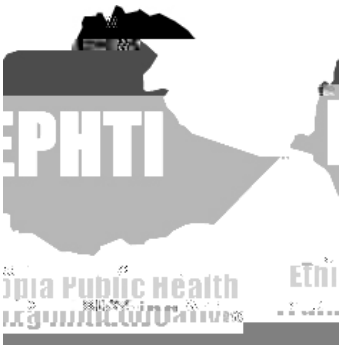
MODULE

Maternal Nutrition

Degree Program
For the Ethiopian Health Center Team



Melkie Edris, Habtemariam Tekle, Yohannis Fitaw,

Baye Gelaw, Dagnew Engedaw, Tigest Alemu

University of Gondar

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

2005

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

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

Abbreviations

AIDS	= Acquired Immune deficiency syndrome
ARV	= Anti retroviral drug
ABCD	= Anthropometry, biochemical, clinical, dietary methods
ATP	= Adenosine triphosphate
BMI	= Body mass index
EBV	= Eptein barr virus
EDTA	= Ethylenediamine tetra acetic acid
ENA	= Essential nutrition action
HCT	= Hematocrit
HFA	= Height for age
HIV	= Immune deficiency virus
ICSM	= International council for standardization hematology
IDD	= Iodine deficiency disorder
IMCI	= Integrated management on childhood illnesses
IQ	= Intelligence quotient
IU	= Internation unit
IUGR	= Intrauterine growth retardation
MPN	= Most problem number
NCHS	= National center for health statistics
PCU	= packed cell volume
PEM	= protein energy malnutrition
RBC	= Red blood cell
SD	= Standard deviation
TB	= Tuberculosis
TSH	= Thyroid stimulations hormone
TT	= Tetanus toxoid
VCT	= Voluntary counseling and testing
WFH	= Weight for height
WHO	= World health organization

Table of Contents

List of Table

List Of Figure

UNIT ONE

INTRODUCTION

1.1. Purposes and uses of the module

For many years it has been known that the height and weight of the mother is closely related to infant birth weight and pregnancy outcome such as perinatal mortality, low birth weight and stunting are often due to chronic malnutrition during pregnancy. Mothers who enter pregnancy with sound reproductive physiology, and who have not suffered ill health or nutritional deprivation during pregnancy are more likely to have larger and healthier infants than mothers who do not have such advantages. Several studies provide evidence for the relationship between adult size reproductive efficiency and socio economic status.

Studies in the U.S. conducted by the National Institute of Health, have shown that mothers who weigh more than 68 kg at conception or who gain more than 13.6 kg in weight during pregnancy tend to have larger and healthier babies with a lower perinatal mortality as compared to mothers who weigh less than or gain less weight than above.

Mothers are often the primary care providers of the children in the household, community and country. They themselves have to be healthy and need the time, the knowledge and the right environment to carry out their duties.

The major maternal micronutrient deficiencies of public health importance in Ethiopia are iodine deficiency, vitamin A deficiency and iron deficiency. Other deficiencies, mainly related to iodine thiamine, vitamin C and fluoride are also observed sporadically in some parts of the country.

To bring a significant change in the reduction of maternal morbidity and mortality due to malnutrition, the presence of health professionals trained through use of appropriate

UNIT TWO

CORE MODULE

2.1. Pre-test

1. Maternal nutrition is affected by:
   a) Income
   b) Culture
   c) Heavy physical activities
   d) All of the above
   e) None of the above
2. One of the following does not affect maternal nutrition
   a) Race
   b) Pregnancy
   c) Lactation
   d) Digestion

a. Poor maternal nutrition
c. Acute and chronic illness
b. Anemia
d. None of the above

7. Which method of nutrition intervention is least practiced in Ethiopia?
a. Food fortification
c. Supplementation
b. Price policy
d. Nutrition education

8. One of the following is not an anthropometric measurement:
a. Weight
c. Skin fold thickness
b. Height
d. Biochemical tests

9. Which one of the following helps to detect chronic malnutrition (stunting)?
a. Weight for height
c. Weight for age
b. Height for age
d. All the above

10. Adding a needed nutrient or nutrients to foods which are centrally produced and commonly eaten within a particular society for the purpose of preventing deficiency is:
a. Fortification
c. Complementation
b. Supplementation
d. All of the above

11. Iodine deficiency disorder can be prevented at a national level by:
a. Iodine capsule supplementation
c. Iodine injection
b. Universal salt iodization
d. All of the above

12. Which of the following is/are not consequence of maternal malnutrition?
a. Infection
c) Decrease immune function
b. Low productivity
d) None of the above

13. The cause for anemia includes:
a. Iron deficiency
c. Malaria
b. Hookworm
d. All of the above

14. Which of the following statement(s) is/are true about well nourished HIV infected woman
a. Delay HIV progression to AIDS
d. All of the above
b. Maintains body weight and strength
c. Enhances response to anti-retroviral drugs

15. Which statement is true about maternal nutrition?

- Available land devoted to cash crop, too little for food crops.
- The amount of food for human consumption varies each year in Africa. The situation has worsened considerably during the last three decades. Drought has become wide spread; population growth in some countries has been more rapid than the increase in food production, e.g. Kenya and Ethiopia. In addition to drought, food production is affected by:
    - Suitability of the soil for certain crops/poor soil fertility/
    - Limited knowledge of agriculture
    - Available land devoted to cash crop
- Uneven distribution of the available food within the household and the community.

Within the household, nutritionally vulnerable groups have the lowest priority. Good food is always served to the head of the household. Mothers eat last or they are served with lower quality food.

Within the community and region as a whole, poor distribution of food in the country may be the result of a lack of certain foods in some areas, e.g.

- In the tsetse fly infested areas, there are no cattle and people cannot get animal products like milk and milk products as well as meat.
- In the arid zone, there are no vegetables and fruits, therefore, people do not take in vitamin rich food.
- In the areas where there is no sea, lake or big river, there is no fish available. People may not eat protein rich animal food. The localized shortages of foods are also aggravated by poor communication, transport, lack of storage and preservation facilities.
- There is a wide spread lack of understanding of the functions of foods. Some people do not know how to feed their children and adults according to their nutritional requirements.
- Infections and parasitic disease are prevalent in all countries of Africa and mothers and their children are especially affected. The nutritional condition of both children and mothers is affected and hence their physical and mental development may be retarded.

These four fundamental causes of maternal malnutrition are also, related to:

- Loss of foods through destruction by insects, fungi, rodents, birds and other animals because of poor storage.
- Soil erosion, often resulting from over grazing of cattle and indiscriminate burning of fields.
- Poor farming practices often due to lack of knowledge, skill, money, equipment and improved agricultural inputs.
- Lack of rain because of changes of weather conditions.
- Lack of time for women to prepare food properly and provide special dishes for herself and her children.

Among the time consuming and energy expending activities of the rural Ethiopian women are drawing and carrying of water from long distance, too heavy farm work, domestic works and hand grinding of cereals.

2.4. Factors Affecting Maternal Nutrition

Culture and beliefs:

- Culture plays a significant role in the types of food eaten as well as feeling about diet and nutrition.
  - During periods of fasting, important nutrients are not consumed, such as animal products.
  - Pork may be forbidden for religious and cultural reasons.
  - Discrimination in feeding among family members; adult males (head of the household) eat before females and children are given left over food.

Economy: The type and amount of foods consumed during pregnancy and lactation depends upon the income of the family.

Gender: In the family and community, females are socially given lower priority and hence they are served with low quality and quantity foods.

Pregnancy and Lactation

The pregnant and lactating woman's diet should include a substantial increase in calories, protein, calcium, folic acid, and iron. Pregnant women at particular risk for nutritional deficiencies are adolescents, underweight women, obese women, women with chronic nutritional problems, women who smoke or ingest alcohol or drugs, low income women, and women with chronic illnesses such as diabetes or anemia.

Life and habit

Eating patterns are highly individualized and greatly determined by personal preference, for example:

- Pregnant mothers have limited motivation to cook and eat meals alone.
- Mixing foods, e.g. Injera with Wat prepared from cereals, legumes, vegetables and others.
- Eating of cereals in the form of kolo (roasted) and nifro (boiled)
- Eating Inset (false banana) which prevents constipation
- Drinking camels milk in the pastoral areas.
- Eating raw vegetables and cereals

The planning of food to meet special needs begins with the pregnant women, lactating mothers, infants and adolescents.

Infant malnutrition often begins at conception. When pregnant women consume inadequate diets, have excessive workloads, or are frequently ill, they give birth to smaller babies with a variety of health problems. Children born to malnourished mothers are more likely to die at infancy. If they survive, by the second year of life they may have permanent damage. For this reason, pregnant and breast-feeding women and children under two years of age should be priority target groups for nutrition intervention. The effect of early childhood malnutrition persists into the school years and even adulthood, lowering productivity and quality of life. Small adult women who were malnourished as children are more likely to produce small babies, and the cycle of malnutrition and illness continues.

