rickets. A more recent community based study in Jimma town showed rickets prevalence of 4% **in** randomly selected children between 6-59 months of age.

The incidence of rickets is particularly high in slum children who live in crowded houses almost devoid of sunlight. Vitamin D deficiency is the most common cause of rickets in Ethiopia. All the rachitic children were said to be exposed to sunlight, the majority daily, and with no clothes on. From clinical experience too some children present with rickets despite history of adequate sunlight exposure (unpublished observation. The deficiency of calcium may increase the requirement for vitamin D, and therefore calcium deficiency may aggravate a borderline vitamin D status. In rats the rate of inactivation of 25-hydioxy-cholecalciferol in the liver is increased by calcium deprivation (or increased phytic acid). The effect is mediated by 1,25 dihydroxy-cholecalciferol produced in response to secondary hyperpara-thyroidism. Studies conducted in Nigeria suggest that rickets is largely the result of lack of calcium. Calcium deficiency as a cause of rickets is also reported from rural South Africa. The evidence for the role of calcium deficiency in the causation of rickets comes from dietary surveys, biochemical studies, and the response to calciurn therapy alone.

recommended daily allowance of 400 micrograms (for pregnant women) and 180 mcg for non pregnant women 15 years and above.

Evidence indicates that the problem of folate deficiency is common in the developed

Emotional deprivation- In orphan children and in children whose parents are negligent in giving care to their children for different reasons, children will lose their appetite and hence end up in state of malnutrition

The Cultural factors- Different biases as to who should take the lion's share of the family 's food (Example, age bias—older children are given more food than the smaller ones,

Gender bias—male children are more favored in getting nutritious food than female children in some families, etc.)

Mal-distribution of food stuffs - within the family, it occurs between the different ages and sexes due to biases, food prejudices and taboos. It also occurs between the different regions of any country because of inappropriate food and nutrition policy, poor marketing and distribution system due to different reasons like embargo, country under-siege, etc.

2.7.2. ETIOLOGY OF MICRONUTRIENT DEFICENCIES

2.7.2.1. **IDD**

Living in the mountainous areas where plant foods have inadequate in iodine

Taking cassava tuber as a food without detoxifying it and other chelating substances

2.7.2.4. **Iron deficiency anemia**

Cultural malpractice and beliefs in child feeding and weaning process, weaning foods, exposure of children to sun light, time of weaning and food prejudices

Intra household mal-distribution of food (age and sex bias)

Effects of emotional deprivation and neglect on nutritional status of children and proper child treatment practices

Importance of breast feeding

Hygiene (personal hygiene, food hygiene, environmental hygiene)

Importance of immunization

Importance of growing fruits and vegetables in the backyard garden and consumption by the household members regardless of their age and sex.

Parents / caregivers need to be instructed how to modify the nutrient contents of the locally available foods used in weaning and child feeding.

2.9.2. Dietary modification: -

This approach focuses on modifying the micronutrient y, protein and energy content of the complementary foods.

- Making iodized accsssible to the whole family especially women in child bearing age.
- Iron and folic acid supplementation to mother during pregnancy and lactation
- vitamin A supplementation to the mother during lactation during the first 6 weeks of delivery
- Iron and vitamin A supplementation to children
- Periodic deworming(giving antihelmithic) of mothers(except in the first trimester of pregnancy) and children every 6 months

2.9.3 Economic approach:

This approach aims at improving the incomes of the target community as a solution to their nutritional problems. It is considered usually in areas where there are many poor people and if their purchasing power is low as in the case of urban slums and people displaced because of war and other natural calamities. There are different methods in this approach: -

Food for work— This involves offering of some work for the poor people and paying them off in terms of food. It is good in that it offsets seasonality in the dietary intake, but it is donor dependent

Food subsidy --- This involves subsidizing of either producers or consumers of food by the government. Structural adjustment policies interfere with the materialization of this approach

Income generating projects---This method operates in some regions of Ethiopia and involves development of income generating projects in the community to make them

generate fund for buying food. It includes organizing the community and using their potentials in the running of the project. The projects could be weaving, pottery, Bee keeping, etc. This approach needs a good feasibility study on how the income generated is used, the sustainability of the programme, etc.

The above approaches could be used either simultaneously where it applies or independently. This should be determined by doing a thorough strength, weakness, opportunities and constraints (SWOC) analysis.

2.9.4. Nutritional Surveillance

Targets for surveillance:- Infant & child growth monitoring and promotion(GMP) activities need to carried out in an integrated manner with other PHC services. Missed opportunities for GM should be fully utilized in such a way that children coming to the health institutions for other purposes are covered in the growth monitoring and promotion (GMP) activities. Besides every child should be regularly monitored for growth performance (growth take up) every month. **Triple A cycle** (assessment, analysis and action) be employed in effecting GM activities.

Assessment includes regular measurement of weight and heights of < 5 children and comparing their growth performance with the standard(determining the direction of growth of the child)

Analysis includes assessment of the different causes of growth faltering and options for intervention with the mother/care giver.

Action involves nutritional intervention to curb the problems, which include counseling of the care taker on child feeding practices.

The action may include rehabilitation of severely malnourished children and following them up and micronutrient supplementation, Nutrition education on importance of backyard gardening & horticultural activities, dietary diversification, breast feeding and proper child feeding practices.

2.9.5. Nutritional surveys

Community based nutritional surveys including anthropocentric measurements and dietary consumption surveys need to be carried out among under five children in order to early detect the occurrence of nutritional problems in the community.

2.10. LEARNING ACTIVITIES (CASE STUDY) CONTINUED

Based on the case studies presented in section 2.4, different points of discussion have been incorporated in the respective satellite modules. Therefore, the students are advised to refer to the questions in satellite modules for each professional category and discuss them in the class under the coordination of their facilitator.

UNIT THREE

SATELLITE MODULES

1.2. Direction for using the satellite module

This satellite module can be used in the basic training of Health Center team particularly health officers who are either already in the service or in training Programs. In order to make maximum use of the satellite module, the health officer should follow these directions

Evaluate yourself by doing the pre-test pertinent to your category under section 2.1.2.1 before going through the satellite module and evaluate your self by referring to the answer keys given in the unit 7 section 7.1.1

Read the core module very thoroughly

Read the case study and try to answer questions pertinent to it

Use listed references and suggested reading materials to supplement your understanding of the problem.

For total and comprehensive understanding of the causes, etiology, pathogenesis, epidemiology and prevention of micronutrient deficiencies, the health officer students are advised to refer to the core module.

After going through this module evaluate yourself by doing post-test and comparing your score with the key given in unit 7 section 7.2.1

Case study: Learning Activity

Read the case studies 1,2 and 3 in the core module very thoroughly so that you will be able to answer questions pertaining to it in section 2.12 of this module.

2.5. Definition

Refer to the core module unit 2 sections 2.5

2.6. Epidemiology

Refer to the core module unit 2 sections 2.6

2.7. Cause, Etiology and pathogenesis

Refer to unit 2 section 2.7 of the core module

2.7.2. ETIOLOGY OF MICRONUTRIENT DEFICENCIES

Refer to the core module section 2.7

poor in zinc content

2.8. Clinical Features

2.8.1. Iodine deficiency

- **Fetus**
  - Abortion
  - Still birth
  - Congenital anomalies
  - Increased infant mortality
  - Neurologic cretinism (including mental deficiency, deaf mutism, spastic diplegia, squint)
  - myxedematous cretinism (dwarfism, mental deficiency)
  - Psychomotor defects

- **Neonate**
    - Neonatal goiter
    - Neonatal hypothyroidism
- **Child and adolocsent**
    - Goiter
    - Juvenile hypothyroidism
    - Impaired mental function
    - Retarded physical development
- **Adult**
    - Goiter with its complications
    - Hypothyroidism
    - Impaired mental function
    - Poor physical work out put
    - Iodine induced hyperthyroidism
- **Beasts of burden (animals used for production like oxen, horses, donkeys are also affected)**
    - Weakness

Diagnosis

Three components to diagnosing IDD:

1. Determination of thyroid size/goiter
2. Determination of urine iodine excretion
3. Determination of blood T4 +TSH levels

Usually the diagnosis must depend upon clinical assessment only using WHO criteria

Measuring Thyroid Size /WHO/

STAGE O No goiter

STAGE IA Goiter detectable by palpation and not visible when neck is in the normal position or distended

STAGE IB Goiter palpable and visible when neck is extended

STAGE II Goiter visible with the neck in normal position

STAGE III Goiter visible at a distance

STAGE IV Huge goiter

At the community level determination of the endemicity of IDD is very important to institute appropriate intervention measures. The following are classification and techniques of survey to detect IDD at the community level.

