MODULE

Measles

For the Ethiopian Health Center Team

Ethiopia Public Health
Training Initiative

Dejene Hailu, Abrham Alano,

Abebe G/Mariam, Tesfaye Abicho

College of Health Science
Awassa

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.

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ACKNOWLEDGEMENT

We, The Authors, are very grateful to The Carter Center, Atlanta, Georgia, for its financial and materials support, which enhanced staff strengthening and curriculum development in genial and health learning modules development and preparation in particular.

We would like to eholeheartedly rxpress our deep thanks and appreciation to Professor Dennis Carlson, Senior Consultant, initially for his vision and Subsequently for his superb, unreserved guidance and encouragement in the development and preparation of the modules. His contributions were very immense without which the preparation of the module would not have been materialized.

Many thanks are due to Dilla College Of Teacher Education and Health Sciences for its relentless assistance and creating conducive working environment for the successful accomplishment of the modules.

We are very gateful to Dr. Solomon Demamu, Ato Asamnaw Kass, Ato Mistre Wolde Ato Haregwoin Merkebu and Dr. Kassu Ketema for their significant contributions at different stages of the preparation of these modules and review as well.

We would also extend our appreciation and thanks to Ato Belete Shiferaw, Ato Negesse Dibisa, And Ato Belayhun Kibret for their contributions towards the preparation of this module.

Special gratitude goes to Alemaya University, Jimma University And Gondar College Of Medical Sciences for hosting the consecutive health learning materials development (Hlmd) workshops.

The authors address their acknowledgment to all-anternational consultants and experts for their valuable contributions to the preparation of the modules.
To mention some of them: Professor Donald of USA, Dr. Charles Larsen of Mcgill University of Canada, Professor Joyce Murray Of Emory University of USA, Professor Nicholas Cunnigham of Colombia University Of USA and professor Joe Wray of Columbia University of USA.

We are also very grateful to our local editors for having invested their time and energy in reviewing the modules and giving theory valuable suggestions and comments. To mention some of them Dr. Asfaw Desta and Dr. Girmay Haile of Jimma University.

Finally, it is out pleasure to acknowledge all those, who have directly and/or indirectly provided us with administrative and logistic support that ultimately facilitated the development and preparation of the module.

UNIT ONE
INTRODUCTION

1.1 Purpose and Use of this Module

The use of modules in the education processes is increasing nowadays. This emanates from their importance in simplifying and easily disseminating information.

As such, this module puts all necessary efforts to present relevant, appropriate and more valuable methods and approaches by which the teaching-learning processes in the community and in higher health learning institutions can be simplified and made widespread. It is aimed at promoting the interaction between the instructors and students through two-way communication. It is also designed in such a manner to facilitate self-insructionssible so as to encourage the students to adopt the habit of using their own efforts to dig out and extract new information and concepts from the subject matter of a course. This module is meant to be used as a teaching aid for different categories of mid-level health professionals (Health Officers, Public Health Nurses, Environmental Health and Medical Laboratory Techniologists) with apparently matched levels of teaching about measles incidence and prevalence in Ethiopia.

Upon successful completion of this module the students are, therefore, expected to have acquired knowledge, skills, and attitudes with the view of being able to do surveillance of disease/health problems, diagnosis and management, control and prevention of measles at health care facility, family and community levels.

1.2 Direction for Using this Module

- Read the contents;
- Do the pre-test questions and evaluate your knowledge;
- Read and understand the learning objectives;
- Read each section under course content before proceeding to the next section;

- Do post-test and evaluate your knowledge;
- Use advanced reference for further information on the subject;

UNIT TWO

CORE MODULE (FOR ALL CATEGORIES OF HEALTH PERSONNEL)

2.1 Pre-test

Direction: Encircle all that are applicable

1. What is the infectious agent for Measles?
   a. Bacteria
   b. Virus
   c. Fungus
   d. Protozoa
2. Which of the following is a risk factor for higher mortality due to measles?
   a. Age
   b. Population Density
   c. Malnutrition
   d. Lack of measles vaccination
3. Factors that contribute to the differences in the mean duration of passively transferred maternal antibodies against measles in infants include?
   a. Geographic variability
   b . Genetic
   c. Efficiency with which children maintain passively acquired immunity
   d. Maternal nutrition
4. Which of the following symptoms/signs is/are pathognomonic (typical characteristic) for the diagnosis of Measles?
   a. Fever
   b. Running nose
   c. Kalpak's spot
   d. Cough

5. Which of the following conditions can be considered as missed opportunities for measles immunization?
   a. False contraindication
   b. Incorrect screening
   c. Vaccination unavailability
   d. Cancellation of schedules
6. Which of the following complications of measles is the most fatal?
   a. Diarrhea
   b. Pneumonia
   c. Otitis media
   d. Furuncles
7. One of the following basic methods is used to monitor the cold chain for maintaining vaccine potency.
   a. Temperature regulation between 0-8^{0}c
   b. Watching the indicator to monitor the cold chain
   c. Vaccine potency testing
   d. Favorable knowledge, attitude and practice of health workers
8. Contributing factors for low immunization coverage of measles include:
   a. Lack of information on the mother's or caretakers' side
   b. Lack of motivation on the side of health workers
   c. Obstacles to immunization like issues pertaining to place, time, vaccinator, vaccine.
   d. All of the above
9. Why are people never reached by measles immunization despite having access to health facilities?
   a. Cost of vaccine and transport
   b. Unawareness of services and its importance
   c. Time constraint
   d. Cultural and/or ethnic barriers, including perceptions about the vaccine

10. Which of the following can be potential solutions to increase measles vaccination coverage?
    a. Social mobilization
    b. Responding to community needs
    c. Refreshment course for health workers
    d. Information on health education

2.2 Significance and Brief Description about Measles

Measles (rubella) is among the leading causes of child morbidity and mortality worldwide. Despite remarkable progress in the control of measles, l measles still continues to claim the lives of millions of children every year around the world. The majority of this mortality takes place in the world's poorest countries, particularly in sub-Saharan Africa, where a combination of factors such as crowding, exposure at a younger age and malnutrition contribute substantially to the high case fatality rates.

Measles accounts for a significant childhood morbidity & mortality especially in third world countries. The WHO estimated in 1996 that the annual case burden amounted to 40 million cases of which about 1 million deaths occur every year, making it the most important killer of the vaccine preventable diseases. The world health assembly (WHA) resolution for child survival calls for 95% reduction of measles deaths and 90% reduction of measles cases by the turn of the 20$^{th.}$ Century, However, most of the developing countries have not achieved this goal yet.

In Ethiopia, measles is among the most common cause for morbidity and mortality in children. However, routine measles immunization coverage has increased from 29% in 1994 to 59.7% in 1999. This is still relatively very low. Due to this low coverage rate and prevailing poor living conditions, measles outbreaks frequently occur in different parts of the country. Major outbreaks with large attack rates resulting in as high as 15 – 20% case fatality rates have been reported in this country. Measles related case fatality rates range between 3-5% in non-epidemic circumstances.

Measles results in huge costs that are measured in healthy years of life lost and loss of productivity. According to the routine reports of health facilities to the Ministry of Health of Ethiopia between 1980 and 1990, the measles incidence was very high in children under 15 years, particularly in the 1 to 4 years age groups.

2.3 Learning Objectives

At the completion of this module, the student should be able to:

- State the etiologic agent of measles;
- Appreciate the magnitude, severity and consequences of measles;
- Recognize the natural history of measles;
- Identify risk factors associated with measles;
- Be familiarized with the distribution and determinants of measles;
- List down the clinical manifestations and diagnostic features;
- Establish a case definition of measles;
- Manage measles and its complications;
- Determine factors that contribute to low immunization coverage against measles;
- Differentiate between true and false contraindications for measles vaccination;
- Design intervention strategies and mechanisms to control and prevent measles;

2.4 Case Study: A learning Activity

Marta was a 2-year-old female child from Sugale Peasant Association, Gedeo Zone, had a fever, reddish discoloration of the eyes with profuse tearing (lacrimation) and a rash all over her body for two days duration. Woizero Daditu, her mother, was concerned so she hurried to the Community Health Agent (CHA), Ato Korie, and begged him to look at her child. Ato Korie accompanied the mother and saw the child's condition. He asked whether there are any similar cases in the neighborhood. The mother counted by her fingers and said there are a lot of similar cases. The CHA gave the child paracetamol to bring the fever down and advised the mother to take her to Won ago Health Center. However, W/ro. Daditu didn't take Marta to health center

thinking that the injection aggravates the condition. Ato Korie went to other households and saw many similar cases. He was alarmed and immediately reported to Won Ago Health Center (HC) ten cases and one death that have occurred before three days due to similar illness.