2. 5. The Role of Maternal Nutrition in the Promotion of Maternal Health

The state of the mother's physiology, especially reproductive physiology, at the time when pregnancy commences has considerable influence on the growth of the fetus. Several studies provide evidence for the relationship between adult size, reproductive efficiency and socio-economic status. In general, the baby of a short woman is lighter and has less vitality and a lower survival than that of a tall woman. Stunting in the

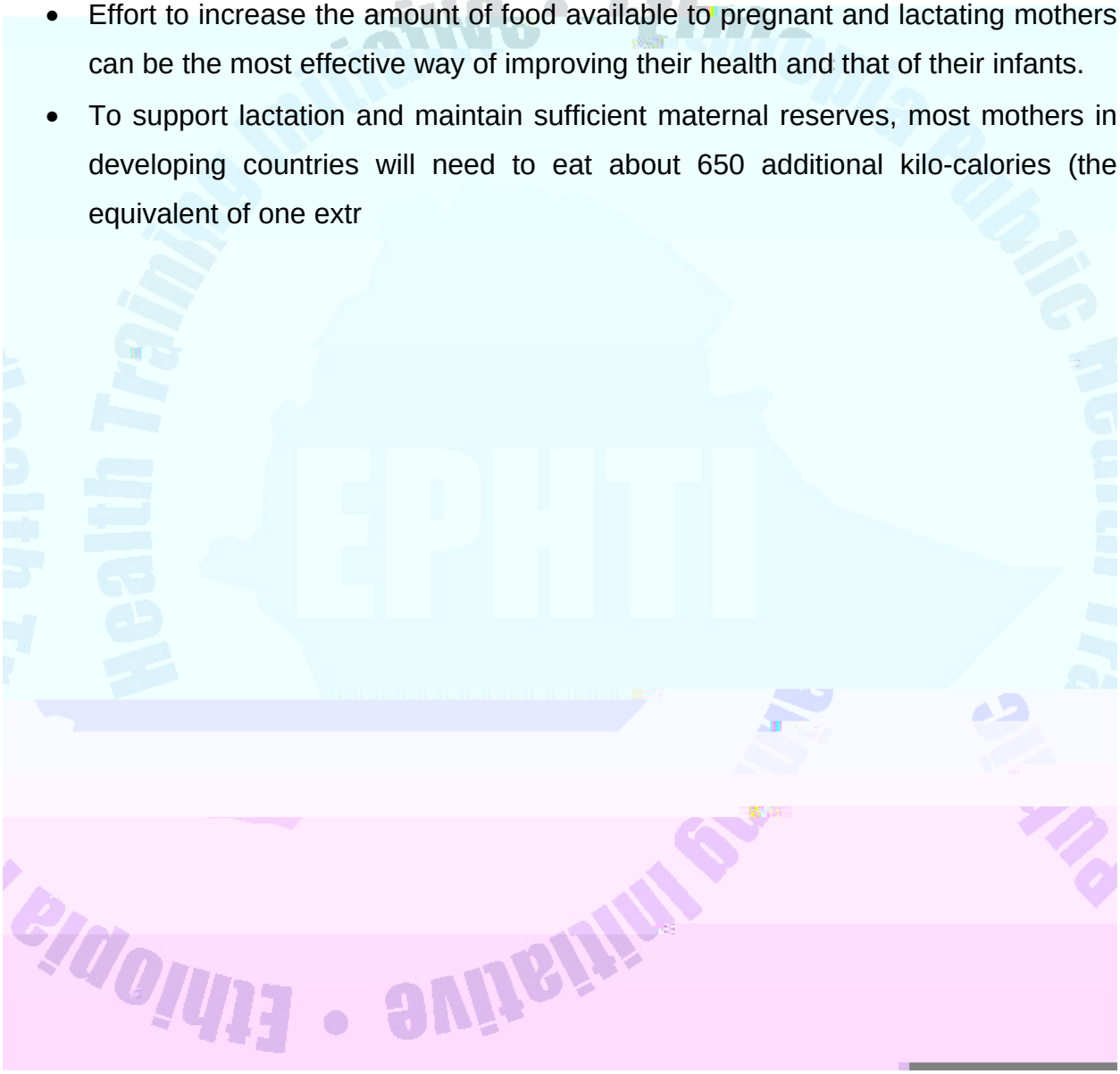
pregnancy tend to have larger and healthier babies with a lower perinatal mortality compared to mothers who weight less or gain less weight than above.

2.6. Recommendations for mothers during pregnancy

- Weight gain during pregnancy is essential. Help clients understand the importance of adequate weight gain during pregnancy. Strongly discourage clients who are obese from attempting to lose weight during pregnancy.
- Encourage clients to plan meals carefully so that all of the nutrients needed during pregnancy can be included without excessive calories using a food guide for pregnancy is helpful.
- Caffeine intake should be limited.
- Instruct client to take only vitamins and minerals prescribed. Excessive amounts can be harmful.
- Advise clients that skipping meals is a poor practice, especially for the pregnant woman. The fetus needs a steady supply of nutrients.
- Encourage the pregnant mother to use high fiber foods and plenty of fluids to avoid constipation.
- Give priority to helping pregnant teenagers improve their eating habits. Together with the teenagers, plan meals and snacks that are nutritious and at the same time acceptable to the teenagers. Teen age pregnancy is undesirable.
- Take advantage of the client's high motivation during pregnancy to provide nutrition

One of the reasons for low birth weight is retarded fetal growth and this often occurs due to poor maternal nutrition. Moreover, the following factors should be known as causes for low birth weight or improving birth weight:

- Anemia
- Acute or chronic infection such as TB
- Effort to increase the amount of food available to pregnant and lactating mothers can be the most effective way of improving their health and that of their infants.
- To support lactation and maintain sufficient maternal reserves, most mothers in developing countries will need to eat about 650 additional kilo-calories (the equivalent of one extr



2. The integral cycle of malnutrition

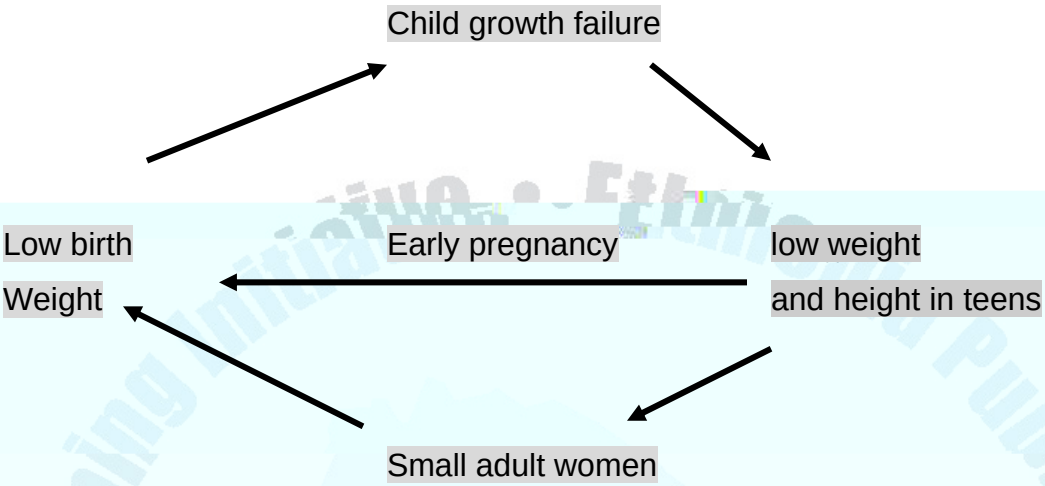


Figure 1: ***Cycle of Malnutrition***

3. Maternal malnutrition: a life cycle issue

3.1. Infancy and early childhood (From birth-24 months)

- Suboptimal breast-feeding practice
- Inadequate and inappropriate complementary feeding
- Infrequent feeding
- Frequent infections

3.2. Childhood (2-9yrs)

- Poor diet
- Poor health care
- Poor education

3.3. Adolescence (10-19 years)

- Increased nutritional demands
- Greater iron needs
- Early pregnancy

3.4. Pregnancy and lactation

- Higher nutritional requirements
- Increased micronutrient intake
- Closely spaced pregnancies

3.5. Throughout life

- Food insecurity
- Inadequate diets
- Recurrent parasitic infection
- Poor health care
- Heavy work loads
- Gender inequities

4. Consequences of maternal malnutrition on

4.1. Mothers

- High maternal mortality
- Increased infection
- Anemia
- Decreased immune function
- Lethargy and weakness
- Low productivity
- Obstructed labor