Table 1. Classification of Endemia of Iodine deficiency disorders by Severity

Grades of severity of iodine deficiency disorders			
	Mild IDD	Moderate IDD	Severe IDD
1. Prevalence of goiter (total)	5-19%	20-29%	>=30%
2. Cretinism	0	0	0-5
3. Daily urine urinary iodine ug/d	50-100	25-49	<25
Median Urine iodine ug/d	3.5-5	2-3.4	0-1.9
4. Prevalence of neonatal TSH > 50 ug/d	<1%	1-5%	>5%

Source: WHO/ICCIDD Report

Survey Techniques for endemic Goiter and Cretinism

1. Survey Organization
   i. Examine school children
   ii. If goiter prevalence is>10%inschool children, sample population for survey
2. If goiter prevalence is > 10% in school children, assess 24 hours urine iodine
3. Check for Goitrogenic factors (e.g. soy products, drugs, cabbage, cassava, etc)

TREATMENT AND PREVENTION OF IODINE DEFICIENCY

Universal salt iodization is one of the most cost effective strategies in preventing Iodine deficiency disorders. The Quality and Standards Authority of Ethiopia, has set the iodine level to be 60-80 PPM as potassium iodate, after making allowance for losses of iodine during storage and distribution.

2.8.2. IRON

Symptoms and Sign of the deficiency

Symptoms

Weakness

Fatigue

Dyspnea on exertion

Coldness and parasthesia of the hands and feet

Vague GI complaints such as

- Capricious appetite
- Flatulence
- Epigastric ditress
- Belching
- Constipation or diarrhea

Glossitis (varying degree of papillary atrophy and soreness) which is

- More common over 40 years of age
- More in women than men

Angular stomatitis in 10-15%

Plummer Vinson syndrome in middle age women

Signs

Pallor

Pica (geophagia, clay eating and ice eating)

Finger nails and toe nails –lusterless, thin, brittle, flattened and spoon-shaped (koilonychias)

“Hemic” murmur, spleenomegally, dependent edema, and lastly congestive heart failure.

Diagnosis

Difficult to diagnose in mild cases

I. Clinical signs and symptoms

II. Biochemical Method

Hemoglobin determination or hematocrit

Peripheral morphology shows hypochromic microcytic

Serum Iron and serum ferritin decreases

Total Iron binding capacity increases usually greater than 84%

Bon marrow aspiration shows low iron storage in macrophages, decrease in number of side oblasts

III. Dietary

Dietary history

24 hours dietary recall

Food frequency questionnaire,

Differential diagnosis

Thalassemia minor (target RBC)

Sideroblastosis (Perl's prussian blue stain)

Chronic illnesses

TREATMENT

In treating iron deficiency anemia we should also consider administration of folic acid (see Table 1 below).

Table 1. Treatment protocol for nutritional anemia

Age group	***Dose***	***Duration of Treatment***
< 2 years	25 mg iron + 100 - 400µg folic acid daily	3 months
2 – 12 years	60 mg iron +400µg folic acid daily	3 months
Adolescents and adults including pregnant women	120 mg of iron + 800µg folic acid Daily	3 months

Source: WHO, BASICS,, UNICEF. Nutrition Essentials: A guide for health managers

Oral or parentral administration of iron in the form of gluconate, succinate, sulphate . Iron dextran should be administered parentrally for patients with:

Ulcerative colitis, regional enteritis, intestinal shunts, colostomy or ilieostomy

Malabsorption syndromes

Uncooperating patient or severe intolerance of oral dose

Complications of parentral administration

Anaphylactic shock particularly during i.V administration

Skin staining at the injection sites

2.8.3. SIGNS AND SYMPTOMS OF VITAMIN A DEFICIENCY DISORDER (VADD)

Night blindness

Lack of tear secretions (due to destruction of goblet cell)

Changes in eyes with eventual blindness if deficiency is severe and untreated

Susceptibility to respiratory infections

Dry, rough skin

Changes in mucous membranes

Weight loss

Poor bone growth

Weak tooth enamel

Diarrhea

Coreal Xerosis(Dryness)

Corneal Ulceration/ Keratomalacia

Bitot's spots

Conjunctival Xerosis

Coreal scar

Slow growth

It is characterized clinically by Xerosis (dryness) of the eyes and night blindness, which are classified by the WHO as follows:

Night blindness (

(Respiratory, gastro intestinal, genito-urinary tracts, as well as the conjunctivae are also affected).

Corneal xerosis (X2A) : is seen as a wrinkling of the cornea.

A Corneal ulcer/ Keratomalacia (X3A) is ulceration and softening of the cornea where

Serum level and

Plasma Vitamin A and plasma carotene

III. Dietary

Dietary history

24 hours dietary recall

Food frequency questionnaire,

Treatment:

Doses of oral vitamin A (as retinal palmitate in oil). One dose immediately, the second dose the next day, and the third dose 2 weeks later.

0-5 months 50, 000 IU per dose

6-11 months 100,000 IU per dose

12^{+} months 200,000 IU per dose.

Prevention:

Vitamin A supplementation

I. **Universal Supplementation**: A single dose of vitamin A every 6 months in population where vitamin A deficiency is a problem of public health importance (see criteria above).

Target groups: Children 6-59 moths and lactating mothers within 6 weeks of delivery. The supplementation could be done through the six critical contacts of women and children with the health service unit:

Antenatal care

Delivery

Postnatal care and family planning

Immunizations

Well baby and

Growth monitoring/ promotion visits and

Sick child visit

Other outlets such as EPI+ programs, Community IMCI and clinical IMCI contacts can also be used for supplementing vitamin A.

II. Disease targeted supplementation: Give a single dose vitamin A to children under five years at the first contact with the health professional as follows:
A case of Protein energy malnutrition on the : 1st, 2nd and 14th days (Therapeutic dose)
A case of measles: 1st, 2nd and 14th days (Therapeutic dose
Cases of acute respiratory illness and diarrheal diseases: a single dose on the 1st day of contact

III. Food Diversification: Give nutrition education on the importance of consuming diversified dietary sources of vitamin A such as green leafy vegetable (Kale, Cabbage) and Yellow fruits and vegetable (Mango, Papaya, Carrot, etc.)
C. Food Fortification: Different food vehicles like sugar can be fortified with vitamin A.

2.8.4. VITAMIN D DEFICIENCY SYMPTOMS

Rickets (a childhood deficiency disease): malformations of joints or bones, late tooth development, weak muscles, listlessness, double maleolus, Rachitic Rosary, Bowed legs and knocked knees, delayed Fontanels closure, craniotabes

Osteomalacia (adult rickets): pain in ribs, lower spine, pelvis and legs, muscle weakness and spasm, brittle, easily broken bones.

Diagnosis

I. Clinical: signs and symptoms

II. Biochemical

Reduced levels of Vitamin D forms in blood.

Decreased serum phosphate, decreased calcium, increased alkaline phosphatase, urinary hydroxyproline, PTH levels.

III. Biophysical: Bone X-ray

IV. Dietary Method: Dietary history, 24 hour dietary recall method, food frequency questionnaire

2.8.5. FOLIC ACID DEFICIENCY

Age group	*Dose*	*Duration of Treatment*
< 2 years	25 mg iron + 100 - 400µg folic acid daily	3 months
2 – 12 years	60 mg iron +400µg folic acid daily	3 months
Adolescents and adults including pregnant women	120 mg of iron + 800µg folic acid Daily	3 months

Source: WHO, BASICS,, UNICEF. Nutrition Essentials: A guide for health managers

2.8.6. ZINC DEFICIENCY

Moderate deficiency:

Impaired taste and smell (hypogeusia)

Growth retardation in children and in fetuses (results in low birth weight)

Delayed sexual maturation and impotence

Alopecia

Rashes

Multiple skin lesions (Acrodermatitis enterohepatica)

Glossitis

Stomatitis

Impaired immunity

Abnormalities of labor including preterm labor or precipitated labor

Post partum hemorrhage due to uterine atony

Blepharitis

Paronychia

Sterility

Low sperm count and hypogonadism

Delayed wound healing

Night blindness and eye lesions including photophobia

Impaired appetite and food intake

Growth monitoring and well baby clinic visits

Sick baby clinic visits

During all these contacts **Essential Nutrition Actions (ENA**) that need to be promoted are the following:

I. Exclusive breast-feeding up to 6 months of age

II. Complementary feeding at the age of 6 months with continued breast feeding up to 2 years and beyond

III. Continued feeding of the sick child

IV. Maternal nutrition

V. Vitamin A supplementation for children 6-59 months and for lactating mothers within 8 weeks after delivery.

VI. Iron and folic acid supplementation to the mother during pregnancy and in the postnatal period

VII. Ensure the consumption of iodized salt by the family

2.12 Learning activities (case study) continued

Refer to case studies 1,2 and 3 in the core module and discuss on the following questions in the class. The instructor can assist you.