Sugale Peasant Association (PA) is one of the expanded programs on immunization (EPI) outreach sites of Wonago health center. Based on Ato Korie's report, the next day, the Head of the HC sent a team of health workers to conduct survey and detect cases. The team divided itself into two groups. One group assessed the child's condition and found out that Marta was acutely sick sitting on her mother's lap with high-grade fever, rash, cough and fast breathing. The team asked for her immunization card and found out that the child was not immunized for measles. The other group assessed the housing condition. The house is very small-a one roomed tukul without windows. Eight family members share it.

The team then brought Marta to Won ago Health Center for further investigation and management.

2.5 Definition

Measles is a highly contagious acute viral disease characterized by fever, coryza (runny nose), cough, irritability, conjunctivitis/ lacrimation, enanthema (Koplik's spots) on the buccal and labial mucosa; and maculo-papular rash appearing in a shower distribution over a period of 3 days, first erupting successively over the head, neck & face then progressing to involve the body (trunk), arms & legs progressing down wards to reach the feet on the third day and accompanied by a high fever.

2.6 Etiology and Pathogenesis

The pathogenic organism causing measles is called measles virus. Measles virus (MV), a negative-sense enveloped RNA virus, is a member of the Morbillivirus genus in the Paramyxoviridae family.It is an RNA virus, which belongs to a group of myxoviruses.

Measles virus (MV) is an efficient pathogen that persists when a population is large enough to support it., Nevertheless, it is able to cause acute infection in any individual only once in his/her life time.

2.7 Epidemiology

Prior to widespread immunization, measles was common in childhood. It is ubiquitous (present everywhere), and a highly contageous disease affecting nearly 90% of susceptible household contacts. Few persons went through life without an attack. Measles is endemic in urban areas, attaining epidemic proportion usually every other year. With effective childhood immunization programs, such as in Europe and North America, Measles cases have dropped markedly and are generally limited to older age groups. However, it still remains to be common in countries with low immunization coverage, such as sub-Saharan Africa. Approximately 30 million measles cases are reported annually to World Health Organization. Most reported cases are from Africa. In 1998, the reported cases of measles per 100,000 total population reported to the World Health Organization was 1.6 in the Americas, 8.2 in Europe, 11.1 in the Eastern Mediterranean region, 4.2 in South East Asia, 5.0 in the Western Pacific region, and 61.7 in Africa. In these areas relatively younger children and infants are affected frequently. Measles epidemics occur every 2-3 years in population with large susceptible groups.

Transmission is primarily person-to-person via droplet spread; direct contact with nasal or throat secretions of infected persons and less commonly by articles freshly soiled with nose and throat secretions. Human beings are the only reservoir of the measles virus.

Risk Factors for Increased Fatality

Age at infection: The measles case fatality rate (CFR) is usually highest among the youngest children. Age-specific attack rates may be highest in susceptible infants

younger than 12 months. This is because complications such as otitis media, bronchopneumonia, laryngotracheobronchitis (ie, croup), and diarrhea occur more commonly in young children. It has been indicated that in many children measles mortality can be particularly high if many children contract measles at an early age. Infants have the highest risk of death.

Malnutrition: Several community-based studies have shown higher mortality among children with protein-energy malnutrition and micronutrient deficiency, particularly vitamin A. Malnutrition is a major factor in case fatality rate (CFR)

Type and severity of complications: differences in the incidence of potential complicating conditions like pneumonia, otitismedia, diarrhea, protein- energy malnutrition, vitamin A deficiency, reactivation of preexisting diseases like Tuberculosis, and HIV/AIDS may account for some of the variation in severity of measles.

Lack of immunization services: is the most important risk factor for measles.

Maternal Immunity: maternal antibodies usually protect children of immune mothers at least to the age of 6 months. Antibody studies indicate that many children under 6 months develop sub-clinical infection when exposed to a sibling with measles. As maternal antibodies disappear, susceptibility increases.

Vaccine Induced Immunity: It has been commonly believed that measles vaccine would produce lifetime immunity similar to natural infection. The large number of cases of measles in vaccinated children observed in developing countries have, therefore, been explained as natural vaccine failure (about 15% in children vaccinated at 9 months age), due to interference from maternal antibodies, & vaccine failure due to cold chain breaks (improper storage & transportation out of the proper range of temperature, and exposure of reconstituted vaccine to sun light.)

2.8 Clinical Manifestations

Typical measles has three clinical stages: an incubation stage, a prodromal stage with enanthem (koplic spots) and mild symptoms, and a final stage with a maculopapular rash accompanied by high fever.

The incubation period lasts 7-14 days (average 10-12 days) to the first prodromal symptoms & another 2-4 days to the appearance of the rash.

Patients usually have no symptoms. Some may experience symptoms of primary viral spread (fever, spotty rash and respiratory symptoms due to virus in the blood stream) within 2-3 days of exposure.

The onset of the disease is characterized by symptoms of the initial catarrhal (prodromal) phase that usually lasts 3-5 days and is characterized by:

- Low or moderate fever (38-39^{o}C)
- Red eyes/lacrimation
- Runny nose/ Coryza
- Cough

These symptoms nearly always precede the appearance of koplik Spots, the pathognomonic sign of measles, which appears usually on the buccal mucosa. Koplik's spot appear as 1 to 2 mm grayish white spots, usually as small as grains of sand, on bright red background typically located on the buccal mucosa opposite the lower molars but may spread irregularly over the rest of buccal mucosa.They appear & disappear rapidly, usually with in 12-18 hours.

- Reddish (erythematous), maculopapular rash typically occurs in cephalo-caudal (top-bottom) progression. The skin rash appears by the third day after the onset of fever, cough & coryza. The fever classically rises, often reaching 40^{0}C,with the appearance of the rash. The rash usually starts as faint macules on the upper lateral parts of the neck, behind the ears, along the hairline, and on the posterior parts of the neck. The individual lesions become increasingly maculopapular as

- The child is irritable and often stops eating and drinking well

Complications of Measles

The chief complications of measles are:

Approximately 30% of reported measles cases have one or more complications. The most common complications that occur are:

- Diarrhea (that may be fatal if dehydration occurs)
- Pneumonia (either primary viral or secondary bacterial). this is the most common cause of death
- Otitismedia
- Encephalitis
- Hyporetinemia (vitamin A deficiency) is present in over 90% of cases of measles in Africa.
- Pyogenic infection of the skin: e.g. impetigo, furuncles
- Keratitis
- Bronchitis
- Croup,
- Conjunctivitis and/or corneal ulceration leading to blindness (especially if vitamin A deficient),
- Mouth ulceration
- Acute glomerulonephritis (inflammation of kidneys)
- Acute renal failure
- Severe Protein energy malnutrition due to
  - Failure to feed

- Mouth ulcer
- Catabolic state of illness
- Diarrhoea loss

- Measles infection during pregnancy increases the risk of premature labour and delivery, and fetal loss. There is also a risk of maternal death.

On examination, look for signs of late complications after the rash has disappeared, such as:

- Pneumonia; one of the most common complications in measles, particularly in infants and is the main cause of death from the disease
- Corneal clouding
- Deep or extensive mouth ulcers.
- Dehydration from diarrhea
- Stridor due to measles croup
- Severe (but often insidious) malnutrition (PEM)
- Worsening active tuberculosis or reactivation of latent mycobacterium infection due to suppression of delayed hypersensitivity (Cell Mediated Immunity, CMI)
- Acute encephalitis (considered as an autoimmune disease)

2.9 Diagnosis

Typical measles may be suspected in any patient with generalized maculopapular rash & fever and one of the following: cough or red eyes (conjunctivitis) or runny nose (coryza).

Evidence of rash, which is considered as a definitive diagnosis is made by identifying Koplik's spot.(although pathognomonic, its diagnostic usefulness is limited once the rash appears since these enanthmatous spots are transient signs that disappear well before the rash appears).This is followed by high grade fever, malaise and the characteristics rash in cephalo-caudal progression. Laboratory confirmation is rarely needed.