4.2. fetal/Infant health

- Increased fetal and neonatal death
- Intrauterine growth retardation
- Low birth weight
- Preterm delivery
- Decreased immune function
- Birth defects
- Cretinism and decreased IQ

4.3. Family and community

- Increased expenditure of resources (cost of medical/social costs)
- Affects the socioeconomic condition

5. The most common maternal nutritional problems

- Protein deficiency
- Iron deficiency
- Vitamin A deficiency

- Iodine deficiency
- Folic acid deficiency
- Zinc deficiency
- Vitamin B_6 and B_{12} deficiency
- Protein energy malnutrition

5.1. Protein energy malnutrition

It is due to deficiency of protein, fat and carbohydrate in the diet. Therefore, the body starts breaking down muscle to provide the needed energy if no carbohydrates are present for energy production

Consequences:

- Infection
- Obstructed labor
- Maternal mortality
- Low birth weight and IUGR
- Neonatal and infant mortality
- Maternal wasting
- Fatigue
- Increase in spontaneous miscarriage

5.2. Iron deficiency

- It is the most common form of malnutrition
- It is the most common cause of anemia
- Other causes of anemia include hookworm, malaria
- Anemia is defined in first and third trimesters as hemoglobin concentration less than 11gm/100ml or Hematocrit less than 33% and in second trimesters hemoglobin less than 10.5gm/100ml or hematocrit less than 32%
- Causes of dietary iron deficiency
  - Low dietary iron intake
  - Low iron bioavailability.
  - Prohibitors consumption
- Parasitic infections like hookworm
  - Cause blood loss

- Not eating sea food
- Not consuming iodide salt

- Consequences
  - Impaired cognition
  - Poor school performance
  - Endemic cretinism
  - Goiter
  - abortion

5.5. Zinc deficiency

- Causes
  - Conditions that decrease bio-availability like Phytates and dietary fibers and increase excretion of zinc
  - Poor zinc content in diet
- Consequences
  - Premature rupture of membrane
  - Prolonged labor
  - Preterm labor
  - Low birth weight
  - Maternal and infant mortality
  - Impaired wound healing
  - Dwarfism and hypogonadism
  - Skin lesion
  - Poor appetite
  - Impaired bone development in the fetus

5.6. Folic acid deficiency

- Cause
  - Nutritional deficiency
  - Drugs that affects bioavailability
- Consequences
  - Maternal anemia
  - Infant neural tube defect

- Low birth weight

5.7. *Vitamin B_6 and B_{12} deficiency*

- Causes
  - INH drugs taken for long time
  - Vitamin B_6

3. Pica

- The craving and eating of non-foods such as laundry starch and clay.
- It is common in some ethnic groups.
- The etiology is unknown but cultural belief and iron deficiency anemia are thought to be contributing factors.
- Pica replaces ingested nutritious food and may bind dietary iron, leading to anemia. There is also the possibility that the ingested substance is toxic

4. Heart burn and acid ingestion

Common complaints in pregnancy that affect intake of nutrients.

5. Constipation

Can be treated by increasing dietary fibers, fluid intake, and exercise.

Uses of Nutritional Assessment

It should aim at discovering facts to guide actions intended to improve nutrition and health.

a) Diagnostic tool (individual and group):
   - Identify whether a problem exists
   - Type of problem
   - Magnitude of the problem
   - Who is affected by the problem

b) Monitoring tool (individual and group)
   - Requires repeated assessment over time
   - Has the situation changed?
   - Direction and magnitude of change

c) Evaluation tool (individual or group): To what extent has the intervention, treatment, or program had the intended effect (impact)

2.11. ASSESSMENT METHODS

Assessment of maternal nutritional status

Maternal nutritional status can be assessed using the ABCD (Anthropometry, biochemical, clinical and dietary methods).

Anthropometric assessment

Measurement of the variation of physical dimensions and the gross composition of the human body at different age levels and degrees of nutrition.

Two types:

- Growth measurement
- Body composition (body fat, and fat-free mass)

Indices can be derived directly from a single raw measurement;

- Height for age
- Weight for height

Anthropometric assessment of growth

Common measurements include:

1. Stature (height)
2. Body weight
3. Skin fold

Indices derived from growth measurements

1. Weight-for-height:
   - Sensitive index of current nutritional status

   Limitations:
   - edema may complicate
2. Height-for-age:
   - Estimates the past or chronic nutritional status
   - Valuable as an index of stunting

   Stunting:
   - Slowing of skeletal growth and stature
   - End result of a reduced rate of linear growth
   - Results from an extended period of inadequate food intake and high morbidity
   - Depends on genetic/ethnic factors
   - Accurate measurement technique is essential because of narrow distribution of height measurement at a given age
   - Used to assess children's nutritional status which is a reflection a reflection of the nutritional status of the household.
3. Weight changes:
   -

Relative weight expresses the weight of a given subject as a per

Classification of all degree of protein energy malnutrition

1. Waterlow has suggested classification based on wasting (current malnutrition) or stunting (chronic malnutrition)

   WFH = 80% of the Reference standard or

   –2SD below the median

   HFA = 90% or – 2SD below the median

Table. 3: Waterlow classification

Height	***Weight***		
		Above	Below
	Above	Normal	Acute malnutrition
	Below	Nutritional Dwarfism	Chronic Malnutrition

BIOPHYSICAL METHOD

It includes radiographic examination and tests of physical functions.

- Eyes
- Skin
- Hair
- Tongue, nail
- Thyroid gland

Common indicators

- Edema
- ÀÑ0

An advantage of this method

It does not require elaborate equipment or a laboratory; several of the signs and symptoms can be evaluated by minimally trained personnel.

Limitations:

- Supplementation
- Family planning
- Integration of nutrition with health
- Price policy
- Primary health care

2.13. Mechanisms of nutrition interventions

There are five principal mechanisms through which all interventions work.

1. Availability of food at local or regional level, making the required foods more available with respect to place and time. This includes:
   - Food storage
   - Agriculture diversification
   - Food imports
   - Community and home gardens
   - Small livestock production schemes
   - Distribution of specific nutrients
   - Food fortification
2. Making the required foods more accessible and available to the households. This includes:
   - Supplementation of the necessary foods to pre-school, school children and women.
   - Price subsidization
   - Appropriate technology for food preparation and preservation
   - Food for work programme
   - Family planning
   - Integration of nutrition with health services
   - Technical changes in agricultural practices
   - Food stamp programme
   - Price policy programme.
3. Food utilization at household level, making better use of available foods, via food processing like fermentation, preparing weaning food. This includes:

Key Interventions to Improve Maternal Nutrition

Improving Maternal Nutrition

- Ensure access to and consumption of salt fortified with iodine in every household
- Distribute a high dose of vitamin A within six weeks after delivery
- Distribute iron supplements during the last six months of pregnancy
- Delay first pregnancy s/teen age girls/
- Increase birth intervals
- Increase food intake during pregnancy and lactation
- Increase access to labor saving devices

Rationale for supplements or fortified food products for mothers

- Certain nutrients in breast milk can be affected by maternal diet (vitamin A, thiamin, riboflavin, vitamin B6, vitamin B12, iodine, selenium)
- First choice is improvement of mothers diet, but cost constraints limit options
- Adequate micronutrient intake during lactation can benefit both mother and infant.

Health Sector and Maternal Actions to Improve Maternal Nutrition in Africa:

1. Adequate food intake during pregnancy and lactation

Essential Health Sector Actions

- Encourage increased food intake during pregnancy and lactation
- Monitor weight gain in pregnancy
- Counsel on reduced energy expenditure

Maternal Actions

- Eat at least one extra serving of staple food per day during pregnancy and the equivalent of an extra meal per day during lactation
- Gain at least one kilogram per month in the second and third trimesters of pregnancy
- Rest more during pregnancy and lactation

2. Adequate Micronutrient intake during pregnancy and lactation

Essential Health Sector Actions

- Counsel on diet diversification

- Prescribe and make accessible iron/folic acid supplements or multiple micronutrient supplements
- Anti helminthic after 3 rd months of pregnancy
- Assess and treat severe anemia in women

- Prescribe and make accessible antihelminthic medication after first trimester of pregnancy

Maternal Actions

- Wear shoes and dispose of feces carefully to prevent infection
- Take a single dose of albendazole (400mg) or a single dose of mebendazole (500mg) in the second trimester of pregnancy as a treatment of hookworm. If hookworms are highly endemic (>50 percent prevalence), take an additional dose in the third trimester of pregnancy.

5. Birth spacing of three years or longer

Essential Health Sector Actions

- Promote optimal breastfeeding practices
- Promote family planning as a health and nutrition intervention; counsel on the need for a reproductive period to build energy and micronutrient stores
- Consider breastfeeding status when prescribing contraception

Maternal Action

- Initiate breastfeeding in the first hour after birth, breastfeed exclusively for about six months, and continue breastfeeding for two years or more
- Practice family planning to space births for at least three years; delay pregnancy so that there are at least six months between the period of breastfeeding and the subsequent pregnancy
- Use contraceptives that are recommended when breast feeding
- Use condoms prior to the decision to become pregnant and during pregnancy and lactation if there is a risk of HIV transmission.