1. *What pertinent history do you ask parents of children in cases 1.2 and 3?*
2. *What pertinent physical signs would you look for?*
3. *What laboratory investigations would you order in order to substantiate your diagnbosis?*
4. *What other assessments do you carry out in order to determine the type of malnutrition?*
5. *What is your diagnosis from the story?*
6. *What other causes do you consider for the differential diagnosis?*

UNIT ONE

SATELLITE MODULE FOR PUBLIC HEALTH NURSES

Introduction

Adequate nutrition is the intake and utilization of enough energy and nutrients, together with disease control, to maintain well-being, health and productivity. “Malnutrition” includes generalized malnutrition (which manifests itself as stunting, underweight and wasting in individuals) and deficiencies of micronutrients such as vitamin A, Iron, Zinc, and Iodine. The magnitude of the problem relating with micronutrients in Ethiopia are so intense and majority of children, adults, pregnant and lactating women are affected. Therefore, health workers particularly the public health nurses are critical to the design and implementation of nutrition program. Collaboration with the other professionals and implementing the essential nutrition action can reduce infant and child mortality; improve physical and mental growth, development, and productivity.

1.1. Purpose and Use of the Satellite Module

The purpose of this satellite module is to equip learners (trainees) with knowledge and skills required to identify and manage effectively cases of micronutrient deficiency. The public health nurses can use this satellite module in their-services or in-services training programs.

1.2. Direction for using the Satellite Module

For a better understanding of this module, the public health nurses are advised to the E(prtfes 28oa2T

UNIT TWO

SATELLITE MODULE FOR PUBLIC HEALTH NURSES

2.1 Pre and Post test

See the core module unit 2

2.2 Significance and Brief Description of the Problem

See the core module unit 2.

2.3 Learning Objectives

To be able to prioritize the key nutrition behaviors which met the health and nutrition needs of vulnerable groups of population in the communities and integrate these in to ongoing intervention programs in health facilities and communities at large.

2.4 Case Study: Learning Activities.

Read cases 1, 2 and 3 so that you will be able to discuss questions in section 2.12 of this module.

2.5 Micronutrient Deficiencies:

Micronutrient deficiency refers to the deficiency (decrease in the level) of micronutrients that are essential for the vital function including growth, development, immunity, fertility

and other lively processes. Although there are various micronutrients essential to our body, in this regard, this module focuses mainly on few micronutrients that are of public health importance in the Ethiopian context due to the tolls of morbidity, disability and mortality they are causing in the population. Therefore, this module focuses mainly on the following micronutrients: Vitamin A deficiency, Iron Deficiency anemia, Iodine Deficiency disorder and vitamin D deficiency (rickets),

2.5.1. VITAMIN A DEFICIENCY

Vitamin A has the distinction of being the first fat-soluble vitamin to be recognized. It is certainly one of the most versatile, with parts to play in such diverse functions as vision, maintenance of body lining and skin, bone growth, anti oxidant activity and reproduction. A deficiency may be as many as hundred thousand a year world wide, placing a heavy burden on society.

Until recently vitamin A deficiency was thought to be a problem only for the eye health and vision. It is now clear that it is also essential for the proper functioning of the immune system of the children, which occurs, long before damage to the eye is apparent.

It is also worth to mention that the vitamin A status of the infant is closely correlated with that of the mother. Vitamin A deficient mother transfers less vitamin A to their fetuses. After birth the concentration of vitamin A in the breast milk depends on the vitamin A status of lactating woman. Breast mmilk depends otsI7wTw -16.625 -ts of

Vitamin A:

Important component for seeing in dim light.

Has to come from food or supplements

Is stored in the liver

Builds the epithelial cells

Is important for immune system.

Who is at the greatest risk?

Children 6 to 59 months

Women during pregnancy and lactation

Objectives:

Eliminate vitamin A deficiency

Decrease child morbidity and mortality.

Solution to vitamin A deficiency

Strategies

Breast milk

Food diversification

Supplementations

Food fortification

1. Breast feeding

Breast milk is a hygienic source of energy, essential nutrients, water, immune factors, and many other components that are beneficial for infant and young children. Breast milk protects against vitamin A deficiency. Breast milk is the ideal food for the children in the first six months of age. This is because:

Breast milk is rich in vitamin A

Exclusive breastfeeding reduces infection and vitamin A losses.

Postpartum vitamin A supplementation of lactating women will raise breast milk vitamin A content.

Promotion of exclusive breastfeeding is a strategy for preventing Vitamin A deficiency.

Vitamin A intervention increases the benefits of breast feeding promotion for maternal and child health and survival.

The Public Health Nurses should always utilize the following important key message at each contact with the mother in order to promote breast feeding.

Treatment supplementation for different diseases

Pneumonia, severe malnutrition, severe anemia and persistent diarrhea Capsule on day 1.

Measles: capsule on day 1, day 2, day 30.

Treatment of eye problems due to Vitamin A deficiency: capsule on Day 1, Day 2. Day 30.

4. Food Fortification: Adding vitamin A to foods that are commonly consumed by the high risk groups, such as: Vitamin A enriched sugar, Iron enriched flour, fish liver oil … etc..

Key contact points for control of Vitamin A deficiency.

Pregnancy

Delivery

Postnatal and family planning

Well child/ GM/P

Immunization

Sick child

Pregnancy (antenatal contact)

Increased food and vitamin A intake. In the areas where vitamin A deficiency is common and vitamin A rich foods are scarce, low dose of vitamin A supplements (< 10 000 IU/ day or 25 000 IU/week) or multiple micronutrient supplements with appropriate levels of vitamin A may be recommended.)

Counsel on early initiation of breast feeding, feeding of colostrum, and frequent exclusive breast feeding

Assess nutritional status and encourage increased energy intake, a varied diet, including vitamin A-rich food, and reduced workloads during pregnancy

Discuss family planning options that protect lactation, including Lactational Amenorrhea Method (LAM)

Educate on parasite prevention and treat parasite infection.

Immediate postpartum Contact

Facilitate early initiation of breast feeding, counsel on frequent and exclusive breast feeding, and help establish good breast feeding skills (Proper positioning and attachment).

Administer a single high dose vitamin A supplement to mother immediately after delivery.

Assess nutritional status and counsel mother on increasing energy intake, consuming a varied vitamin A rich diet, and reducing work load through out lactation.

Discuss family planning options that protect lactation, including LAM.

Postnatal contact

- Vitamin A deficiency will result in low vitamin A concentration in breast milk.

In areas where vitamin A deficiency is common, give a single high dose [200,000 IU] vitamin A capsule as soon after delivery as possible, but no later than eight weeks postpartum. This will help to build up vitamin A stores, improve the vitamin A content

Well baby contact (Growth monitoring and immunizations)

Provide nutritional assessment and counseling, reinforcing the mother's need for increased energy intake, a varied vitamin A diet, and reduced work load.

Counsel on exclusive breast feeding, timing for the introduction of appropriate complementary food, the importance of vitamin A rich foods in the child's diet, and practical ways of enriching the child's diet using locally available foods.

Check and complete vitamin A supplementation protocol for older infants and young children.

Check and complete mother vitamin A supplementations(If with in 8 weeks postpartum)

Discuss family planning options that protect lactation, including LAM, IUCD…etc.

Administer 50, 000 IU Vitamin A supplement to non breast fed infant under six months at first contact

The sick baby clinic/ Sick child:

Assess and counsel on breast feeding and adequate and complimentary feeding during and after illness.

Check and complete vitamin A supplementation protocol: Follow national policies therapeutic dosing with high dose of vitamin A capsule for measles, xerophtalmia, chronic diarrhea and severe malnutrition.

Action to support breast-feeding and improve vitamin A status:

Use local communication channels (mass media, schools, religious institutions, community events, market place, community based distributions systems etc.) to disseminate information on optimal infant feeding practices, maternal nutrition, and vitamin A.

Increases availability of vitamin A-rich foods through schools and community gardens, fruit trees and animal husbandry (raising hens, chickens, and other small animals).

2. Household level

The public health nurse should advice the mother at home setting level that sun dried seasonal fruits and vegetables or air dried out of direct sunlight would provide a source of vitamin A through out the year.

Recommend the mother in a way that she may be capable of serving vitamin A-rich foods with a little fat (oil, butter, peanuts) to increases utilization by the body.

Recommend communities to plant gardens with a variety of vitamin A-rich vegetables such as Mango, Sweet potatoes, Pumpkin, Carrot

Basic Facts: Consequences of Vitamin A deficiency in Pregnancy

Increases the risk of:

Night blindness

Maternal mortality

Miscarriage

Still birth

Low birth weight

Reduced transfer of Vitamin A to fetus

2.5.2 Iron Deficiency Anemia

Anemia is low level hemoglobin in the blood, as evidenced by reduced quality or quantity of red blood cells that affects oxygen carrying capacity of blood. It has massive consequences for maternal and child health, child development and productivity. Iron is essential to periods of growth, such as infancy, adolescence, pregnancy and lactation.