The virus can be detected in the early stage of the disease by rapid immunofluorescent staining of pharyngeal and urinary epithelial cells or it can be grown in tissue culture in research laboratories. Serological tests are also available.

Differential Diagnosis (for a typical form of Measles):the rash of measles must be differentiated from other causes of rash.

- ***Rubella (German measles):***
  - Mild course with few or no constitutional symptoms
  - Enlarged and tender post auricular and sub occipital lymph nodes
  - Low grade fever
  - Usual absence of a recognizable prodrome
  - Short duration
  - Absence of Koplik spots
- ***Roseola infantum***- skin rash similar to measles but is seldom seen

  In children over the age of 3 years. Its high initial temperature and absence of Koplik's spots can usually differentiate it. Fever subsides as the rash appears (usually after three days).
- ***Drug rashes*** (e.g. sulfonamides, Phenobarbitals, etc.) :
  - History of drug intake (ingestion) is important
  - Rash resembles that of measles
  - Absence of typical prodromal symptoms
  - Absence of severe cough
  - No typical cephalo-caudal rash progression
  - Prominent involvement of palms and soles
- ***Scarlet fever (scarlatina):***
  - Principally signs and symptoms of soar throat(pharyngitis)
  - High white blood cell count (leukocytosis),
  - Absence of Koplik's spot,
  - Cough is not severe and no conjunctivitis.

- The rash is fine goose flesh or sand paper like and not characterized by head to feet (cephalo-caudal) progression as for measles.

- ***Diphtheric croup***
  - ⇩ Severe croup, sometimes descending, but mainly localized process.
  - ⇩ Hoarseness, stridor,dyspnea,croupy cough.
  - ⇩ A gray membrane is visible in the throat.
  - ⇩ Relative lack of fever
  - ⇩ Absence of typical measles rash.

- ***Acute laryngotracheobronchitis/Croup syndrome/***

- ***Erythema infectiosum(5th disease)***
  - Symptoms of mild respiratory tract infection
  - Rash_Erythematous facial flashing giving a slapped- cheek appearance of the face followed by rapid spread of diffuse macular erythema to the trunk and proximal extremities
    - ⇩ More prominent on the extensor surface;
    - ⇩ Spare palms and soles;
  - Child afebrile and not ill- appearing.

- ***Enter virus infections:***
  - Fever, malaise
  - Sore throat, coryza
  - Minimal conjunctivitis
  - Cervical lymhadenopathy
  - Non-specfic exanthems

- ***Rickettsial diseases:***
  - Fever, head ache
  - Chills, myalgia, arthralkgia
  - Hepatosplenomegaly

- Skin rash-red blanching macula's or maculopapular characteristically on ankle, wrists or lower leg.

- ***Infectious mononucleosis:***
  - Pharingitis
  - lymphadenopathy
  - Splenomegaly
  - Atypical lymphocytes
  - Rash –not typical for measles

2.10 Case Management

General Approach:

- Properly organized hygienic conditions for the patient
- Careful nursing care
- Protection from secondary infection
- Continuous feeding giving more fluids than usual
- Control fever
- Watching (actively anticipating for) complications.

*Measles cases are hospitalized when**:***

- They have severe and complicated measles.
- Unsatisfactory home condition or not possible to arrange proper Nursing care.

Treatment:

There is no specific anti viral therapy

Treatment is mainly symptomatic and supportive:

- Antipyretics (acetaminophen) for fever
- Bed rest
- Maintenance of an adequate fluid intake
- Keep the room comfortably warm.

- Protect patients from exposure to strong light
- Continue breast-feeding, if possible more often for several weeks.

Appropriate anti-microbial therapy for secondary bacterial infections like pneumonia, otitismedia & other infections.

- Vitamin A Prophylaxis:(to be given immediately)
  - Less than 6 months: 50,000 IU
  - 6 – 12 months: 100,000 IU
  - 12 months to 5 years: 200,000 IU given orally reduced morbidity and mortality (recent study showed) in malnourished African children with severe measles.

Therapy:

Children with ophthalmic evidence of vitamin A deficiency should be given additional doses the next day and 4 weeks later.

Measles pneumonia should be treated in compliance with the general rules adopted in pediatrics, i.e.,

- Proper antibiotics
- Oxygen therapy
- Intravenous infusions of glucose and electrolyte containing fluids, when deemed necessary
- Post measles malnutrition needs to be prevented or treated by aggressive frequent feeding of affected infants and children for several months until child regains lost weight.

2.11 Measles Prevention and Control

The patient may transmit the virus by the 9^{th}-10^{th} day after exposure & occasionally as early as 7^{th} day before the illness can be diagnosed.

Isolation precautions, especially in hospitals & other institutions should be maintained from the 7^{th} day after exposure until 5 days after the rash has appeared.

Measles immunization strategies in developing countries:

The expanded program on immunization (EPI) recommends immunization with a single dose of attenuated live measles vaccine at the age of 9 months in developing countries. Due to maternal antibodies, not more than 80-90% may get immunity at this age. In developed countries, measles vaccination is delayed to the age of 15 months or later in order to prevent interference from maternal antibodies.

Measles control is defined as decreasing measles mortality and morbidity to a level at which measles is no longer a major public health problem; that is, achieving reduction by 90% of morbidity and 95% mortality. Ethiopia with measles vaccination coverage of less than 60% and high mortality(CFR >4%),has adopted the measles control goals of reduction of morbidity & mortality through efforts to increase immunization coverage, especially in areas of poorest coverage, and to improve case management.(MOH, 1999).

Why “child is not vaccinated?”

Common reasons for immunization failure:

1. Lack of information on the part of the mothers.
    - 1.1. Unaware of need for immunization
    - 1.2 Place and/or time of immunization unknown
    - 1.3 Fear of reaction or side effects
    - 1.4 Wrong ideas about contraindications

2. Lack of motivation of either health personnel or families/communities:
    - 2.1. Postponed until another time
    - 2.2. No faith in immunization

3. Obstacles to immunization
    - 3.1. Place of immunization is too far
    - 3.2. Time of immunization is inconvenient
    - 3.3. Vaccinator absent

3.4. Vaccine not available

3.5. Mother too busy

3.6. Family problem including illness of mother

3.7. Child-ill not brought

3.8. Long waiting time

Possible causes of missed opportunities for immunization:

1. Workers do not know policy on expanded program on immunization (EPI)
2. Workers screen but tell patients to return later
3. While not immunizing the children brought by mothers, workers tend to immunize only pregnant women, e.g., with tetanus toxoid.
4. Workers will only open a vial if there are several patients needing it.
5. False contraindications

Strategies and Major Activities:

1. Increasing routine measles immunization coverage among infants less than one year:

- Raising and maintaining high coverage in high-risk areas, with emphasis on immunizing children as soon as possible after 9 months of age;
- Conducting regular and intensive information, education and communication (IEC)/Social Mobilization Campaigns to remind parents and community leaders of the importance of measles vaccine soon after 9 months of age;
- Measles immunization coverage should be monitored at Woreda level in order to identify low-coverage areas and devise appropriate strategies accordingly.

2. Supplement Immunization Activities:

- Conducting mass immunization is important to reach such high-risk areas. During mass immunization campaigns, a single dose of measles should be given, irrespective of the immunization and disease's history status, to all children in the target age group (at least to all those aged 9 to 59 months).

- Including children 5 years & above for supplemental mass vaccination programs based on the measles surveillance data & susceptibility profile.

3. Establishing Surveillance:

Cases of measles that meet the case definition should be reported as part of routine reporting of EPI target diseases. Cases by age, immunization status and by Woreda should be monitored. Deaths due to measles should be reported in the same way.

4. Proper Outbreak investigation and response

- Outbreak investigation by identification of cases by age, immunization status and other information to be collected and documented.
- Proper case management of measles cases.
- Prevention of nosocomial (acquired in health institutions) measles: Assessing the immunization status of all children coming to health facilities is important during measles outbreaks. All children without card-verified evidence of vaccination should receive a dose of measles vaccine upon admission. Where possible, patients with rash and fever should be isolated from other patients.

5. Proper case management of Measles

- Distribution of Vitamin A, twice a year, to children 6 months to 5 years of age, particularly in areas with Vitamin A deficiency (VAD).
- Integrated Management of Childhood Illness (IMCI) approach: This approach is found to be one of the most cost-effective interventions in child survival.