Benefits of breastfeeding for the mother

- Breastfeeding is a contraceptive method during the first 6 months after birth if breastfeeding is exclusive and menses have not returned
- Immediately putting the baby to the breast helps to expel the placenta because the baby's sucking stimulates uterine contractions, and thus reduces risks of post-partum hemorrhage

- Initiating breastfeeding soon after birth (within 1 hour) helps to promote breast milk production and lactation
- Immediate and frequent suckling helps to prevent breast engorgement
- Breastfeeding helps to reduce the mother's workload since breast milk is available at anytime and anywhere, is always clean, healthy and available at the right temperature
- Breastfeeding is economical
- Increases nurturing bond between mother and child
- May reduce risks of breast cancer

2.14. Essential Nutrition Actions (ENA) Approach:

An action oriented approach to nutrition...

If we use ENA approach to nutrition, estimated decrease of child mortality is 25% from the existing rate.

Action Areas:

1. Women's nutrition:

Key messages:

During pregnancy and lactation

- Increase feeding
- Iron/folic acid supplementations
- Treatment and prevention of malaria
- De-worming during pregnancy
- Vitamin A capsule after delivery

2. Control of Vitamin A Deficiency:

Key messages:

- Vitamin A rich foods (e.g. yellow and green vegetables)
- Maternal supplementation
- Food fortification

3. Control of Anemia:

Key messages:

- Supplementation of women and children (IMCI)
- De-worming for pregnant women and children (twice/year)
- Malaria control
- Iron rich foods
- Fortification of food
- Vitamin C rich foods

4. Control of Iodine Deficiency Disorders:

Key messages:

- Access and consumption of iodized salt by all families

How the Essential Nutrition Actions expands coverage of nutrition support in the health sector:

Critical contact points in the lifecycle

1. During Antenatal Care

- Pregnancy: Tetanus toxoid (TT) vaccine and Voluntary Counseling and Testing (VCT)
- Antenatal visit, Iron/Folic Acid
- De-worming
- Maternal diet
- Exclusive breast feeding
- Family planning, sexually transmitted infection prevention
- Safe delivery
- Iodized salt

2. Delivery

- Safe delivery
- Exclusive breast feeding
- Vitamin A, iron/folic acid
- Diet, family planning and sexually transmitted infection, referral if any complication

3. Postnatal and Family Planning:

- Exclusive breast feeding, diet, iron/folic Acid
- Family planning, sexually transmitted infection prevention
- Child's vaccination

4. Immunizations:

- Vaccination, Vitamin A
- De-worming
- Assess and treat infant's anemia
- Family Planning, Sexually Transmitted Infection prevention, Referral

Recommendations for Maternal Nutrition

- During Pregnancy — Increase food and vitamin A intake
- Postpartum — In areas where vitamin A deficiency is common, take a single high-dose (200,000IU) vitamin A capsule as soon as possible, but no later than eight weeks postpartum.
- During Lactation — Increase food and vitamin A intake
  Plan for recuperative period between lactation and the next pregnancy
- All times — Diversify the diet to improve vitamin A and other micronutrient intake

Priority Nutrition Activities in District Health Services

District Level

- Monitor nutrition problems, identify sub-populations at high risk of nutrition problems, and direct additional resources to high risk areas
- Provide resources and tools to implement nutrition activities at health facilities and in communities
- Implement communication strategies to reinforce priority nutrition messages
- Implement special actions to supplement routine services, e.g., campaigns to distribute micronutrient
- Provide facilities for management of severe malnutrition and anemia

- Form partnerships with private service providers in the district

Health Facility Level

- Carry out essential nutrition actions at these contact points with women: during pregnancy, at delivery and postpartum, and in the weeks following delivery
- Detect, treat/ refer severe anemia
- Build community partnership in the catchment areas
- Train and supply community workers; encourage private providers to follow appropriate guidelines
- Implement special actions to achieve coverage targets, e.g., local micronutrient distribution days
- Record and monitor the coverage of essential actions; conduct surveillance of nutrition problems

Community Level

- Identify and support a system to follow all pregnant

Target Group	Dosage (IU)	Frequency
Post partum women	200, 000	within 45 days after delivery

Iodine capsule

As a short-term strategy in highly endemic areas, Lipiodol (iodized oil capsule), should be distributed on a one-time basis to individuals. This will cover the recipients for one to two years until salt Iodization processes are in place.

Dosages are: 1 capsule for pregnant women

UNIT THREE

SATELLITE MODULE

3.1. SATELLITE MODULE FOR HEALTH OFFICER STUDENTS ON MATERNAL NUTRITION

3.1.1. Introduction

Under the normal conditions the mother's weight increases by 20% during pregnancy. In well-nourished mothers from industrial countries this corresponds to the average weight gain of 12.5 Kgs.

3.1.2. Learning objectives:

At the end of the course the student will be able to:

- Discuss the role of nutrition in the promotion of maternal health.
- Discuss some of the important causes of maternal malnutrition
- Explain common maternal nutritional problems
- Identify the available intervention methods

3.1.3. What are the common maternal nutritional problems?

See Core Module.

3.1.4. Treatment and prevention of vitamin A deficiency:

Vitamin A deficiency is a major health problem in Ethiopia. Bitot's Spot was reported to be 0.8% nationwide in Ethiopia. WHO identifies the area as having a problem of public health significance if Bitot's Spot is greater than 0.5%.

Vitamin A deficiency occurs when vitamin A intake (or liver stores) fails to meet daily metabolic requirements. The most common cause is inadequate consumption of vitamin A rich foods. Deficiency also occurs when there is problem of absorption, conversion or utilization of vitamin A or when there are repeated infections of diseases such as measles or diarrhea. In the absence of foods containing oils or fats in the diet, vitamin A is not well absorbed and utilized.

Vitamin A deficiency has long been associated with blindness. Recent research reveals that vitamin A deficiency is associated with increased morbidity and mortality. In countries like Ethiopia, where diarrhea, acute respiratory infection, and measles are among major causes of child mortality, Vitamin A deficiency is of specific concern.

Rationale for action:

Improving vitamin A status:

- Prevents night blindness, xerophthalmia, corneal destruction, and blindness
- May reduce birth defects
- Prevents epithelial and perhaps other types of cancer

Animal sources of vitamin A

The best food sources of pre-formed active retinol, which is most effectively used by the body, are animal foods. These include egg yolks, organ meats such as liver, whole milk, and milk products, small fish with liver intact, fish, cod-liver oil, butter, and ghee.

Plant sources of Vitamin A

Plants contain beta-carotene that needs to be converted into retinol by the body. The best plant sources of vitamin A are dark orange or dark yellow fruits and vegetables such as papayas, mangoes, pumpkins, carrots, and yellow or orange sweet potatoes and dark green vegetables such as spinach, kale and Swiss chard. Gommen is an example of a traditional plant, which is rich in vitamin A and commonly included in the Ethiopian diet.

Food fortification with vitamin A

This involves adding one or more vitamins to commonly consumed foods.

This strategy is beneficial for the whole population if many types of foods for human consumption were to be processed and fortified at the factory level. Unfortunately food fortification is not well known in Ethiopia. Some efforts are under way to fortify sugar and oils that are being produced in some of the larger factories.

Deficiency of Iron

Causes of anemia are multiple and the main causes are nutritional deficiencies, which represent more than half of all cases. Other causes of anemia include blood loss through hemorrhage, destruction of red blood cells by infections, and genetic defects of red blood cells.

Causes of iron deficiency

- Insufficient iron in the diet
- Blood loss during menstruation
- Heavy load of intestinal parasites such as schistosomiasis, tricuriasis and, ascariasis

Consequences: Anemia leads to reduced work capacity, decreased mental performance and intolerance to infections. When the level of hemoglobin concentration falls below 4g/ld it may cause death from anemic heart failure. Iron deficiency anemia can also cause increased maternal mortality due to adverse immune reaction, and maternal anemia can cause prenatal infant loss, low birth weight and prematurity.

3.1.5. Prevention and treatment of iron deficiency

The main strategies are:

- Supplementation of iron tablets with folates preferably with vitamin B_{12} and vitamin C.
- Dietary improvement of iron rich foods
- Changing of dietary habits and food preparation practices through nutrition education.
- Fortification of foods with iron
- Control of malaria infection
- De-worming of intestinal infection
- Control of febrile and chronic diseases
- Prenatal iron supplementation

  Pregnant women require much higher amount of iron than is met by most diets. Therefore, it is important that pregnant women routinely receive iron supplements. In areas where anemia prevalence is high, supplementation should continue into the postpartum period, to ensure adequate stores of iron.