Premature birth

Intrauterine growth retardation

Low birth weight

Increased risk of maternal mortality

Reduced ability to survive bleeding during and after birth

Decreased productivity due to fatigue and tachypnia.

Consequences of Anemia in Children:

Increased infant mortality(due to low birth weight)

Learning deficits (Iron Deficiency anemia lowers IQ by 10 points)

Fatigue and poor growth

Iron deficiency affects iodine up take thus increasing risk of Iodine Deficiency Disorders

Critical Contact Points

Essential nutrition action needs to be taken by all health and extension workers.

Those critical contact points are:

During pregnancy

During delivery

During postnatal period

Well baby clinic

Immunization

Sick child clinic

1. **Antenatal contact**

Give Iron /folic acid supplementation

De-worm pregnant women

Give anti malarial to pregnant women

Promote mosquitoes-nets for mothers and baby

Promote improved diet for women

Prepare for optimal breast feeding once the baby is born

Promote consumption of iodized salt

Complete vitamin A

De-worm for parasites

Check and complete vaccinations.

5. Sick child visit (IMCI) contact

Monitor infant /child growth

Counsel on feeding breast feeding and complementary feeding

Assess and treat anemia

De-worm

Complete vitamin A and vaccinations

Assess and treat as IMCI

6. Contact in other sectors

6.1. In school Programs

Assess and treat child and adolescent anemia

Promote consumption of iodized `salt

Complete vitamin A

De-worm

School lunch if possible

Promotion of better nutrition

Assess and treatrasites

6.2 In out reach sites

Monitor infant /child growth

Promote consumption of iodized salt

Complete vitamin A

De-worm for parasites

6.3 In existing community based organization meetings.

Promote adequate breast feeding

Promote environmental sanitation and clean water.

2.5.3 Iodine Deficiency Disorders (IDD)

Proper nutrition is essential for mental and physical development and school performance. Evidence from different countries shows that malnutrition considerably reduces children's learning ability, school performance and retention rates. Iodine deficiency lowers the ability of children to think and become creative and productive adults. Iodine is also necessary for the normal development of the brain of fetus during pregnancy. Pregnant women living in iodine deficiency regions are more likely to give birth to mentally retarded children.

IDD remains a significant public health problem in many countries. According the 1990 nutritional survey in Ethiopia, the total rate of goiter, the most visible sign of iodine deficiency is 22 %. Globally, 30 % of the world's population is affected by IDD and more than 150 million people are affected in Africa alone. In Ethiopia, one out of every 1000Tw 2arrably

In school age children

Women in the reproductive age

Men and females of all ages

Young children and growing fetus are particularly vulnerable to the damage caused by IDD.

Infants who are not exclusively breast fed

Lactating women

Strategies used to control IDD

1. Distribute iodized oil capsule
2. Increase access and consumption by all families of iodized salt

Distribution of Iodized oil capsule

The public health nurse should distribute to all potential clients if available.

For High endemic areas only the following regime should be utilized

1. capsule for pregnant women and children less than 5 years
2. Capsule for women and children for 5 to 14 years of age.

Key contact points for control of IDD

Pregnancy

Delivery

Postnatal and family planning

Immunization

Well child/ GM/P

Sick child Clinic

-(Refer the essential activities on the key contact points for Vitamin A and Iron deficiency as applied to IDD)

-The public nurse should know the following important element of a successful IDD program.

Elements of a successful IDD program

Supplement supply

Delivery system

Demand and compliance

Monitoring and evaluation

2.5.4 Vitamin ‘D’ Deficiency (Rickets):

Rickets is a disease caused due to Vitamin D deficiency. it is characterized by weakness and deformity of bones. Deficiency states occur due to lack of calcium ion in the body which intern is mainly due defective absorption because of vitamin D deficiency.

The two most important vitamins ‘D’s are vitamin D-2 and D-3. Vitamin D-2 (ergo-calciferol) exists in fungi and yeast and in the form generally added to milk, food and vitamin supplements. It is used to combat hypocalcaemia (low blood calcium).Vitamin D-3 (cholecalciferol), is found in fish oils, egg yolks and milk. The body produces vitamin D-3 in the presence of ultraviolet light.

Unhealthy child care practices such as non exposure of infants to sunshine and complete covering while out doors for fear of evil eyes contribute to the occurrence of rickets in Ethiopian children.

Since sun shine is adequately available in Africa, rickets is uncommon. But in countries like Ethiopia, traditional and cultural practice of child-care has contributed to the occurrence of rickets. Rickets is more commonly associated with protein energy malnutrition and improper weaning practice.

Functions of Vitamin D

Regulates growth, hardening and repairing of bone by controlling absorption of calcium and phosphorus from small intestine.

Prevent rickets

Prevent hypocalcaemia (low blood calcium)

Prevent post-operative muscle contraction

Sardines

Sunlight plus subcutaneous fat

Vitamin D fortified milk.

How to take available capsule or tablets

Take with or immediately after food to increase absorption

Take oral solutions with meals or 1-1: 30 hours after meal.

High dose of vitamin D have been generally discouraged as it has side-effects including: calcification of soft tissue, kidney failure which is manifested by high blood pressure, irregular heart beat, nausea, weight loss, seizure, mental and physical growth retardation, kidney damage …etc

2.6 Practical Nursing for Improving Nutrition

Guidelines for appropriate complementary feeding of infants and young children 6- 24 months.

Appropriate complementary feeding promotes growth and prevents stunting among children 6-24 months.

The period of complementary feeding is when others foods or liquids are provided along with breast milk. Rates of malnutrition's usually peak at this time with consequences of persist throughout life. Stunting is seldom reversed in later childhood and adolescents. Inadequate feeding of female children also affects nutrients stores, subsequent reproductive health, and the risk of maternal mortality.

Appropriate complementary feeding invol

Feed energy-dense combination of foods to 6-11 months olds.

Introduce “finger foods”(snacks that can be eaten by children alone) beginning around 8 months of age in the mean time, try to avoid risk of chocking

Make the transition to the family diet at about 12 months of age.

Diversify the diet to improve quality and micronutrient intake.

Feed Vitamin A-rich fruits and vegetables daily.

Feed meat, poultry, or fish daily or as often as possible, if feasible and acceptable.

Use fortified foods, such as iodized salt, Vitamin A-enriched sugar, iron enriched sugar, Iron enriched flour or other staples, when available.

Practice active feeding

Feed infants directly and assist older children when they fed themselves.

Offer favorite foods and encourage children to eat when they lose interest or have depressed appetites.

If children refuse many foods, experiment with different food combination, tastes, texture, and methods for encouragement

Talk to children while feeding.

Feed slowly and patiently and minimize distractions during meals.

Do not force children to eat.

Practice frequent and active feeding during and after illness.

During illness, increases fluid intake by more frequent breastfeeding, and patiently encourage children to eat favorite foods.

After illness, breastfeed and give foods more often than usual, and encourage children to eat more food at each sitting.

Practice good hygiene and proper food handling

Wash caregivers’ and children’s hands with soap before and after food preparation and eating.

Serve foods immediately after preparation

Use clean utensil to prepare and serve food.

Serve children using clean cups and bowls, and never use feeding bottles.

i. Responsibility of the public health nurse to

This involves teaching all sections of the community, especially fathers and mothers, to make the best use of the foods available (including breast feeding), to make use of available primary health care services, and to grow local foods in their own garden.

There are seven rules, which, if kept, can largely improve nutritional status in the community.

1. Identify the local sources of food stuffs.
2. Recognize the causes of improper feeding in the community.
3. Explain the effects of improper feeding on different age and sex groups.
4. Teach nutritional food values of local food stuffs.
5. Demonstrate how to cook balanced meals using locally available foods.
6. Teach personal and food hygiene at home

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7. Evaluate what the community members have learned about improved nutrition in order to prevent micronutrient deficiency
8. Make the revencyc-19ced meals u-8dfa4.72 Tm( )Tr to pre-Eects of improper

Signs of properly attached infant:

a. Mother brings infant toward her breast, not the breast toward her infant
b. Infant's mouth is open wide.
c. Infant's lower lip turns outwards
d. Infant's chin touches mother's breast
e. Mother entire nipple and a good portion of the areola (dark skin around the nipple) are in infant's mouth.

Mother initiates breastfeeding within 1 hour of birth.

Takes advantages of the newborn's intense suckling reflex and alertness

Stimulates breast milk production

Protects infants from diseases by providing the thick yellowish milk(colostrums),

Helps to expel placenta more rapidly and reduce blood loss.

Helps expel meconium the infant's first stool.

Keeps newborn warm through skin-to skin contact

Fosters bonding between mother and infant

Mother breast feeds frequently, day and night.