The treatment algorithms (including use of flow chart) by IMCI to measles cases complicated with Pneumonia, Diarrhea or VAD is applicable and thus is the recommended strategy in the National EPI Program.

Phases of Measles Control

There are four sequential phases for Measles immunization programs.

1. Measles Control Phase: The aim of this phase is to achieve high levels of coverage (> 80%) and reducing measles incidence and lengthening the intervals between outbreaks. Supplemental measles vaccinations will be conducted in the selected high-risk areas in order to improve the measles coverage. This phase has two steps. Mortality reduction and accelerated measles control activities.

2. Measles Outbreak Prevention Phase: Once measles has been drastically and persistently reduced through sustained immunization coverage, implementing of the second phase will commence. This phase is aiming at the prevention of periodic outbreaks. These strategies include:

- Improving surveillance in order to understand the changing epidemiology of the disease (changes in age distribution of cases, environmental setting for measles transmission, etc.) in order to identify population at higher risk.
- Predicting of outbreaks and preventing them by timely immunization of susceptible individuals in populations at higher risk.
- Increasing the levels of measles coverage in the population
- If an outbreak is anticipated, supplementary immunization activities may be considered.

3. Measles Elimination Phase: Maintain the number of the susceptible individuals in the population below the critical number that is required to sustain transmission of the virus at low leveles. This effort is to eliminate indigenous transmission of the virus.

4. Measles Eradication phase: It is a global effort of halting the transmission of the measles virus. Measles eradication phase is the sum of successful elimination efforts in all countries. It is the sum of successful elimination efforts in all regions.

In summary, to achieve the above-mentioned targets:

1. Immunize children in the first year of life.
2. Reduce missed opportunities, like
    2.1. False contraindications
    2.2. Incorrect screening
    2.3. Unavailability of vaccine
    2.4. Cancellation of schedule
    2.5 Inconvenient time
    2.6 Health workers should open a vial even for a single child/use of smaller dose vial as needed.

Immunization is one of the most powerful and cost-effective weapons of modern medicine.

Without immunization, an average of three out of every one hundred children will die from measles. Therefore, it is crucial to immunize children if they are found un immunized after the age of 9 months.

The main approaches for delivery of immunization services include:

Static: The health staff of the health units as part of the routine activities performs immunization.

Outreach: Immunization approach in which the staffs of the health units go out and administer vaccines at other sites in their catchment areas.

Mobile strategy: It is only implemented for single dose vaccination in settlement areas, farmers'/villages' producer cooperatives and used for controlling outbreaks (epidemics) of measles.

To improve immunization coverage, WHO/UNICEF recommended 5 specific areas for immediate actions:

- Provide immunization or information about immunization at every health contact.
- Reduce dropout rates.
- Increase the priority given to the control of measles.
- Improve immunization services to the poor in urban areas.
- Use special approaches such as national immunization days (NID).

UNIT THREE

SATELLITE MODULES

3.1 Health Officer Students

3.1.1 Purpose and use of this Module

This satellite module is designed to further identify and determine the specific roles of a Health Officer student. BY enhancing the acquisition of knowledge, attitudes and skills through an interactive and self-learning processes s/he can effectively and efficiently carry out interventions that can significantly reduce morbidity child and mortality due to measles in Ethiopia.

3.1.2 Direction for using this module:

Refer to core module

Before reading this satellite module, the reader is advised to go through the core module

3.1.3 Epidemiology

Besides what is stated in the Core Module under the Epidemiology Section, a Health Officer student has to know the following features of epidemic process: In the absence of rational control measures, particularly in areas of low immunization coverage, measles has a tendency to spread with great rapidity, directly depending on the percentage of susceptible persons in the community. It also depends on social factors like malnutrition, low socio-economic status, poor housing and over crowding. Until recently, the incidence of measles has been one of the highest among acute infections in children. It presents a particular danger to infants under one year old and small children between 1 and 2 years of age, among whom mortality is especially high. Small and large-scale outbreaks are common in Ethiopia.

Epidemics were reported from relief camps during the 1983-1985 famine and during

the civil war in 1990-91 in Ethiopia. Most cases were reported from Gondar, Tigray, Wollo, and Addis Ababa. In the 1982 community based study in Peasant Associations (PAs) of the Konso area in Gamu Gofa region during a measles epidemic, mortality rates between 7.1% and 20.9% were reported for children under 10 years of age (Cultural factors including avoidance of injections during measles epidemics and the interaction and close communication with relatives living in the other villages where children had died of measles, facilitated transmission). In three villages in rural Shewa, 5.8% were infected with measles during an outbreak. The average age of patients was 9 years and CFR 6.2%. None of the children affected had been previously immunized. Crowded living conditions and loss of maternal antibodies appear to be major factors in the measles epidemiology in Ethiopia.

A Prevalence study in Addis Ababa using ELISA testing in 286 unvaccinated children under one year of age showed a 75% rate of passively acquired maternal antibodies in the age group under six months. This rate dropped to 30% in age range 6-12 months. The antibody level declined markedly with increasing age in the latter group. The maternal antibody profile in this study indicates that Ethiopian children are unprotected by the time they reach 9 months of age. In another community survey in Debre Markos district in Gojam region the measles incidence was 7.5% in 280 unvaccinated children in contrast to 0.3% in those immunized.

Measles has a worldwide distribution. A single serotype measles virus causes it. Human beings are the only known natural host. It is a highly contagious disease affecting nearly 90% of susceptible household contacts. With effective childhood immunization programs such as in Europe or North America, measles cases have dropped markedly. However, it still remains a common health problem in areas with low immunization coverage, such as sub-Saharan Africa. Measles virus is transmitted primarily person to person via droplet spread or direct contact with nasal or throat secretions of an infected person. Patients are contagious from one to two days before the onset of symptoms till four days after the appearance of the rash. It peaks during prodromal period. The mean interval duration from infection to onset of symptoms and to appearance of rash is ten and fourteen days, respectively.

3.1.4 Pathogenesis

Measles virus enters through inhalation invades the respiratory epithelium and spreads via the bloodstream to the reticuloendothelial system, from which the virus infects all types of white blood cells thereby establishing infection of the skin, respiratory tract, and other organs. These infected sites are manifested by rash & classic symptoms of cough,conjunctivitis & coryza. Generalized damage to the respiratory tract with loss of cilia predisposes to secondary bacterial infection such as pneumonia and otitismedia. Immune reaction to virus in the endothelial cell of dermal capillaries plays a role in the development of Koplik's spot and skin rash. In measles encephalitis pathological changes include focal hemorrhage, congestion and perivascular demyelination. Direct invasion of T-lymphocytes may play a role in transient immunity depression.

3.1.5 Prevention and Control of Measles

Besides what is stated in the core module under prevention and control section, a Health Officer student should be able to understand and implement Improved management and potential solutions:

- Improve managerial skills on promotion of immunization coverage by organizing and administering in-service training and conducting supervision;
- Design innovative ways to Improve immunization coverage;
- Develop mechanisms to provide effective and efficient immunization services so as to minimize the problem of long waiting of clients in the health facility;
- Enable the health facilities to plan their catchments areas and target population, who are supposed to get the immunization service.
- Improve planning, organization, implementation, monitoring and evaluation processes concerning immunization program.
- Facilitate cold-chain maintenance and monitoring to ensure vaccine efficacy.
- Make requisition of vaccine based on the actual need of vaccines so as to ensure adequate availability and minimize vaccine wastage.

- Organize efforts not to miss the dates of appointments for immunization.
- Organize surveillance routinely to identify defaulters and other problems in immunization coverage for prompt action.

3.2 Public Health Nurse Students

3.2 Satellite module for Nurse Students

3.2.1 *Introduction*

Nurses have two-fold responsibilities in EPI targeted disease prevention. Primarily they promote child health by immunization, nutritional education and healthy baby clinics. Secondly they assist in disease identification, case management and referrals. In addition, Nurses have the duty and responsibility for EPI organization, planning, implementation and evaluation processes. Nurses are also responsible in conducting relevant research in order to improve the quality of services provided for measles patents and establish better preventive and control strategies. Therefore, in order to perform the above activities properly, basic knowledge and understanding of measles is what nurses are expected to and also imperative to equip them.