3.1.6. Assessment of maternal malnutrition:

See core module

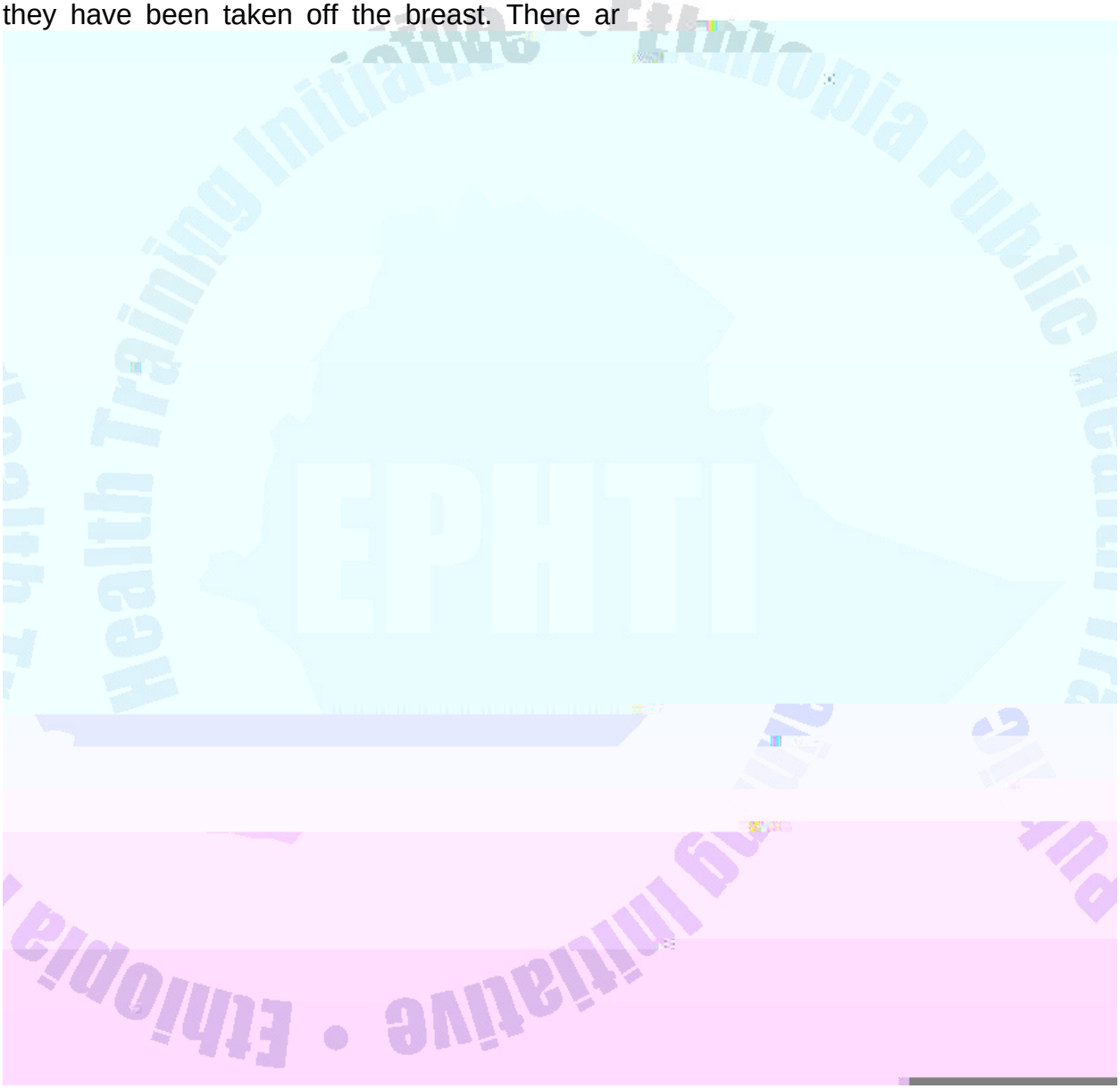
3.1.7. Nutrition Intervention

When there is a serious nutritional problem in a community, we will try to intervene. For intervention we need many things, such as manpower, logistics and resources. When

Protein Energy Malnutrition (PEM)

PEM is today the most serious nutritional problem in Africa and other developing countries. Its two clinical forms are kawashiorkor and marasmus.

These diseases occur most often in children between one and three years of age, after they have been taken off the breast. There ar



and consequently, the pressure they exert also is reduced. When there is insufficient pressure to remove fluid from the tissues, edema results.

Nutrition Education should focus on:

- Cultural malpractices and beliefs in feeding pregnant and lactating women.
- Intra household mal-distribution of food (age bias, sex bias,)
- Effects of emotional deprivation and neglect
- Breast feeding and its benefits (policy issues posed by HIV)
- Hygiene (sanitation of food cooking and storage utensils, personal hygiene, food hygiene etc)

3.1.8. NUTRITION IN MOTHERS

Goals:

- Help women understand the importance of adequate weight gain during pregnancy. Strongly discourage women who are obese from attempting to lose weight during pregnancy. Weight gain during pregnancy is essential
- Encourage clients to plan meals carefully so that all of the nutrients needed during pregnancy can be included without excessive calories, using a food guide for pregnancy is helpful. Strongly discourage the pregnant woman from drinking alcohol.
- Caffeine intake should be limited.
- Instruct client to take only vitamins and minerals prescribed, excessive amounts can be harmful.
- Advise clients that skipping meals is a poor practice, especially for the pregnant woman. The fetus needs a steady supply of nutrients.
- Encourage the use of high fiber foods and plenty of fluids to avoid constipation.
- Give priority to helping pregnant teenagers improve their eating habits. Together with teenagers, plan meals and snacks that are nutritious and at the same time acceptable to the teenagers.
- Take advantage of the client's high motivation during pregnancy to provide nutrition education for the family as well as for the pregnant woman.

ALCOHOL CONSUMPTION SUCH AS:

-Liquor -Tella

-Wine -Teje

-Beer -Areki

Alcohol mentioned above should be avoided during pregnancy. Use of alcohol is associated with the risk of birth defects, as alcohol enters both the maternal and the fetal bloodstream. Babies born to alcoholic mothers may develop fetal alcohol syndrome. This disorder is characterized by low birth weight, and slow growth and development. In some cases there may be permanent mental retardation.

3.1.9. Supplementation

This refers to an administration of a nutrient in the form of a tablet, a capsule or an injection. For example some of the nutrients that are considered in the supplementation programmes in Ethiopia are: -

- Vitamin A for children under five year old and lactating mothers
- Iron for pregnant mothers and any anemic person
- Folic acid for pregnant mothers and any person with macrocytic (megaloblastic) anemia
- Iodine for everybody in the goiter endemic area in the form of iodized salt
- Vitamin K (Menadione) for pre-term newborns and other people with vitamin K dependent clotting factor deficiency.

STRATEGIES

Fortification

For fortification to be opted as a strategy to address special nutrient problems the following concerns need to be addressed:

- The staple food should be centrally produced by firms
- Consumption of the staple food should not vary from day to day
- The target nutrient must be bioavailable from the vehicle food
- The vehicle be culturally accepted
- The fortification nutrient should not alter the color, taste, shelf life, or cost of the vehicle
- There should be a law to enforce the implementation of consumption of the fortified product
- There should be a quality control mechanism as to the quality of the fortified product in terms of its nutrient content.

3.10. Case Study (learning activity)

A 30-year-old woman came to the health center with complaints of weakness, swelling of the lower extremities, and sometimes of the face. She has four children and her husband is not living with her. She is a daily laborer and is responsible for taking care of her children. Their daily diet consists mainly of cereals.

1. Based on the above information, what is your diagnosis?
2. What are the possible causes of her complaint?
3. What diagnostic work would be appropriate?
4. Describe your treatment.

Treatment of malnourished mothers:

- Efforts to increase the amount of food available to pregnant and lactating mothers can be the most effective way of improving their health and that of their infants.
- To support lactation and maintain sufficient maternal reserves, most mothers in developing countries should eat about 650 additional kilocalories per day.
- Mothers should eat a balanced diet including fruits, vegetables, animal products, and fortified foods when possible.

- Community and household members should be informed of the importance of making additional food available to women during pregnancy and lactation, as well as helping them reduce their workload and obtain adequate rest.
- During pregnancy and lactation increase caloric intake, iron/folic acid supplementations, and de-worming.
- Vitamin A capsule after delivery.

- How do you manage her problems as a nurse?
- What points should be included when counseling the mother?