Mother offers second breast after infant empties the first.

Mother continues breastfeeding when either she or` the infant is sick.

Mother who will be away from her infant for an extended period expresses her breast milk. Care givers feeds expressed breast milk from a cup.

Mother expresses breast milk following these steps.

washes hands

- Prepares a clean container
- Gently massages breasts in a circular motion
- Positions her thumb on the upper edge of the areola and the first two fingers on the underside of the breast behind the areola.
- Pushes straight into the chest wall.
- Avoids spreading the fingers apart.
- For large breasts, first lifts and then pushes in to the chest wall

- Rolls thumb and fingers forward as if making thumb and fingerprints.
- Repeats rhythmically: position, roll; position; push, roll
- Rotates the thumb and finger positions.

Learning Activities (Case Study) Continued

Refer to the story of cases 1,2 and 3 in the core module and discuss on the following questions among the team.

1. What type of major health problem did the health center team identify in that particular community?
2. What fundamental intervention programmes need to be planned by the health workers in general? (Consider all the given case scenario)
3. Who should be involved in identifying and prioritizing the health problems for better intervention and good outcome?
4. What is expected from the health workers as far as the given case scenario is concerned?
5. What type of feeding behavior and practices would bring change and improve the health of the community?
6. What basic things were thought by the nurse in order help children to grow healthier and to prevent micronutrient deficiency?
7. What will happen to children if they do not get the necessary nutrients?
8. What will be the role of the public health nurse in the promotion of health and prevention of diseases in the community?

UNIT ONE

SATELLITE MODULE FOR LABORATORY TECHNICIANS

Introduction

1.1 Purpose of the module

This module helps laboratory technicians to participate in the team in the diagnosis and management of micronutrient deficiencies, with a particular emphasis on the laboratory investigations of selected micronutrients such as iron, iodine, zinc, folate, vitamins A and D. Additionally useful laboratory tests associated with these micronutrient deficiencies are discussed.

1.2 Direction for using the satellite module

For a better understanding of this module the laboratory technicians are advised to follow the following directions.

Do the pretest in your profession in unit 2, section 2.1.2.3 of the core module

Read the core module thoroughly

Use listed references and suggested reading materials to substantiate your understanding of the problem

Evaluate yourself by doing the post test and referring to the keys given in unit 7 section 7.1.2.3

2.4 Learning activities: Case study

2.5 Definition

Refer to the core module unit 2 sections 2.5.

2.6 Epidemiology

Refer to the core module unit 2 sections 2.6.

2.7 Cause, Etiology and pathogenesis

Refer to the core module unit 2 sections 2.7.

2.8 Clinical features

Refer to the core module unit 2 sections 2.8.

2.9. Diagnosis

2.9.1 Introduction

Medical laboratory professionals are mainly

T_3 in dried blood spots exposed to

2.9.3. Estimation of hemoglobin by the Acid Hematin Method of Sahli-Hellige

Principle: -

Hemoglobin in a sample of blood is converted to a brown colored acid hematin by treatment with 0.1 N HCl and after allowing the diluted sample to stand for 5 minute to ensure complete conversion to acid hematin it is diluted with distilled water or 0.1 N HCl until its color match as with the color of an artificial standard (tinted glass).

Depending on the type of hemoglobinometer, this gives the hemoglobin concentration either in g/dl or as a percentage of normal where 100% is equal to 14.6 g/dl. To convert the percentage to g/l, multiply by 1.46 or to g/dl by 0.146. Other standardized haemoglobin estimation methods could be used whenever available. Though, expensive the haemo-cue method is more reliable and dependable than the Sahil's method. As some other colorimetric methods it is not technically demanding, standardization is simple and operation with out direct electric supply option is offered.

Normal range of hemoglobin at different age groups

	Hemoglobin in mg/dl
Children at birth	13.6-19.6
Children at 1 year	11.3-13.0
Children, 10-12 years	11.5-14.8
Women	11.5-16.5
Men	13.0-18.0

Source: Harriet Lane handbook

2.9.4. PREPARATION, STAINING AND EXAMINATION OF PERIPHERAL BLOOD FILM

2.9.4.1 Preparation of Thin Blood Film

Examination of the blood film is an important part of the hematological evaluation and the validity or reliability of the information obtained from blood film evaluation, the differential leukocyte count in particular depends heavily on well-made and well-stained films. If not made from skin puncture, films should be prepared within 1 hour of blood collection into EDTA. Adequate mixing is necessary prior to film preparation if the blood has been standing for any appreciable period of time. A thin blood films can be prepared on glass slides or cover glasses. The latter has the single most important advantage of more even distribution of leucocytes. Preparation of blood films on glass slides has the following advantages:

Slides are not easily broken

Slides are easier to label

When large numbers of films are to be dealt with, slides will be found much easier to handle.

Generally it is advisable to make a smear that covers about 2/3 or ¾ the size of the slid. Cells should evenly spread in monolayer, especially at the examination area near the tail of the smear. Preferably blood slides should be labeled before they are made. The commonest practice is, once the smear is dry, it should be labeled appropriately with the name of the patient and date or a reference number on the head of the film using a lead pencil or graphite. If these are not available, labeling can be made by scratching the above information on dried smear with the edge of a slide. A paper label should be affixed to the slide after staining.

2.9.4.2 Staining of thin blood film with Romanowsky dyes

Modern Romanowsky stains in common use (e.g., Wright's, Leishman's) containing an acidic component (eosin B) and a basic component (methylene blue) are commonly used. Also panoptic stains like MayGrunwalds- Giemsa could be used to stain blood films for differential leukocyte count and red cell morphology study. Wright's or Leishman's methods are simpler to be practiced at peripheral laboratories. These stains could be purchased as a ready to use solution or as powder and prepared in the laboratory in a solution form. Their staining reactions are also similar.

Appearance of cells and cell components in Romanowsky-stained blood films

Films stained with Wright's stain are pinkish in color when viewed with the naked eye. Microscopically,

. Red cells - pink with a central pale area

. Nuclei of leukocytes - blue to purple

. Cytoplasmic neutrophilic granules - tan

. Eosinophilic granules - red orange each distinctly discernible

. Basophilic granules - dark blue

. Cytoplasm of monocytes - faint blue gray

. Platelets - violet granules

. Malaria parasites - sky blue cytoplasm and red purple chromatin

Note: Before staining patient blood films, it is always advisable to stain one or two well-prepared blood films according to the procedure by making use of filtered staining solutions to check for the quality of the stain using the above-mentioned characteristics. If deviation, necessary adjustments should be made and rechecked.

2.9.4.3 Examination of stained thin blood films

Examination of stained thin blood film helps for Morphologic classification of anemia and is considered to be the most appropriate and practical way for the correct appraisal of red cell morphology. If performed properly and related with the values of other hematological parameters, they provide clue as to the type of anemia at peripheral level.

1. Normocytic normochromic anemia

2.9.5.1 Methods of counting

Various systems of performing the differential count have been advocated. The problem is to overcome the differences in distribution of the various classes of white cells, which are probably always present to a small extent even in well-made films.

The lateral strip (“crenellation”) pattern of differential counting is the most routinely used pattern and in this method the field of view is moved from side to side across the width of the slide in the counting area just behind the featheredge where the cells are separated from one another and are free from artifacts. Multiple manual registers or electronic counters are used for the count.

N.B. The following elements of the blood film must be observed while performing the differential count.

Erythrocytes: size, shape, degree of hemoglobinization, presence of inclusion bodies

The presence of atypical lymphocytes

Haemoparasites: malaria, borrelia, babesia, microfilariae, trypanosoma, etc.

2.9.5.2 Reporting the differential leukocyte count

The differential leukocyte count could be expressed as the percentage of each type of cell or it could be related to the total leukocyte count and the results reported in absolute numbers.

2.9.5.3 Normal differential ranges:

	1-4 years	10 years	Adults
Neutrophils	36-48%	45-55%	55-65%

of red cells to whole blood in liters or in percentage. By microchaematocrit it is only possible to measure results to two decimal places.

The major role of the primary health care laboratory professional in the diagnosis of micronutrient deficiency is to perform tests used in presumptive diagnosis. Additionally for specific diagnosis using biochemical tests involved in proper collection, preparation, storage and transportation of the appropriate samples to the central or specialized laboratories. The type of specimen, storage and transportation requirement may vary according to the test protocol used, hence following the instructions is mandatory. However, limited hematological investigations such as mentioned above could be performed to aid in the diagnosis of iron deficiency anemia.

2.10 Case management

Refer to the core module unit 2 sections 2.10.

2.11. Prevention and intervention

Refer to the core module unit 2 sections 2.11.

2.12. Learning activities (case study) continued

Refer to story of health professionals in the core module and discuss on the following questions in the class. The instructor can assist you.

How is blood specimen collected, stained and examined for blood morphology examination?