3.2.2 Purpose and use of this Module

This satellite module for Nurse students is prepared to enable them to acquire scientifically sound knowledge, develop acceptable attitudes and skills to provide preventive and supportive health services for the target population. It further helps them identify their actual role and responsibilities in relation to the other health center team members. Besides, the module is aimed to facilitate analytical educational processes critical thinking.

3.2.3 Direction for Use of the Satellite Module

- Do the pre-test in order to check your previous knowledge;
- Read the learning objectives;

- Go through the case management, prevention and control of measles;
- Do the post-test to check the gain after learning the satellite module and check your answers from Answer Keys in the Annex.

3.2.4 Pre-Test

Direction: Choose the letter of correct answer and encircle it.

1. Measles vaccine is administered via:
   a. Intradermally
   b. Intramuscularly
   c. Subcutaneously
   d. Intravenously
2. The appropriate dose of measles vaccine to be administered is:
   a. 0.01ml
   b. 0.05ml
   c. 0.5ml
   d. 0.1ml
4. Which one of the following types of nursing care is given for measles patient?
   a. Palliative
   b. Supportive
   c. Rehabilitative
   d. Terminal
4. Appropriate temperature for cold chain maintenance of the measles vaccine is 2-8 ^{0}C. This can be assured by monitoring the temperature of the refrigerator. How many times a day should the nurse check the thermometer?
   a. Four times
   b. Two times
   c. Three times
   e. Six times

5. The target group for measles vaccine is:
    a. All children below five years
    b. All children below one year
    c. All children
    d. All mothers between 15-49 years
6. Which one of the following could be the actual nursing diagnosis of patient with measles?
    a. Alteration in body temperature
    b. Alteration in fluid and electrolyte
    c. Lower respiratory tract infections
    d. A and B
    e. All

3.2.5 Learning Objectives

After going through the satellite module the student will be able to:

- Identify the target group for measles vaccine;
- Mention the appropriate site to administer the vaccine;
- Maintain cold chain by recording thermostat;
- Administer the appropriate dose of the measles vaccine;
- Provide nursing care for measles patients;
- Provide appropriate promotive and preventive services.
- Conduct relevant research that enables the prevention and control of the disease.

3.2.6 Case Management

The nursing management of the measles patient depends on the severity of the disease. Mild & moderate cases of measles can be handled at Health Center out patient department (OPD) level. In severe and complicated condition, the patient needs admission and appropriate nursing care:

The nursing management of measles as any other problems should utilize nursing process.

1. Assessment
    - History taking
        - History of present illness
        - Nutritional history
        - Developmental history
        - About immunization
        - Any information about measles epidemic particularly in under five children

    Physical examination
        - Pertinent physical examinations
        - Integumentary system
        - Respiratory system assessments
        - Nutritional and developmental assessment (growth, muscle size, arm circumference, head circumference)
        - Fluid and electrolyte status
        - Mental status
        - Vital signs
        - Community survey about the status of herd immunity and disease distribution
2. Nursing Diagnosis
        - Alteration in comfort due to pain
        - Fever
        - Fluid volume and electrolyte deficit less than body requirement
        - Alteration in nutrition
        - Alteration in coping mechanism, particularly in young mothers
        - Knowledge deficit about the disease process and its prevention and control
        - Community wordiness about the epidemic

3. Planning/Goal
    - Improve comfort
    - Reduce body temperature
    - Maintain fluid electrolyte balance
    - Improve knowledge status of the parents
    - Improve coping mechanism
    - Stabilize vital signs
4. Implementation

In most cases, the management is supportive:

- Providing antipyretics or controlling body temperature by cold compress/es;
- Maintenance of hydration by frequent p.o intake of ORS if tolerated.
- Monitoring vital signs especially body temperature;
- Protecting the patient from secondary infection by maintaining the cleanliness of the patient and his/her immediate environment;
- Administering of antibiotics as prescribed;
- Administering Vitamin A orally;
- Encouraging nutritional intake; if breast feeding, advising the mother to maintain it;
- Instructing Mother or Care taker Education about the cause, and case management, preventive aspects;
- Participating in the treatment of complications like pneumonia;
    - Administer intravenous glucose and other electrolyte containing fluids if ORT not tolerated or as prescribed.
    - Advice on importance of maintaining good diet until premeasles weight is regained.
    - Advise care takers to immediately bring back to health facilities if the child has:
        - Convulsions
        - Drowsiness
        - Rapid or difficult breathing
        - Chest in drawing
        - Refusal to drink or eat
        - Painful or dry eyes.

3.2.7. Prevention and Control of Measles

The nurse should actively be involved in measles prevention. Therefore, he/she shall do the following activities:

- Identify target groups for measles immunization. These are children below one year old, who constitute 4% of the total population. Therefore, all the children at 9 months of age are our target group;
- Organize EPI units in health institutions and community
- Set and maintain stock balance for EPI;
- Maintain the cold chain system at all times. The temperature of the refrigerator should be between 2^0- 8^0 C by recording it 2 times a day. Keep measles vaccine in the second compartment of the refrigerator.
- Preparation for measles immunization:
    - Prepare needles & syringes for vaccine administration;
    - Syringes needed are 5 ml or 10 ml for reconstitution of vaccine& 2 ml or 1ml syringes for injection.
    - Needles are 18 gauge for mixing and 30 mm of 22 gauge for injection;
- Type of vaccine
    - Measles vaccine is a live attenuated (weakened) virus.
- How to administer the measles vaccine:
    - Reconstitute one vial of dried measles vaccine with 5 ml of distilled water;
    - Position the baby exposing the left upper arm towards you;
    - Load the syringe with 0.5 ml of reconstituted vaccine;
    - Hold the child's arm and pinch up the skin;
    - Insert the needle 45^0 in the left upper arm subcutaneously and press the plunger with your thumb to inject the vaccine;
    - Withdraw the needle and discard in needle container.
    - Shield reconstituted vaccine from direct sunlight for fear of losing its potency.

NB: Give appropriate dose at appropriate site for appropriate child:

- Age of child 9 months
- Dose 0.5 ml
- Route Subcutaneously
- Site in the left upper arm
- Number of dose in most case, a single dose

NB: Vaccination against measles may be given for children as young as 6 months of age in cases of epidemic and famine (which is known to increase fatality following measles).

- Conduct home visits and do active surveillance;
- Mobilize communities and involve them;
- Work with the community health workers;
- Promote intersect oral action for measles vaccine immunization (examples: school teachers, agriculture extension workers);
- Maintain proper recording and reporting;
- Set communication with Woreda Offices, Zonal Health Department and/or Regional Health Bureau;
- Provide essential health education at schools, health institutes, home, and community settings;
- Promote an integrated child health care service.

Instruction to mothers:

- Tell the mother that the child may have a fever for 1-3 days or about a week after measles vaccine immunization and that some times there is mild measles rash.
- Reassure the mother that it is much milder and the rash goes away by itself.

3.2.8 Post-test:

Direction: Choose the letter of correct answer and encircle it.

1. Measles vaccine is administered via:
   a. Intradermally
   b. Intramuscularly

c. Subcutaneous Ely

d. Intravenously

2. The appropriate administered dose for measles vaccine is:

a. 0.01ml

b. 0.05ml

c. 0.5ml

d. 0.1ml

3 Which one of the following types of nursing care is given for measles patient?

a. Palliative

b. Supportive

c. Rehabilitative

d. Terminal

4 Appropriate temperature for cold chain maintenance of the measles vaccine is 2-8 ^{0}C. This can be assured by monitoring the temperature of the refrigerator. How many times a day should the nurse check the thermometer?

a. Four times

b. Two times

c. Three times

d. Six times

5. The target group for measles vaccine under normal circumstances includes:

a. All children below five years

b. All children below one year

c. All children

d. All mothers between 15-49 years

6. Which one of the following could be the actual nursing diagnosis of patient with measles?

a. Alteration in body temperature

b. Alteration in fluid and electrolyte

c. Lower respiratory tract infections

d. A and B e. All

3.3. Satellite Module for Environmental health Professionals

3.3.1. Introduction

Immunization of vulnerable segment of population is one means that greatly contributes towards prevention of infectious childhood diseases. Provision of such basic health service to people at risk of infection is the responsibility of all health professionals working at different levels. Each category of health professionals therefore, has some important role to play in order to prevent and control communicable diseases. Environmental Health professionals are expected to share the largest portion of disease prevention activities including immunization programs. This satellite module is thus prepared with the aim of emphasizing and presenting specific practical activities that the Environmental Health professionals should perform in the prevention and control of measles in Ethiopia.