PreTest

1. What are the doses of Iron/Folic Acid supplementation recommends for the pregnant women to prevent anemia?
   a. Iron 200mg/day and Folic Acid 200mg/day
   b. Iron 40mg/day and Folic Acid 300mg/day
   c. Iron 60mg/day and Folic Acid 400mg/day
   d. Iron 120mg/day and Folic Acid 800mg/day

2. Which of the following **is not** a cause for anemia?
   a. Hookworm infestation
   b. High zinc in the body
   c. Malaria
   d. Iron deficiency

3. A lady came to you with intractable vomiting at gestational age of 8 weeks. Which one is true about this patient?
   a. She should eat small and frequent meals
   b. She doesn't need psychological support
   c. Hyperemesis gravidarum can be diagnosed in this patient
   d. A and C

4. One **is not** true about the advice that will be given for a mother with constipation
   a. Decrease the amount of food taken
   b. Increase fiber intake
   c. Increase fluid intake
   d. None

5. Which micronutrient deficiency causes goiter?
   a. Iron
   b. Iodine
   c. Folic acid
   d. Zinc

3.2.4. Major maternal nutritional problems of public health significance in Ethiopia

Refer to the core module

3.2.5. Factors that affect maternal nutritional status

Refer to the core module

3.2.6. Assessment of maternal nutritional status

Refer to the core module

3.2.7. Intervention against maternal nutritional problems

Refer to the core module

3.2.8. Management of Maternal Nutritional Problems

1. ***Management of protein energy malnutrition should attain:***
   - Rapid regeneration of tissues & institute cure of malnutrition
   - Treat complications and reduce case fatality
   - Rehabilitation on a well balanced diet
   - Prevent relapse and future deterioration, through education
   - Long-term follow up with the view of helping individual family members and community.

2. Management of micronutrient deficiencies

I. Iron deficiency anemia

a) Iron/Folic acid supplements for the pregnant women to prevent anemia

Table 6. Dosage of iron and folic acid

Doses of Iron/Folic acid	**Duration**
Iron 60mg/day Folic acid 400 mg/day	▪ Six months during pregnancy where anemia prevalence is < 40% ▪ Six months during pregnancy & months post partum where anemia prevalence is ≥ 40%

a) Albendazole 400mg single dose
b) Mebendazole 500mg single dose
c) Levamisole 2.5mg/kg single dose, best if second and third dose repeated on next two consecutive days
d) Pyrantel 10mg/kg single dose, best if dose repeated on next two consecutive days

2. Malaria

In endemic area where transmission is high; give anti malaria prophylaxis to the woman according to the local recommendation

II. Vitamin A deficiency

a) Prevention

   Immediately after delivery give one oral dose of 200,000 IU vitamin A to all mothers.

b) Treatment for night blindness or bitot's spot in reproductive age, pregnant or not
   - 5,000-10,000 IU vitamin A/day po for at least four weeks
   - Daily dose should never exceed 10,000 IU and weekly dose not exceeding 25,000 IU

c) Treatment for corneal xerophthalmia in reproductive age, pregnancy or lactation

- Substitute additional energy food, protein and calcium to meet growth needs as well as to provide increased calories and nutrients for the growing fetus

2. Nausea and vomiting

- Symptomatic reassurance
- Eat small and frequent meal consisting of dry, starchy foods and avoidance of spicy food.
- Vitamin B6 25mg three times per day
- In severe cases (Hyperemesis Gravidarum)
  - Hospitalization
  - Rehydration
  - Glucose
  - Antiemetics
  - Followup
- Psychological counseling
- Avoid drinking liquids with meals
- Avoid coffee, tea, and spicy foods
- Avoid high fat foods because they delay gastric emptying time

3. Pica

- Detection of practice
- Determine what is being ingested.
- Screen for and treat iron deficiency anemia
- Counseling to discourage or at least minimize the ingestion of non-food substances
- Show economical ways to obtain an adequate diet
- Encourage a high-fiber, high-fluid diet if the client experiences constipation
- Observe for diarrhea and vomiting which may indicate parasitic infection or lead poisoning

4. Heartburn and Acid indigestion

Eat small, frequent, dry meals separate from fluid intake, avoid greasy foods, wearing loose-fitting clothing can produce some relief

- Antacids can be taken for symptomatic relief but they may bind iron in gastrointestinal tract and excess use should be discouraged
- Eat small frequent meals and avoid liquids immediately before and after meals to avoid gastric distention
- Avoid coffee, high fat foods, and spices
- Advise not to lie down or bend over for tow hours after eating
- Avoid gas-forming foods

5. Constipation

- Treat by increasing dietary fibers, fluid intake and exercise
  E.g. whole grains, legumes and fresh fruits and vegetables
- Drink 6-8 glasses of liquid daily
- Encourage the client to try hot water with lemon or fruit juice on waking to

- Economic status

b. Objective Data

- Height
- Pre pregnancy weight
- Present weight
- Calculate BMI
- Blood pressure
- Hemoglobin and Hematocrit

2. Nursing Diagnosis

- Poor health seeking behaviors, as evidenced by a lack of knowledge of appropriate diet before pregnancy, during pregnancy and during lactation and a desire to learn
- Altered nutrition: Less than body requirements, related to poor bioavailability
- Altered oral mucus membrane

3. Planning

After the diagnosis and related factors are identified, client goals and interventions are planned

Client Goals

The client will:

- Explain the importance of diet for her health and for fetal growth and development
- Plan - days' menus that are nutritionally adequate, using the daily food guide for pregnancy
- Consume an adequate, varied, and balanced diet based on the daily food guide for pregnancy
- Consume three meals per day plus two to three nutritious snacks
- Gain weight within the recommended range and rate, as determined by her assessment data
- Have an absence of nutrition related problems or complications of pregnancy

4. Intervention

Diet Management

- Set a mutually agreeable weight gain goal (range), based on the client's base line pre pregnancy weight for height
- Promote the intake of a varied, nutrient dense diet based on the dietary food guide
- Modify the diet as needed to avoid or alleviate nutrition related problems or complications of pregnancy

Client Teaching

Instruct the client and family

- Other specific signs of nutritional problems like edema, wasting, weight loss at any time during pregnancy, failure to gain any weight for one month, excessive weight gain, etc.

3.2.10. Prevention of Maternal Nutritional Problems

Refer satellite module for Environmental Health technician.

3.2.11. Posttest

Refer to the pre test

3.3. Satellite Module for Medical Laboratory Technology Students on Maternal Nutrition

3.3.1. INTRODUCTION

Purpose of the module

This module helps laboratory technology students know their specific tasks and roles in the diagnosis and management of maternal nutrition. The module is prepared with consideration of the tasks, roles and responsibilities of laboratory technologists with B.Sc. degrees and instructors. Moreover, all types of laboratory workers may find the module helpful.

Direction for using the satellite module

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

- Do the pre test
- Read the core module thoroughly
- Understand the contents of the satellite module
- Evaluate yourself by completing the posttest

Pretest

1. Which one of the following is not an anticoagulant?
   a. Ethylenediamine Tetra acetic acid (EDTA)
   b. Tri sodium citrate
   c. Double oxalates
   d. Heparin
   e. None of the above

2.

3. Normal mature red blood cells are:

   a. Discocytes c. Megalocytes

   b. Macrocytes d. Microcytes

   e. All of the above

4. Micro-organisms manifest their presence in one of the following except:

   a. They can cause spoilage

   b. They can cause food borne illness

   c. They can transform a food's properties in a beneficial way-food fermentation

   d. None of the above

5. List five gram-positive bacteria of significance for foods.

   a. _____ c. _____

   b. _____ d. _____

   e. _____

6. List three groups of fungi identified as a food contaminant.

   a. _____ b. _____ c. _____

7. Indicate the two principal laboratory te the ch15( )]TJEMC ET372.66 36e Td(entia>>BDC -0.0

the majority of the people living in Seraba use open fields for waste disposal, including human feces. In this small town there is one junior secondary school with a student population of 400 and all the students share a water source of an unprotected well. At one time many of the students were suffering from bloody diarrhea, vomiting and fever. The school director reported the condition to Aykele Health Center and the health institution organized a team consisting of a health officer, nurse, laboratory technician and sanitarian that went to Seraba junior secondary school.

Based on the above information answer the following questions.

1. Discuse the role of the laboratory technician in addressing the above problem.
2. What are the possible etiological agents for the problem?
3. List the important laboratory investigations for this particular problem.
4. The condition observed can be considered as an outbreak of diarrheal disease (epidemic) and one way of managing such epidemics is identifying the etiological agent from the water source. List all considerations while conducting bacteriological water analysis.

3.3.4. Laboratory Investigations Associated with Maternal Nutrition.

Depending upon the level of the laboratory various types of hematological, biochemical and parasitological investigations can be performed in the laboratory to evaluate maternal nutrition.