What could be the etiology of micronutrient deficiencies?

What laboratory investigations could be done at the health station or health center level?

What should be reported in the laboratory request form in the determination of hematological tests for the assessment of iron and folate deficiency?

What is the prime role of laboratory professionals at primary health care level in the diagnosis and management of micronutrient deficiencies?

2.13 Roles and Task Analysis

Refer to the core module unit 4.

2.14 Glossary and abbreviations

Refer to the core module unit 5.

2.15 Bibliography

Refer to the core module unit 6.

2.16. Annexes

Refer to the core module unit 7.

UNIT ONE

SATELLITE MODULE FOR SANITARIAN

Introduction

The role of the sanitarian in the prevention of micronutrient deficiencies is mostly in awareness creation, environmental sanitation improvement and behavioral changes in nutritional improvement and hygiene practices.

1.1 Purpose and use of the module

The main purpose of this module is to equip the sanitarians with adequate knowledge and skills for the prevention of micronutrient deficiencies together with other team members.

1.2 Directions for using the module

For a better understanding of this module, the sanitarian is advised to follow the following directions

Do the pre test pertinent to your field in unit 2 of the core module (The sanitarian should also read the core module thoroughly at first and when referred in this module)

The sanitarian could be successful in using this module if he works with other team members and intersectorally with other development workers (agriculture extension workers, development workers, home economists, etc)

Evaluate your self by doing posttests and comparing your score with the pre tests.

UNIT TWO

SATELLITE MODULE

2.1 Pre test and posttest:

Please refer to the core module

2.2 significance and brief description of the problem:

Please refer to the core module

2.3 Learning objectives

At the end of reading this module the sanitarians will be able to:

Describe the prevention methods of micro nutrient deficiencies

Identify appropriate methods and the primary targets for nutrition and health education program in the prevention of micro nutrient deficiencies

Describe why personal hygiene, environmental sanitation and nutrition education prevent those risk factors which are associated with micro nutrient deficiencies

Describe the whole mechanism of different factors that are associated with the problem of micro nutrient deficiencies

2.4 Learning activities:

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high cost of foods rich in iron (refer to case study 1). Dietary diversification can be addressed by:

i. *Economic approach* (promotion of agriculture). This approach aims at improving the incomes of the target community as a solution to their nutritional problems.

ii. *Income generation scheme*: Income generation schemes enable the target community to buy food. It includes organizing the community and using their potentials in the running of the project. The target communities according to their needs or resources available could identify the project. The project may be weaving, bee keeping, pottery, etc.

2. *Fortification*: The fortification of staple foods such as wheat or other grains is likely to increase iron intake for those population that have access to them. However, infants and children who have a limited capacity to eat large quantities of fortified food are not likely to benefit significantly from this strategy. Targeted fortification as is practiced by the developed world is an excellent way to increase the intake of iron in children. Nevertheless, fortified commercially prepared infant foods are relatively expensive and may not be affordable for many families with children at highest risk of iron deficiency.
3. *Supplementation*: The final approach is through supplementation of individuals or communities at risk. For infants and children, this approach is the most likely to succeed. Supplementation may be the best way to reach infants and young children in families that can't afford expensive iron containing or fortified foods. Challenges from supplementation, however, includes compliance and adequate distribution of the supplement.
4. *Environmental sanitation*: Many studies have shown that iron deficiency anemia is associated with malaria and other parasitic infections. Therefore, to prevent these problems the following are major interventions that has to be conducted by the sanitarian together with other team members in the community.

existing behavior. Each culture lives in a unique environment requiring evaluation to understand the interaction contributi

What needs to be done?

The technology for adding potassium iodate to salt during processing and refinement is one of the lowest-cost health and nutrition interventions available.

In summary, an array of nutrition interventions is available to address nutrition problems in different settings. Based on experiences in the past two decades, the most cost-effective, widely applicable, and manageable nutrition interventions for primary health care services consist of promoting, protecting, and supporting-

Exclusive breastfeeding for at least four, and if possible, for six months;

Appropriate complementary feeding and continued breastfeeding to two years

Adequate nutritional care of sick and malnourished children;

Adequate vitamin A intake;

Adequate iron intake;

Adequate iodine intake

To assess the existence of micronutrient deficiency in a given community the sanitarian should assess the nutritional situation of the community using different indicators. Use the following table as a guideline in collecting data.

Examples of household survey questions for priority nutrition interventions (WHO, 1999).

Priority behavior	Indicator	Questions
Exclusive breast feeding	% of infants 0-6 months of age who are exclusively breastfed	What did the child eat yesterday? (Note if anything other than breast milk was given except vitamin drops.
Complementary feeding and continued breastfeeding to two years	% of infants 6-9 months of age given breast milk and semi-solid complementary foods. % of children 6-23 months who are actively encouraged to eat. % of infants 12-18 months of age given semi-solid or solid	What did the child eat yesterday? Was this food liquid, semi-solid, or solid? (Record the number of times the child was fed). What ingredients were in the child's food? (Use a checklist of locally available foods rich in vitamin A and C,

	complementary foods at least 4 times/day, in addition to breast milk. % of children 20-23 months of age who are breast feeding	local sources of animal products, and energy-dense foods.) Did you actively encourage the child to eat yesterday? If yes, what did you do? (Correct answers: Give foods liked by the child, sat with the child, and others.)
Care of sick children	% of children 0-23 months of age who were sick in the past 2 weeks, and increased breast feeding. % of children 0-23 months of age, who were sick in the past 2 weeks, & didn't reduce feeding other foods. % of children 6-23 months of age sick in the past 2 weeks and were encouraged to eat.	Was the child ill in the past 2 weeks? If yes, did the child breastfeed more, less or the same? If yes, did the child eat more, less or the same amount of other foods? If yes, did you actively encourage the child to eat during or after the illness? (Correct answers: Gave special foods

UNIT ONE

SATELLITE MODULE FOR HEALTH EXTENSION WORKERS (HEW)

Introductions

1.1. Purpose & Use of the Module

Materialization of the Community based management of micronutrient deficiencies is made possible through training of HEW that are well equipp

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UNIT TWO

SATELLITE MODULE FOR PRIMARY HEALTH WORKERS (HEW)/COMMUNITY HEALTH WORKERS (HEW)

2.1. Pre and posttest

See the pre and post test for primary health workers (HEW)/Community health workers (HEW) in the core module section 2.1.2.5

2.2. Significance and brief descriptions of the problem

The user of this module for training HEWs is highly advised to refer to the core module sections 2.2.

- **Learning Objectives**
- At the end of completing this module the HEWs will be able to**:**

Define and identify types of micronutrient deficiencies

Identify symptoms and signs of common micronutrient deficiencies

Demonstrate preparation of nutritious food that contain the essential micronutrients to the mothers and care givers

Refer children with micronutrient deficiencies to the to the appropraite health institution

Give health education on the preventive methods of micronutrient deficiencies and importance of child nutrition for proper growth and development

Advise mothers/care givers on the importance of exclusive feeding during the first 6 months and complementary feeding with breast milk there after

Educate mothers/care givers/or other members of the family about the importance of horticulture and backyard gardening, immunization, importance of continued feeding during diarrhea

2.4. Learning activities (case study)

Read the different stories in the core module for the class or make them read it thoroughly so that they will be able discuss the questions related to the story in unit 2, section 2.12

2.5. Definition

Micronutrient mal nutrition is the manifestation of deficient dietary intake of micronutrients that provide the body with the function of growth, development, immunity, fertility, and other essential bodily activities that are dependent on the supply of the particular nutrient.

2.6. Epidemiology

Micronutrient deficiency is called a hidden hunger because it is unnoticeable and has far-reaching consequences. Besides there are simple solutions to it. In Ethiopia, about 40% of all mothers and 50% of pregnant mothers are anemic. Vitamin A deficiency affects about 27% of the population. Total goiter rate is 22%. As the diet of over 85% of the society is based on cereal foods, there the deficiency of other micronutrients like zinc and iron.

2.7. Causes

Different factors contribute to the occurrence0 0.0022 Tw -122dt eat1027 Tw o -2.15 bstnt fa

- History of immunization
- Birth interval in the family
- Child care practices

Physical Examination

- Vital signs –Pulse rate, Respiratory rate, Weight and height
- Check for specific signs of micronutrient deficiency
- Check for the underlying causes of the anemia (infection, malabsorption, hemorrhage, etc.)