3.3.2. Directions for using this Satellite Module:

1. Before studying this satellite module, make sure that you have completed the core module prepared for all health professionals.
2. Do the pre-test questions before proceeding to the satellite module.
3. Study the satellite module following the sequence in which the items are presented in the table of contents of this satellite module;
4. Refer to the core module sections when indicated or otherwise.
5. Do the post-test after completing the satellite module and check your answers from the answer keys in the appendix.

3.3.3. Pre-test:

Instruction: Four alternatives are given to the following multiple-choice questions. Choose the best answer and write the letter of your choices on a separate paper.

1. Which of the following can be source (s) of infection for measles?
    a. Naso-pharyngeal discharges of cases.
    b. Infected mother with measles during the last trimester
    c. Contaminated foods
    d. Freshly soiled (contaminated) fomites with faecal materials

2. Environmental factors associated with transmission of measles include:
    a. Season of the year
    b. Overcrowding
    c. Food
    d. Water

3. Which one of the following is not a mode of measles transmission?
    a. Droplet infection
    b. Droplet nuclei
    c. Direct contact with an infected person
    d. Consumption of water from unprotected sources

4. Basic measles preventive and control methods are:
    a. Isolation of cases
    b. Concurrent disinfect ion of soiled (contaminated) articles with naso-pharyngeal discharge.
    c. Immunisation (active or passive) of children.
    d. Effective vector control measures.

5. Which one of the following is/are a harmful practice/belief about measles illness?
    a. Discouraging the child from taking a shower or bath
    b. Never allow the opening of doors and windows of the room in which the case resides.
    c. Keep all children with the case so that they soon get sick and immunised.
    d. Never allow the case to take any fluid until recovery.

6. Which of the following is irrelevant to the success of Immunization programs?
    a. Involvement of the local community leaders
    b. Involvement of the local religious leaders
    c. Education of the community about benefit of immunization programs
    d. Forcing mothers reluctant to bring their children to immunization sites.

3.3.4. Learning Objectives

Up on the completion of the module, the students will be able to:

- Identify the role and responsibilities of Environmental Health Professionals in surveillance, prevention and control of measles;
- Plan and implement the preventive and control methods of measles through environmental health measures;
- Evaluate and monitor the environmental interventions.

3.3.5. Case Study

Baraso , a sanitarian at Yirgachaffe Health Center, was only two months since he was assigned. In one of his first visits to eating and drinking establishments in Yirgachafe town, he encountered a different problem.

On his way to W/ro Ayelech's Bar, he saw a girl running towards him in a desperate condition. This girl was Damenech, approximately 12 years of age and a fifth-grade pupil. She was weeping and crying for help when she met the sanitarian. "My brother a one year and a half, is almost on the verge of death; would you please visit him and see his condition?" was her request. She, further, told him that her parents were not willing to take him to the health center. "I tell you he will soon die similar to my niece at Chelba (I am from Chaffe) who died last month. The disease is the same. Please, let us go, "was her last plead. This time Baraso took it seriously and decided to go with her.

During their journey, she told him that the place is in Kebele 03; adjacent to the kebele they were in at that time. "Alas! They might have killed him by now;" was the next sentence she uttered.

She soon saw Baraso was confused and told him not to worry considering it a deliberate crime. "My parents decided to treat the already weak child with a local drug. My mother was away to call for the local herbalist, whose drug did not even cure my niece. They think that the illness that my brother has cannot be cured by "Hakim" I tried my best, but I could not convince them. I was running to the police, when my friend told me that you are one of the 'Hakims' in my health center."

Baraso wanted to ask certain questions, but they had arrived already at the place. The place was "Chesches" tera, one of the slummy areas in the above-mentioned kebele. The Sanitarian recognized that he had visited the area once and already discussed the poor housing conditions and improper disposal of both solid and human excreta prevailing in the same place. The area is also densely populated with many children.

Following Damenech, he went into an old, one-roomed house. Inside was dark and suffocating. After a while, he was able to see four persons – one female and three males, who later were found to be the father, the local herbalist, the mother and the child. They were forcing the child, who was lying on the floor with a small piece of rag under him. He immediately managed to stop the harmful practice and started observing the condition of the child.

He found out that the child was seriously sick with fever, runny nose, cough, conjunctivitis and a rash. When he was through with the child, the herbalist had run away. He then told the parents to calm down. He introduced himself and why he was there. He asked them about when the child got sick, where had he been taken, and who had visited the family recently. He also asked about the immunisation status of the child and the other children (if they are immunised at all).

The parents, even though were uncooperative for a while later told him that the child was sick for nine days, and prior to that his mother used to take him to Chelba on- and-off during her visits to his sick 3 year old niece, who by chance died last month. Furthermore, the father explained that since the child was sick during his early days of

life they did not try to get him immunized. Additionally, the Sanitarian observed that the house had no windows; the personal hygiene of the child as well as of the whole family was really poor.

Finally, the family was convinced to take the patient to the health center and they all went together.

Answer the following questions based on the Case Study:

1. What do you think was the disease the child contracted?
2. What were the possible sources of infection?
3. What social and environmental factors do you consider contributed to the development of the disease?
4. What possible control and preventive measures do you suggest to prevent the disease?
5. Which place(s) do you think should be under immediate surveillance for new cases of the disease?

3.3.6. Environmental factors contributing to causation of measles.

Like other communicable diseases, the incidence of measles is associated with environmental and social factors. Factors such as overcrowded dwellings, improper management of infectious naso-pharyngeal discharge, or articles soiled with them and poor personal hygiene are considered to enhance the transmission of measles. Thus, their role in the magnitude of the morbidity and mortality of measles should not be neglected. To this end, developing countries, like Ethiopia, have been experiencing epidemics of measles, with high mortality in slum urban settings and densely populated rural areas, where the mentioned factors dominate the living condition of the respective populations. In fact, the high child mortality rate, for which measles is one of the communicable diseases, indicates the low status of environmental health in the country.

3.3.7. Epidemiology

The epidemiological approach to measles follows the consideration of agent factors, host factors, and environmental factors. For the brief explanation of the first two, refer to the core module.

The third category, environmental factors contributing to measles infection, however, is explained as follows: Human beings are a reservoir of measles infection. Nasal and throat secretions from measles cases contain viruses and are therefore a major source of infection. The chance of transmission of the viral agents from these sources to healthy child population through the air droplets is very high in overcrowded communities.

Experience has shown that most of urban settings in Ethiopia are over-crowded. Single and unventilated dwelling units are usually shared among a number of family members in both urban and rural areas. Such conditions make the transmission of measles viruses worst in large segments of the Ethiopian population, particularly in case of measles epidemics. Measles in some parts of Ethiopia is an infection whose cases are believed to be kept in the closed residential environment for some time due to traditional beliefs (Ayne Tila). Its treatment is also rigidly governed by local beliefs and customs. The sick are deprived of good ventilation. Such social and environmental factors are major factors contributing to measles prevalence in Ethiopia.

3.3.8. Prevention and Control of Measles

1. Measles Prevention:

- *Immunization:* The role of a sanitarian in promoting immunization coverage is highly recognized: Facilitating the birth registration; mobilizing the population in the catchment's area for vaccination; training and supervising CHAs and Traditional Birth Attendants (TBAs); following after defaulters, and etc. For details, refer to the core module.

2. Measles control:

- *Ventilation:* Ventilation of the indoor air in which the measles case is found helps to remove or dilute the atmosphere, which has become stagnant. It reduces the chance of infection of contacts (other health people). Good ventilation should be attained both in the health facilities and homes where the measles patient may be admitted. The sanitarian should, therefore, check whether the admission room maintains a minimum of 28 m^3 air volume per person, and keeping the windows open to allow adequate air movement in the room;

- The Sanitarian should do regular, interval surveys on measles. S/he also designs area identification through mapping of the villages (Spot Mapping);
- *Concurrent disinfection:* It involves the immediate destruction of the measles viruses from all articles soiled with nasal and throat secretions of the sick person through out the course of his/her illness.
- Any of the following applicable disinfectants may be used:

- Physical disinfection:
- Burning
- Boiling
  - Steaming
  - Chemical disinfect ion:
- Lime
- Bleaching powder

3.3.9 Post-test:

Instruction: Four alternatives are given to the following questions. Choose the best answer and encircle the letter(s) of your choice.