The most important laboratory tests used to investigate maternal nutrition are:

1. Hemoglobin determination
2. Packed cell volume determination
3. Micro nutrients such as foliate, iodine, vitamin A, vitamin D and iron determination.
4. Serum protein determination
5. Serum glucose determination
6. Investigation for blood and intestinal parasites.
7. Red blood cell morphology
8. Urinalysis

Determination of packed cell volume (PCV) or hematocrit (HCT)

The PCV, also commonly called hematocrit, is a measure of the ratio of the volume occupied by red blood cells to the volume of whole blood in a sample of capillary or venous blood. The ratio is measured after appropriate centrifugation and is expressed by a decimal fraction or as percentage.

There are two methods, micro hematocrit and macro hematocrit methods. Although the macro Hematocrit method is recommended by the international council for standardization in hematology (ICSH) as an alternative method, it is no longer in routine use because of technical problems.

Micronutrient determination

A. Folate

- Folate deficiency is usually detected by hematological abnormalities.
- A macrocytic megaloblastic anemia and

C. Vitamin A

- Measuring serum retinol and serum retinol binding protein provides for laboratory diagnosis of vitamin A deficiency.
- Measuring breast milk retinol shows the vitamin A status of the mother and that of the breast-feeding infant.

D. Vitamin D

Measurement of blood plasma 25-OH D, blood plasma calcium, and blood plasma parathyroid hormone enables diagnosis of vitamin D deficiency.

E. Zinc

Zinc status in human subjects is assessed by measurement of zinc in plasma, erythrocytes, neutrophils, lymphocytes and hair. Available data indicate that zinc in neutrophil and the assay of activity of alkaline phosphates in neutrophil may be the best tools for the diagnosis of zinc deficiency.

Serum protein determination

- Proteins are biochemical compounds with high molecular weight. They are present in the cytoplasm and cell membrane of all cells
- In disease conditions, both the total serum protein and the ratio of individual protein fraction may be changed independent of one another.
-

- Red blood cells may show variation in size (Anisocytosis) and included are:
  - Macrocytes
  - Megalocytes
  - Microcytes

Urinalysis

- The production and composition of urine depends on glomerular filtration, tubular reabsorption and tubular secretion.
- Changes can occur in the volume, appearance, constituents, and mass density (specific gravity) of urine.
- Common laboratory tests on urine specimens include:
  - Protein (albumin)
  - Glucose
  - Ketones
  - Bilirubin
  - Uroblinogen
  - Nitrites
  - Specific gravity
  - P^H
  - Microscopic examination of urine sediment.
  - Urine culture and sensitivity test
- Currently all chemical tests can be conducted by using N - multistixs.

Microbiological analysis of food

- The foods that we eat are rarely if ever sterile, they carry microorganisms.
- The microorganisms present will originate from the natural micro flora of the raw material and those organisms introduced in the course of harvesting, processing, storage and distribution.
- In most cases the micro flora has no discernible effect and the food is consumed without objection and with no adverse consequences.
- In some instances microorganisms manifest their presence in several ways.

6. Staphylococcus and Micrococcus species

- Micrococci are spoilage organisms commonly found in cured meats
- Staphylococcus aureus produce potent entrotoxin

7. Streptococci

- S. Pyogenes cause food transmitted sore throat
- Enterococcis are indicator organisms and produce vasoactive amine compounds which cause sudden changes in blood pressure
- Enterococci are relatively thermoduric and may survive in pasteurized milk and egg products

8. Gram- negative bacteria of significance in foods and water

1. Acetobacteriaceae
2. Legionella pneumophila and other legionella spp. are hazards in food
   - Will not be encountered using normal culture media
3. Enterobacteriacea

9. Lactose fermenter indicator organisms

- Escherichia coli
- Citrobacter
- Enterobacter
- Erwina
- Klebsiella

10. Non-lactose fermenters

- Salmonella
- Shigella
- Proteus
- Morganella

11. Viruses identified as a food contaminants

- Epstein-Barr virus (EBV)
- Hepatitis A virus
- Rota viruses

Systematic overview of analytical precautions that are essential to obtain reliable and reproducible results in the microbiological examination of food samples.

1. Sampling
2. Handling before examination
3. Preparation for examination
4. Drawing of sub samples (aliquots)

- Each bottle of broth must contain an inverted Durham tube for the collection of gas
- Refer to medical laboratory manual for tropical countries for estimating the most probable number (MPN) of fecal coliform bacteria.

Post test

Refer pretest

2. Which of the following is/are environmental toxin/s?
    a.

To determine water contamination levels, undergo:

a) Physical analysis (organoloptical)

Taste

Color

Smell

b) Bacteriological analysis of water

- Multiple tube test to check gas production and color change
- Membrane filtration technique
- Counting colonies and further culture of the colonies at 44^0c to check presence of E-coli

c) Chemical analysis of water

- To assure its chemical quality especially for iron, fluoride etc by using the available laboratory facility.

- Frequent transportation of perishable foods exposed to chemical and biological contaminants in open and un-refrigerated manner.

Gastroenteritis caused by viral, bacterial agents, typhoid, hepatitis, cholera and parasitic disease are commonly contracted from unsanitary establishments.

To have proper maternal nutrition the food should be processed safely starting from production, preparation, storage, transportation and services. Food should be free from chemicals that may cause acute or chronic problem to the mother.

- During cultivation
- During growth

3.4.4. The Role of the Environmental Health Officer in the Prevention of Maternal Malnutrition

I. Food poisoning and food infection control

A. Food poisoning: -

It is more likely to affect people with lowered resistance to disease than healthy people who might show mild symptoms or none at all. Elderly or sick people, pregnant mothers, babies and young children are particularly vulnerable to food poisoning. They should seek treatment if they have symptoms. Extra care should also be taken when preparing food for these vulnerable groups to minimize the risks of their coming in contact with food poisoning bacteria.

Food poisoning is contamination of any food or drink by toxins from microorganisms, environmental toxins or naturally occurring toxins in the food itself.

1. Microbial toxins

The most common microorganisms to cause food poisoning are:

- Clostridium botulism (common in canned food)
- Clostridium perfringens
- Staphylococcus aureus

2. Naturally occurring toxins

   These groups of toxins are naturally found embedded in the edible portion of the food. E.g. mushroom,

3. Environmental toxins

   These get access to our food or drink from the containers we are using or via leaching of agro-chemicals into the water bodies and contaminating the food or drink, e.g. heavy metals like copper, zinc, mercury and lead.

   - Copper and zinc dissolve into drinks or canned watery foods from damaged containers.
   - Mercury, found in fishes, originates from chemicals used in agriculture.
   - Lead occurs in paints and dust and MCID 23 >>BDC /TTJEMC Bed inTw 1.5 -1Tc 0.002/ae wa

Germs can get into our food at any point in the food chain from the time when an animal or food is in the field to the moment food is put on to the table to eat.

In the case of salmonolosis/salmonella infection, the Environmental Health Officer can prevent or control it by educating people on proper storage of food, thorough cooking food, eliminate rodents or pets and poultry, water and meat sanitation. Advise not to eat raw beef.

II. Educating the mother

- *Personal hygiene of food handler*
  - Adequate cooking of products to assure destruction of pathogenic organisms
  - Thorough washing and storage of fruits and vegetables.
  - Proper washing of equipment and utensils as follows.
  - frequent washing of hands with soap and water.

Wash	***Rinse***	***Sanitize***	***Drying***
- T ^{o} 110-120^{o}F Hot water - Use detergent such as chlorine	- immerse in hot water	- T^{o} - 170^{o}F for 2min - 212^{o}F for 30 sec - use chlorine solution 50 PPM for 2 min.	- air drying

- *Dietary diversification, supplementation* of different nutrients should be recommended to the mother by working with the agricultural office in the specific woreda
- *Environmental sanitation*: - pregnant women may have the following problems: PEM, Vit. A deficiency, Fe-deficiency and iodine deficiency. These can be due to physiologic condition or associated with malaria and parasitic infection. Therefore, to prevent these problems, the following major interventions need to be conducted by the environmental health officer together with the health center team and the community.

A. Prevention of Anemia

a) **Hookworm** – In communities where hookworm is endemic,
   - Construction of latrines and education on their proper use
   - Wearing of shoes

- Anthelmenthic / deworming / drugs given to all anemic persons to eliminate the intestinal worms.

b) **Malaria,** especially in areas where P.falciparum and P.Vivax are endemic, the different physical methods of control such as filling in ditches, draining stagnant water, clearing bushes, drying marshy areas, using bed net, etc should be demonstrated. The different chemical control methods such as, Abate, DDT should also be recommended apart from administering the proper treatment.