2.10. Case management

Upon regular **growth monitoring** care givers of those children with micronutrient deficiencies should be educated to improve their child feeding practices by preparing a balanced diet from locally available foodstuffs. Children who fail to improve in their nutritional status in the subsequent measurements (follow up) be referred to the next health institution for better management. For further details *refer to the core module unit 2, section 2.10*

2.11. Prevention & Intervention

Give nutrition education to mothers or caregivers on **essential Nutrition Actions (ENA**) that need to be promoted are the following:

Exclusive breast-feeding up to 6 months of age

Complementary feeding at the age of 6 months with continued breast feeding up to 2 years and beyond

Continued feeding of the sick child(Importance of continued feeding during diarrheal attack or other illness)

Maternal nutrition: Increased consumption of balanced diet during pregnancy and lactation by mothers

Vitamin A supplementation for children 6-59 months and for lactating mothers within 8 weeks after delivery.

Iron and folic acid supplementation to

INTRODUCTION

Appropriate feeding practices are important for the survival, growth, development, health and nutrition of infants and children everywhere. Every pregnant and lactating women needs adequate nourishment as means of attaining and maintaining health and recognizing that infant malnutrition is part of a wider problem .The health of infants and young children cannot be isolated from the health and nutrition of women. Therefore, Advising, and counseling women's are an important elements in the health care intervention. The following are important points with regard to micronutrient deficiency disorders.

HOME TAKE MESSAGE WITH REGARD TO PRACTICE TO IMPROVE INFANT NUTRTION DURING THE FIRST SIX MONTHS.

1. **Initiate breastfeeding within one hour of birth.**

   Early initiation will be important for :

   Take advantage of the newborns intense suckling reflex and alert state.

   Stimulating breast milk production.

   Serving as the baby's first immunizations. The infant will immediately benefit from the antibodies present in the colostrums (The first milk)

   Minimizing maternal postpartum hemorrhage.

   Fostering mother-child bonding.

2. **Establish good breast feeding skills (proper positioning, attachment, and effective feeding)**
3. **Breast-feed exclusively for the first six months.**

   Breast milk should be the baby's first taste. There should be no prelacteal feeds such as water, other liquids, or ritual foods.

   Breast milk completely satisfies an infant's nutritional and fluids needs for the first six-months.

   Exclusively breastfed infants are at much lower risk of dying than the other children whom are on different feeding scheme.

UNIT FOUR

TASK AND ROLE ANALYSIS

Table 4.1. Knowledge objective and essential tasks of the health center team (health officer, Public health nurse, Medical laboratory technician and sanitarians)

	Learning objective (expected out Come)	HO	PHN	EH	MLT	Activity
Knowledge	Define and describe types of micronutrient deficiency List causes and risk factor of Micronutrient deficiencies.	Define and describe types of micronutrients deficiency List causes and risk factor of Micronutrient deficiencies.	Define and Describe types of micronutrient deficiency. List causes and risk factor of Micronutrient deficiencies.	Define and describe types Of micronutrient deficiency. List causes and risk factor of Micronutrient deficiencies.	Define and describe types of micronutrients deficiency. List causes and risk factor of Micronutrient deficiencies	Define and describe Types of micronutrient deficiencies. List causes and risk factor of Micronutrient deficiencies

	Describe the Magnitude and contribution of micronutrient deficiencies to over all childhood and adult health problems locally and nationally	Describe the Magnitude and contribution of micronutrient deficiencies to over all childhood and adult health problems locally and nationally	Describe the Magnitude and contribution of micronutrient deficiencies to over all childhood and adult health problems locally and nationally	Describe the Magnitude and contribution of micronutrient deficiencies to over all childhood and adult health problems locally and nationally	Describe the Magnitude and contribution of micronutrient deficiencies to over all childhood and adult health problems locally and nationally	Describe the Magnitude and contribution of micronutrient deficiencies to over all childhood and adult health problems locally and nationally

Table 4.2. Knowledge objective and essential tasks of the health center team (health officer, Public health nurse, Medical laboratory technician and sanitarians)

	Learning Objective (Expected Outcome)	HO	PHN	EH	MLT	Activities
Knowledge	Describe the assessment Of micronutrient deficiency.	Describe the assessment Of micronutrient deficiency.	Describe the assessment Of micronutrient deficiency	Describe the assessment Of micronutrient deficiency	Describe the assessment Of micronutrient deficiency	. Describe the assessment Of micronutrient deficiency
	Describe the principle and Treatment of micronutrient Deficiency.	Describe the principle and Treatment of micronutrient Deficiency.	. Describe the principle and Treatment of micronutrient Deficiency.	-------	----	. Describe the principle and Treatment of micronutrient Deficiency.
	Describe the pathogenesis Of micronutrient deficiency	Describe the pathogenesis Of micronutrient deficiency	---	---	---	Describe the pathogenesis Of micronutrient deficiency

	Believe in promoting proper Feeding of infants and balanced diet for adults. Believe in utilization of health services Both by children and adults in order to reduce the burden of micronutrient deficiency.	Advocate continued Feeding of a child and balanced diet for adults. Advice mothers, care takers And CHW to promote the utilization of existing health services in order to minimize micronutrient deficiencies.	Advocate continued Feeding of a child and balanced diet for adults. Advice mothers, care takers And CHW to promote the utilization of existing health services in order to minimize micronutrient deficiencies	. Advocate continued Feeding of a child and balanced diet for adults Advice mothers, care takers And CHW to promote the utilization of existing health services in order to minimize micronutrient deficiencies	Advocate continued Feeding of a child and balanced diet for adults Advice mothers, care takers And CHW to promote the utilization of existing health services in order to minimize micronutrient deficiencies	-Educate mothers care give and (health extension workers, about the importance of balanced diet for children and adults to reduce micronutrient deficiencies. Teach about the importance of health services for children and adults to utilize the existing health services at the maximum possibility.

	Up hold the idea that micronutrient deficiency is caused by deficiency of nutrients.	Educate mothers, care givers and CHW how to prevent Micronutrient deficiencies.	Educate mothers, care givers and CHW how to prevent Micronutrient deficiencies	Educate mothers, care givers and CHW how to prevent Micronutrient deficiencies	Educate mothers, care givers and CHW how to prevent Micronutrient deficiencies	Educate mothers, care givers and CHW how to prevent Micronutrient deficiencies

Table. 4.4. Practice objective and essential tasks of the health center team (health officer, Public health nurse, Medical laboratory technician and

	Demonstrate how to do laboratory tests On micronutrient deficiencies. Demonstrate the preparation of dietary formula for the treatment micronutrient deficiencies to mothers and care givers.	Carry out laboratory investigation On micronutrient deficiencies Demonstrate the preparation of dietary formula for the treatment micronutrient deficiencies to mothers and care givers.	----- Demonstrate the preparation of dietary formula for the treatment micronutrient deficiencies to mothers and care givers.	-------- Demonstrate the importance of clean water and utensils in the preparation of food in feeding with rich micronutrients	Carry out laboratory i Investigation pertaining to micronutrient deficiency. ---	- Make a laboratory investigation on micronutrient deficiencies Show materials and ingredients to be used in the preparation and utilization of feeding formula in the treatment of micronutrient deficiency.

	Learning Objective (Expected out come)	HO	PHN	EH	MLT	Activities
	Identify a case of micronutrients deficiency and demonstrate appropriate management.	Demonstrate the management principle, identify the complication and manage accordingly	Demonstrate appropriate feeding and drug administration and also Provide proper nursing care to the clients.	------	------	Identify the case and its complication Mange the case by selecting appropriate treatment plan Refer PRN -33(and)]TJ 62 0.72 ref

	List causes and risk factors for pro Micronutrient deficiency.	List the different causes of micronutrient deficiency and their association with risk factors.	- Explain the cause of micronutrient deficiency in general and what risk behaviors are associated to it.	- Explain the relationship between the risk factors and development of micronutrient deficiency (HEW) - Describe that micronutrient deficiency is caused by improper feeding, infection, diarrhea etc.

Table 4.6. Attitude objectives and essential tasks of health extension workers and car givers

	Learning Objective (Expected out come)	CHW	Care giver	Activity
Attitude	Promote utilization of health service facilities for the treatment of Micronutrient deficiency.	Advice care givers to bring a child with Micronutrient deficiency the health service units to consult health worker	Advice friends and families to visit health worker the health service units in case of Micronutrient deficiency.	Educate care givers the importance of taking children with micronutrient deficiency to health d service institution Encourage visits health service unit the case of Micronutrient deficiency.
	Advocate the importance of exclusive breast feeding in the first 4-6 months and continued feeding then after in reducing mortality and morbidity due to micronutrient deficiency.	Instruct mothers or care givers the importance of breast feeding in reducing morbidity and mortality from micronutrient deficiency..	Advise family friends and neighbors to continue breast feeding in a child with micronutrient deficiency.	Advocate / Promote breast feeding practices in prevention of micronutrient deficiency (HEW) Encourage breast feeding practices of , family, in the prevention micronutrient deficiency.

Promote continued feeding of with micronutrient deficiency.	Advocate and encourage proper feeding of children with micronutrient deficiency by

Table 4.7. Practice objective and essential tasks of health extension workers and car givers.