1. Which of the following can be source (s) of infection of measles?
   a. Naso-pharyngeal discharge of cases
   b. An infected mother with measles during the last trimester
   c. Contaminated foods
   d. Freshly soiled fomites

2. Environmental factors associated with measles include:

a. Season b. Overcrowding

c. Food d. Water

3. Which one of the following is not the mode of measles transmission?

a. Droplet infection b. Droplet nuclei

c. Direct contact with an infected person

d. Consumption of water from unprotected sources

4. Basic measles preventive and control methods are:

a. Isolation of cases

b. Concurrent disinfect ion of soiled (contaminated) articles with nasopharyngeal discharge.

c. Immunization (active or passive).

d. Effective vector control measures.

5. Which one of the following is harmful custom/belief during measles illness?

a. Discouraging the case from taking shower or a bath

b. Never allowing the opening of doors and windows of the room in which the case resides.

c. Keeping all children with the case so that they soon get sick and immunized.

d. Never allowing the case to take any fluid until recovery.

3.4. Satellite Module for Medical Laboratory Technologists

3.4.1. Introduction

This module is designed with the purpose of equipping the Medical Laboratory technologists with the knowledge, attitudes and skills concerning laboratory diagnosis of measles by giving special attention to specimen types, their collection and transport.

3.4.2. Directions for using the Satellite Module

- Read the information in the core module
- Do the pre-test;
- Read thoroughly the information in the satellite module;
- Do the post-test;
- For pre- and post-test questions look answer keys in the appendix.

3.4.3 Pre-test Questions

Instruction: Encircle all the applicable answers

1. Which of the following can be a possible sample to diagnose measles virus?
   A. Stool
   B. Nasal secretions
   C. Cerebrospinal fluid (CSF)
   D. Conjunctival swab

2. Which of the following can be used to diagnose measles virus?
   A. Electron microscope
   B. Cell culture
   C. Serological tests
   D. Light microscope

3. During transportation of the specimen for the diagnosis of measles virus, the specimen must be:
   A. Refrigerated
   B. Put in protein media to stabilize virus infectivity
   C. Put in high glucose media
   D. Always keep at room temperature

4. A positive test result for specific IgG antibodies indicate:

   A. Past infection with measles virus
   B. Measles vaccination
   C. Ensures protection from measles infection
   D. Avoid possibility of re-infection by measles virus

3.4.4 Learning Objectives

Up on completion of this module, the Medical Laboratory Technologist will be able to:

- Mention the type of specimens for the diagnosis of measles;
- State transportation of specimens for the diagnosis of measles;
- Describe the diagnostic methods for the measles virus;
- Acquire basic knowledge about the lab diagnostic methods of measles virus

3.4.5 Collection and Storage of Specimen to Diagnose Measles Virus:

Even though the success of measles virus isolation from clinical specimens is low, the virus is best isolated:

◆ During the prodromal period, that means, as soon as possible after onset of rash but no later than 4 days afterwards, from nasopharyngeal , throat swab, and Conjunctiva specimens

- after collecting nasopharyngeal or throat swab using sterile swabs, the sample should be placed in a tube containing 2mL to 3 mL of VTM (viral transport medium: PBS or suitable isotonic solution such as Hank's BBS containing antibiotics [100 units/mL penicillin, 100mg/mL streptomycin] and, either 2% fetal bovine serum [FBS] or 0.5% gelatin).

- Keep all specimens under refrigeration (approximately 4^{o} C), and ship as soon as possible on wet ice to the laboratory for processing.

◆During the late illness;

- From urine samples;

Between 50 ml to 100 ml sterile urine samples, should be collected within 7

days after rash onset. Keep urine at 4^{o} C and Process within 48 hours at the latest; and

- From Stool samples;

◆ From Cerebrospinal fluid (CSF)

◆ From serum

-To extract serum, at least 3 ml of blood should be collected

- For IgM serology, a single blood specimen collected 3 to 28 days after rash onset is Usually satisfactory

- For IgG serology, the first (acute) sample should be obtained as soon as possible after the onset of the rash, and in any event no later than 7 days afterwards. The second (convalescent) sample should be collected 10 to 20 days after the first sample. These paired sera must be tested simultaneously.

Note: blood samples can also be collected and send to virology labs by using special filter paper (dry blood sample collection method)

❋ All the above specimens are collected according to the World Health Organization (WHO) standard procedures.

❋ The specimens are refrigerated (but not frozen) and are transported to virology laboratory as soon as possible.

❋ To send to the referral laboratories, the transportation media should contain proteins, which stabilize measles virus infectivity.

Specimen container should have the following labels:

- name of institution sending the specimen
- Patient name and number;
- Date and time of Sample collection ;
- Date of fever onset;
- Date of rash onset;
- Pathogen city;
- Type of test to be done;
- Type of transport media.

Note: Nasopharyngeal or throat swab or urine specimens should not be substituted for blood, which is required for serologic diagnosis.

Laboratory diagnostic methods for measles virus:

Measles virus can be diagnosed in the laboratory by:

- Isolation of the virus using human fetal kidney or other cell cultures and observing the specific cytopathic effects the virus causes, which is further confirmed by specific anti-sera, or PCR
- Electro microscopic examination of the virus directly from the clinical specimens;
- Serological tests**;**
- Histological examination **and** hybridization of ribonucleic acid (RNA).

Serological Tests for the Diagnosis of Measles Virus

Detecting measles virus specific antibody is more successful and easier than virus isolation from the clinical specimen.

-In acute, uncomplicated measles, a significant rise in measles-specific IgG antibodies between acute- and convalescent-phase serum specimens is generally considered diagnostic.

-A positive test result for specific IgG antibodies in a single serum specimen indicates past infection with measles virus or measles vaccination, but does not ensure protection from infection or re-infection.

-Detection of specific IgM antibodies in a single serum specimen collected with in the first few days of rash onset can provide a good presumptive diagnosis of current or recent measles virus infection.

-Therefore, Measles specific IgM serological test is the standard test of choice for routine diagnosis of measles.

-In the interpretation of serological tests, four-fold increase of specific anti-body titers in a serum taken 7-14 days interval is the basis for diagnosis.

A. General Principle of the test:

-Standardized measles antigen is commercially prepared to react with measles specific antibodies in serum.

-The reaction is made visible by different techniques, such as immune fluorescence techniques.

-Also ELISA and radioimmunoassay can demonstrate measles virus antigen from patient serum.

B. Procedures

The details of the testing procedure vary with the types of serological tests, but common to all is:

- Collecting venous blood
- Isolating the pure serum:
- Making serial dilutions of the serum with distilled water;
- Adding the measles antigen according to the manufacturer's instruction;
- Incubating according to the kit's instructions;
- Reporting the titer.

C. Result reporting

Report the highest dilution that gives a positive result, which is indicated by the manufacturer; usually a four-fold and above increase in titer between two samples (or paired), collected at interval of 7 to 14 days show a positive result.

D. Source of errors

- Using expired reagent kits;
- Wrong serial dilution;
- Improper incubation of specimen;

- Problems associated with identification of the different types of antigen-antibody reactions.
- A determining titer from a single specimen
- Patients with impaired immunity may show false negative results
- Patients with atypical measles may make only small amount of antibodies and show false negative results
- Improper sample collection

3.4.7 Post-test Questions

Instruction: Encircle all the applicable answers:

1. Which of the following can be a possible sample to diagnose measles virus?
   A. Stool
   B. Nasal secretions
   C. Cerebrospinal fluid (CSF)
   D. Conjunctival swab

2. Which of the following can be used to diagnose measles virus?
   A. Electron microscope
   B. Cell culture
   C. Serological tests
   D. Light microscope

3. During transportation of the specimen for the diagnosis of measles virus, the specimen must be:
   A. Refrigerated
   B. Put in protein media to stabilize virus infectivity
   C. Put in high glucose media
   D. Always keep at room temperature

4. A positive test result for specific IgG antibodies indicate:
    A. Electron microscope
    B. Past infection with measles virus
    C. Measles vaccination
    D. Ensures protection from measles infection
    E. Avoid possibility of re-infection by measles virus

3.5 Satellite Module for Community Health Workers

3.5.1 Introduction

Most health problems in developing countries, including Ethiopia are preventable, if effective and sound preventive measures are used. Some of these health problems are vaccine preventable. Measles is among these diseases. Community health workers are expected to mobilize the community to encourage measles Immunization of eligible children.