The pregnant mother should be advised to eat iron rich foods to prevent iron deficiency anemia through the following mechanisms:

Iron-deficiency Anemia

1. Dietary diversification – promotion of a diet with a wider varietyf a ron r0.3077

C. Iodine deficiency prevention

- Educating people to take iodized salt in their food
- Undergoing chemical analysis of water to check the concentration of iodine so that possible preventive step will be taken.
- In areas where the soil formation is rocky and far from seawater, people should be aware that they need to take iodized salt.

D. Vitamin A deficiency prevention

- Vitamin A deficient may affect the eye and lead to blindne

3.5 Satellite Module For Health Extension Workers on Maternal Nutrition

3. Which of the following is not a method to prevent iron deficiency anemia?
   a) Giving antihelmenthic
   b) Proper waste disposal
   c) Increase iron intake from diet
   d) None

4. The following are causes of maternal malnutrition ***except:***
   a) Cultural malpractice

3.5.7. Causes of maternal malnutrition

- Lack of knowledge
- Infection
- Cultural malpractices
- Poverty
- Manmade and natural calamites
- Social unrest (war)
- Poor food production
- Uncontrolled population growth
- Poor marketing, storage and distribution

3.5.8. Factors affecting Maternal Nutrition

1. Culture and beliefs

- During period of fasting important nutrients are not consumed, such as animal products.
- Discrimination in food distribution among family members; adult males before females and feeding of children with leftover food.

2. Pregnancy and Lactation

The pregnant woman's diet should include a substantial increase in calories, protein, calcium, folic acid, and iron.

Pregnant women at particular risk of nutritional deficiencies are adolescents, underweight women, obese women, women with chronic nutritional problems, women r defici

3.5.9. The Role of Maternal Nutrition in the Promotion of Maternal Health

The growth of the fetus can be regarded as a result of the interaction between its genetic potential and the intrauterine environment. Mothers who enter pregnancy with sound reproductive physiology, and who have not suffered ill health or nutritional deprivation in childhood, will have larger and healthier infants than mothers who do not have such advantages.

There are many short mothers in the lower socio economic groups, which may mean that inadequate nutrition and different illness prevent many girls in the social group from achieving optimal physique.

3.5.10. What mothers do during pregnancy

- Help clients understand the importance of adequate weight gain during pregnancy. Strongly discourage clients who are obese from attempting to lose weight during pregnancy. Weight gain during pregnant is recommended.
- Using a food guide for pregnancy, encourage clients to plan meals carefully so that all of the nutrients needed during pregnancy can be included without excess calories. Strongly discourage the pregnancy woman from using alcohol.
- Caffeine intake should be limited. Instruct client to take only vitamins and minerals prescribed, excessive amounts can be harmful.
- Advise clients that skipping meals is a poor practice, especially for the pregnant woman. The fetus needs a steady supply of nutrients.
- Encourage the pregnant mother take in high fiber foods and plenty of fluids to avoid constipation.
- Give priority in helping pregnant teenagers improve their eating habits. Additionally, teenagers need snacks that are nutritious and at the same time acceptable to them.
- Take advantage of the client's high motivation during pregnancy to provide nutrition education for the family as well as for the pregnant woman.

3.5.11. Common Maternal Nutritional Problems

- Vitamin A deficiency
- Iodine deficiency

5.1. Protein energy malnutrition

It is due to deficiency of proteins,fat and carbohydrate

Consequences - Infection

- Obstructed labor- how?
- Maternal mortality
- Low birth weight and IUGR
- Neonatal and infant mortality

5.2. Iron deficiency

- Anemia is defined in first and third trimesters as a hemoglobin concentration less than 11gm/100ml or hematocrit less than 33% and in second trimester, hemoglobin less than 10.5gm/100ml or hematocrit less than 32%.
- It is the most common form of malnutrition
- It is the most common cause of anemia
- Other causes of anemia are parasitic infections and malaria
- Causes of dietary iron deficiency
  - Low dietary iron intake
  - Low iron bioavailability.
-

- Neonatal mortality
- Reduced physical activity and productivity
- Impaired cognition

5.3. Vitamin A deficiency

- Causes
  - Inadequate intake
  - Recurrent infection
  - Reproductive cycle
- Consequences
  - Night blindness
  - Maternal mortality
  - Miscarriage
  - Still birth
  - Low birth weight
  - Reduced transfer of vitamin A to fetus
  - HIV vertical transmission
  - Low vitamin A concentration in breast milk

5.4. Iodine deficiency

- Causes include:
  - Living in the mountainous area where plant foods have inadequate iodine
  - Taking cassava tuber as a food with out detoxifying it and other Oxposure to chelating substances
  - Not eating (or “having access”) to sea foods
- Consequences include:
  - Impaired cognition
  - Poor school performance
  - Endemic cretinism

3.5.12. Assessment of maternal nutritional status

Power-type indices express weight relative to some power function of height or height relative to some power function of weight.

Assessing PEM in women

- Height less than 1.45m
- Weight less than 45kg
- BMI less than 18.5 (thinness)
- Pregnant – weight gain less than 1.5kg/month in the second and third trimesters (or less than 10.5kg gained over full course of pregnancy)

Body Mass index = $Wt/(Ht)^2$

Table: 5. The BMI and recommended weight increase during pregnancy

Pre pregnancy BMI	*Recommended total gain (kg)*
Low (BMI < 19.8)	12.5 – 18
Normal (BMI 19.8 – 26)	11.5 – 16
High (BMI > 26 - 29)	7 – 11.5
Obese (BMI >29)	< 7

Common indicators

- Edema
- Dyspigmentation of the hair
- Angular Stomatits
- Corneal lesions
- Swelling (enlargement) of glands
- Xerosis, etc.

Key interventions to improve Maternal Nutrition

Improving Maternal Nutrition

- Ensure access and consumption of salt fortified with iodine in every household
- Distribute a high dose of vitamin A within six weeks after delivery
- Distribute iron supplements during the last six months of pregnancy

How the Essential Nutrition Actions expands coverage of nutrition support in the health sector:

Critical contact points in the lifecycle

1. During Antenatal Care

- Pregnancy: Tetanus toxoid
- Antenatal visit, Iron/Folic Acid
- De-worming
- Maternal diet
- Exclusive breast feeding
- Risk signs, family planning, sexually transmitted infection prevention
- Safe delivery
- Iodized salt

2. Delivery, Safe delivery,

- Exclusive Breast Feeding
- Vitamin A, Iron/Folic Acid
- Diet, Family Planning and Sexually Transmitted Infection, Referral

3. Postnatal and Family Planning:

- Exclusive Breast Feeding, Diet, Iron/Folic Acid
- Family Planning, Sexually Transmitted Infection prevention
- Child's vaccination

4. Immunizations:

- Vaccination, Vitamin A
- De-worming
- Assess and treat infant's anemia
- Family Planning, Sexually Transmitted Infection prevention, Referral

UNIT FOUR

AUTHORS

1. **Melkie Edris Yusuf** B. Sc. in public Health Gondar Public Health college, Addis Ababa University, M.Sc. in Applied Human Nutrition University of Nairobi, Kenya, Associate Professor of Nutrition in the University of Gondar Currently I am coordinating the Health Officer Training Programme.

2. **Habtemariam Tekle** is an assistant professor in Gynecology and Obstetrics. He received his MD from Jimma University and did his specialization at the Addis Ababa University. He worked in various capacities from General Medical Practitioner to the current post.

3. **Baye Gelaw** MLT (Gondar College of Medical Sciences and National Research institute of health)
   - BSc (Jimma University)
   - MSc (AAU) lecture of Medical Microbiology in Gondar University College.

4. **YOHANNIS FITAW** is an assistant professor in Public Health. He received his MD from Gondar University and MPH from the Addis Ababa University. He worked in various capacities from General Medical Practitioner, Assistant lecturer, Lecturer.

5. **Dagnew Engidaw**

6. **Tigist Alemu**
   Is an instructor in the department of nursing, Gondar University. She obtained her diploma in nursing from Gondar college of Medical science and her B. Sc degree in Nursing from Jimma University.

7. **Yewenetu Dessalegn**

REFERENCES

1. Steven G. Gabbe Obstetrics, normal and problem anegnancy, maternnornubstginatinTm(Tf-0.0

13. National Guidelines for control prevention of micronutrient deficiencies, Federal ministry of Health, Family Health depactun Ethiopia June 2004.

14. Belachew T., Legesse W, Asres T., Tigabu T., Tiku S., Kebede E., Demen G., and Haile M. Module on Micronutrient deficiency for the Ethiopian Health Center Tem. Jimma University 2004.

15. Sahlemariam Z. Hematology for Medical Laboratory Technology students. Jimma University 2002.

16. Damcha G. Clinical chemistry principles, procedures and interpretation. Addis Ababa 1997.

17. Cheesbrough M. District Laboratory practice in tropical countries Volume I and II. Cambridge Univeristy press 1998.

18. D.A.A. Mossel, J.E.C. corry