	Learning Objective (Expected out come)	HEW	Care giver	Activities
Practice	Demonstrate preparation of feeding formula for the treatment of micronutrient deficiency and its proper use. Identify a case of micronutrient deficiency and demonstrate its appropriate management Demonstrate proper communication to mothers or care givers pertaining to micronutrient deficiency.	Demonstrate preparation of feeding formulas their administration to the case of Micronutrient deficiency. Identify complications of Micronutrient deficiency and its degrees and advise the caregiver to feed the patient Properly. Display Effective communication skill with mothers or care givers on treatment and prevention of Micronutrient deficiency.	Demonstrate properly how and what to prepare and administer to a child with micronutrient deficiency. Identify signs of symptoms of Micronutrient deficiency and its complications and decide whether there is a need for admission or referral -------	Show materials and ingredients to be used in the preparation of feeding formulas. Identify sings and symptoms of Micronutrient deficiency and administer proper feeding Practices (see the core module). Identify ways of educating Mothers/ care gives about micronutrient deficiency.

UNIT FIVE

Glossary & Abbreviations

Anthropometric assessment: - Measurement of different body dimensions and proportions at different nutritional states and interpretation of the result by comparing to the standard to determine whether a person is malnourished or well nourished.

Antioxidant: - Micronutrients like vitamins A, C, E, & minerals, selenium which detoxify (scavenge) free radical species formed in the body and protect body cells from oxidative damage.

Catch up growth: - Rapid increase in weight and height of children after a period of nutritional deprivation in response to corrective dietary intervention.

Communication: the means of sending or receiving information, such as interpersonal communication, group discussion and mass communication.

Folate: a vitamin of the B complex found especially in leafy green vegetables, liver, and kidney.

Fortification: Addition of a nutrient in to a food that does not naturally contain it to increase the nutritive value of (food) by adding vitamins.

Hygiene: conditions or practices conducive to maintaining health and preventing disease, especially cleanliness.

Latrine: a toilet, especially a communal one used by individuals or communities.

Malnourishment: suffering from malnutrition, which may be under nutrition or over nutrition.

Supplementation: Periodic administration of a nutrient in the form of tablets, capsules or injections to an individual or a group of people to prevent the occurrence of deficiencies of the nutrient.

Day Care Nutrition Rehabilitation Centers (DCNRC): Feeding and nutrition demonstration centers attached to health units where mothers/care givers bring their

malnourished children and get them fed and see how to prepare balanced diet from locally available foodstuffs.

Dehydration: - Excessive loss of fluid and electrolyte from the body that impairs cellular function if not corrected timely.

Emotional deprivation: - State of mood change in a child that occurs following neglect of child (poor care given to the child by the mother or care giver).

Exclusive breast-feeding: - Breast-feeding of infants with no additional (supplementary) food or fluid administration.

Recovery Syndrome: - Fluid over load, congestive heart failure and death due administration of high protein and high caloric to a malnourished child during the acute (stabilization) phase of the management

Weaning: - Administration of food (solid or liquid including formula or cows milk) in addition to breast milk or without breast milk.

UNIT SIX

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VITAMIN A DEFICIENCY (VAD)

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UNIT SEVEN

ANNEXES

7.1 ANSWER KEYS

7.1.1 KEYS FOR THE CORE MODULE (ALL CATEGORIES)

Q.No.1**. C**

Q.No.2**. E**

Q.No.3. **E**

Q.No.4.**A Marasmus**

a. Kwashiorkor

b. Marasmic –kwashiorkor

c. Underweight

d. Stunting and wasting

Q.No.5. **D**

Q.No.6. **Kwashiorkor**

B. Pitting edema

C. Gray and easily pluckable hair

D. Miserable and apathetic

E. Loss of muscle & preservation of subcutaneous fat

Marasmus

A. Loss of both subcutaneous fat and muscle (skin and bone appearance)

B. Irritability and moodiness

C. Wizened monkey faces (old man appearance)

D. Absence of edema

Q.No.7.

a. Anthropometric assessment

b. Biochemical or laboratory, assessment

c. Epidemiological (dietary assessment)

Q.No.8.

d. Acute stabilization phase

e. Rehabilitation phase

Q.No.9. **a**

condition called recovery syndrome)

Q.No.10. **D**

Q.No.11**. D**

Q.No.12. **D**

Q.No.13. **E**

Q.No.14. **A**

Q.No.15. **D**

Q.No.16. **D**

Q.No.17**. D**

Q.No.18**. D**

Q.No.19**. D**

Q.No.20. **C**

Q.No.21. **B**

Q.No.22**. D**

Q.No.23. **D**

Q.No.24**. D**

Q.No.25. **E**

7.1.2.KEYS FOR SATELLITE MODULES (SPECIFIC PROFESSIONAL CATEGORIES)

7.1.2.1. HEALTH OFFICERS

Q.No. 1. E

Q.No. 2. D

Q.No. 3. E

Q.No. 4. A. Goiter with its complicatios

B. Mental retardation and poor academic performance

C. Poor physical work out put

D. Poor Physical growth

Q.No. 5. D

Q.No. 6. E

Q.No. 7. D

Q.No. 8 E

Q.No. 9. D

Q.No. 10. D

Q.No. 11. E

Q.No. 12. E

Q.No. 13. D

Q.No. 14. E

Q.No. 15. E

Q.No. 16. B

Q.No. 17. E

Q.No. 18. E

Q.No. 19. E

Q.No. 20. B

Q.No. 21. E

Q.No. 22. E

Q.No. 23. A

Q.No. 24. A

Q.No. 25. E

Q.No. 26. E

Q.No. 27. E

Q.No. 28. E

7.1.2.2. PUBLIC HEALTH NURSE

Key for Public Health Nurse

1.

Antenatal care

Delivery

Post-natal care/FP

Immunizations

Welll baby clinic

Sick baby clinic

2. D.
3.

Food diversification

Food fortification

Vit A supplementation

4. A
5. D.
6. C.
7. D.
8. 150 microgram per person
9. D.
10. Beef, cheeks, fish, Lamb, liver, and pork.

11.

Prolonged breast feeding with out complementary feeding.

Heammorhage.

Infections

Low consumption (Dietary)

Repeated pregnancy.

13. “Dry Eye” in Greek.

Function as anti oxidant

Maintain normal taste and smell

Promotes normal growth and development

Aids wound healing

Promotes normal fetal growth

Helps synthesize DNA and RNA.

Promotes cell division cell repair cell growth

Maintain normal level vit A in blood.

B. Personal, environmental and food hygiene

C. Importance of taking their children to the health institutions for Growth monitoring

D. Importance of getting their children immunized

E. Stimulation and proper treatment of children

7.2. Recommended Dietary Allowance (RDA) For selected micronutrients:

Estimate of adequate daily intake by the Food and Nutrition Board of the National Research Council, 1989 by age group.

FOLIC ACID

Age RDA
0-6 months 25mcg
6-12 months 35mcg
1-3 years 50mcg
4-6 years 75mcg
7-10 years 100mcg

Males
11-14 years 150mcg
15+ years 200mcg
Females
11-14 years 150mcg
15+ years 180mcg
Pregnant 400mcg
Lactating 1st 6 mos 280mcg
2nd 6 mos 260mcg

VITAMIN A

Age Retinol Equivalents International Units

0-6 months 375RE 2,100IU

6-12 months 375RE 2,100IU

1-3 years 400RE 2,000IU

4-6 years 500RE 2,500IU

7-10 years 700RE 3,300IU

MALES

11+ years 1,000RE 5,000IU

FEMALES

11+ years 800RE 4,000IU

Pregnant 800RE 4,000IU

Lactating 1st 6 mos 500RE +2,500IU

2nd 6 mos 500RE +2,500IU

VITAMIN D

Age RDA

0-6 months 7.5mcg

6-12 months 10mcg

1-10 years 10mcg

MALES

11-18 years 10mcg

19-24 years 10mcg

25+ years 5mcg

FEMALES

11-18 years 10mcg

19-24 years 10mcg

25+ years 5mcg

Pregnant 10mcg

Lactating 10mcg

IODINE

Age	RDA
0-6 months	40mcg
6-12 months	50mcg
1-3 years	70mcg
4-6 years	90mcg
7-10 years	120mcg
11+ years	150mcg
Pregnant	375mcg
Lactating	200mcg

IRON

Age	**RDA**
0-6 months	5mg
6-12 months	10mg
1-3 years	10mg
4-6 years	10mg
7-10 years	10mg

MALES	
11-18 years	12mg
19+ years	10mg
FEMALES	
11-50 years	15mg
51+ years	10mg
Pregnant	30mg
Lactating	15mg

Zinc

Age:	RDA:
0-6 months	5mg
6-12 months	5mg
1-10 years	10mg
Males:	
11+ years	15mg
Females:	
11+ years	12mg

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