This module, therefore, will provide Community Health Workers with relevant and basic information on knowledge, skills, and attitudes. On how to prevent and control measles.

3.5.2 Pre-test Questions

Instruction: Encircle all the applicable answers

1. The causative agent for measles is:
   a. Germ
   b. Worms
   b. Water
   c. Evil spirit
2. The mode of transmission of measles is:
   a. By ingestion
   b. By inhalation/air droplet
   c. By contact
   d. Not known
3. Measles mostly affects:
   a. Children of all ages
   b. Children above 9 months
   c. All mothers and children
   d. No answer
4. Prevention of measles infection includes:
   a. Immunization
   b. Coffee ceremony
   c. Health education
   e. Treatment

3.5.3 Learning Objectives

Upon completion of this module, the community health workers will be able to:

- Define measles;
- Mention the causative agent;
- Describe distribution and determinants of measles;

- List common signs & symptoms of measles;
- Be familiar with the management of measles cases;
- Actively participate in preventive and control activities;

3.5.4 Definition

Measles is a highly infectious acute disease, which is caused by the measles virus (germ). It is characterized by fever, runny nose, cough, redness of eyes & rash.

3.5.5 Epidemiology

Measles predominantly attacks unimmunized children from age 9 months and above. Measles occurs in most parts of Ethiopia. The disease is spread from sick to healthy persons through air droplets from nose & throat. Measles virus is transmitted primarily person- to- person via droplet spread, direct contact with nasal or throat secretions of infected persons. Patients are contagious from one to two days before the onset of symptoms until four days after the appearance of the rash and it peaks during prodromal period. The mean interval duration from infection to the onset of symptoms and the appearance of rash are ten and fourteen days respectively.

Malnutrition and overcrowding in poorly ventilated environments are risk factors (conditions) that enhance measles infection.

3.5.6 Symptoms and Signs

- Fever
- Headache
- Runny nose
- Redness of the eye
- Rash (from head to neck and trunk)
- Cough
- Ear infection
- Skin infection

3.5.7 Management

- Good personal hygiene
- Treat fever with antipyretics (give paracetamol but not aspirin)
- Instruct about the administration of prescribed drugs:
- Nutritional support

3.5.8 Prevention & control

- Make a house-to-house survey
- Promote health education about the importance of measles Immunization
- Mobilize all eligible children for immunization
- Improve poor housing conditions:
  - Avoid overcrowding
  - Promote proper ventilation
- Promote nutritional status

3.5.9 Post-test Questions

Instruction: Encircle all the applicable answers

1. The causative agent for measles is
   a. Germ
   b. Worms
   b. Water
   c. Evil spirit
2. The mode of transmission of measles is
   a. By ingestion
   b. By inhalation/air droplet
   c. By contact
   d. Not known
3. Measles mostly affects
   a. Children of all ages
   b. Children above 9 months

c. All mothers and children

d. No answer

4. Prevention of measles infection includes

a. Immunization

b. Coffee ceremony

c. Health education

e. Treatment

3.6 Take Home Message for Caregiver

3.6.1 Definition

Caregiver means any person - woman or man, young or old- who acts as a first line person to provide service or care for the child who needs help.

3.6.2 Message for Caregiver:

Dear Caregiver, we would like to appreciate your participation and involvement in management and prevention aspect of measles. Always keep in your mind that the following points in measles:

- Measles is caused by germ called the measles virus
- Measles can be transmitted only from person to person
- Measles mostly affects children, particularly unimmunized children
- If a child has fever, rash and cough, bring him/her immediately to health facilities like health post, health center, or hospital
- Keep breastfeeding the child, give additional nutrition support
- Give additional fluids for the sick child
- Keep the child in a good personal hygienic condition
- Give special care and attention for the sick child
- Attend health institution's immunization programs

- Complete the immunization program, if you started
- Contact the local health agent or institution, if your child has any health problems
- Open windows and doors to ventilate the house
- Separately give care for sick child

UNIT FOUR

ABBREVIATIONS

CFR	-	Case Fatality Rate
CHA	**-**	Community Health Agent
CMI	-	Cell Mediated Immunity
ELISA	**-**	Enzyme Linked Immunosorbent Assay
EPI	-	Expanded Program on Immunization
G.C.	**-**	Gregorian Calendar
HCT	-	Health Center Team
HH	-	Household
IEC	-	Information, Education and Communication
IMCI	-	Integrated Management of Childhood Illness
IU	**-**	International Unit
MOH	-	Ministry of Health
MV	**-**	Measles Virus
PA	-	Peasant Association
RNA	-	Ribonucleic Acid
TBA	-	Trained Birth Attendant
UNICEF	**-**	United Nations Children Fund
USA	**-**	United States of America
VAD	-	Vitamin A Deficiency
WHA	-	World Health Assembly
WHO	-	World Health Organization

UNIT FIVE

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UNIT SIX

ANNEX

6.1 Answer Keys

6.1.1 Pre- and Post-tests for Core Module on Measles:

1. b
2. a, b, c, and d
3. a, b, c, and d
4. c
5. a, b, c and d
6. b
7. a, b, c and d
8. d
9. b, c and d
10. a, b, c and d

6.1.2 Pre- and Post-tests for Public Health Nurse Satellite Module:

1. c
2. c
3. b
4. b
5. b

6.1.3 Pre- and Post-tests for Environmental Health Satellite Module:

1. a, b and d
2. a and b
3. d
4. a, b and c
5. a, b, c and d

6.1.4 Pre- and Post-tests for Medical Lab Technology Satellite Module:

1. a, b, c and d
2. a, b and c
3. a and b

6.1.4 Pre- and Post-tests for Community Health Workers Satellite Module:

1. a
2. b
3. b
4. a

UNIT SEVEN

GLOSSARY

Autoimmune - a disorder of the body's defense mechanisms in which antibodies(auto antibodies) are produced against certain components or products of its own tissues, treating them as foreign material and attacking them.

Autoimmune disease - occurrence of a disease due to inappropriate reaction to self

Case- fatality rate- the proportion of personas with a particular condition (cases) who die from that condition.

Catarrhal - is the interval between the onsets of symptoms of infectious diseases to lthe appearance of characteristic manifestation of the disease.

Cold chain - a system of people and equipment that ensures the potency of a vaccine from the time of manufacture to the time it is given to a child or woman.

Encephalitis - inflammation of the brain

Eradication - termination of all transmission of infection by extermination of the infectious agent through surveillance and containment.

Immunization - Protection of susceptible individuals from connunicable disease by administration of a living modified agent, suspension of killed organisms or attenuated toxin.

Incidence rate - A measure of the frequency with which an event, such as new case of illness, occurs in a population over a period of time.

Koplik Spots - spots that occure in the mouth inside the cheek during early stages of measles.
They are small, irregular, bright red spots with a white spot in the center.

Acute laryngo tracheo bronchitis (croup syndrome) - a severe and almost

exclusively viral infection of the respiratory tract, especially of young children, in whom there may be a dangerous degree of obstruction either at the larynx or main air passages (bronchi) due to the thickness and stickiness of the fluid (exudates) produced by the inflamed tissues.

Missed opportunities - children and women who need immunization and visit the health institution, but who are not immunized by the health institution staff.

Morbidity - being diseased or suffering from a disease or condition

Mortality - death occurring as a result of a disease

Pathogen - an organism that causes disease

Pathognomonic - indicative or characteristic of a particular disease

Photophobia - an increased sensitivity to light

Prevalence - the total number or proportion of cases or events or conditions in a given population

Prodromal - The first symptom of an infectious disease and the development of a rash or fever

Sero conversion - a time when the host start to develop antibody to a given pathogen

Stridor - the noise heard on breathing in when the trachea or larynx is obstructed. It tend to be louder and harsher than wheeze

Sub clinical - describing a disease that is suspected but not sufficiently developed to produce definite signs and symptom in the patient

Surveillance - the ongoing systemic collection, collation, and analysis of data, and the dissemination of information to those who need to know sin order that action may be taken.