

MODULE

Rheumatic Fever and Rheumatic Heart Disease

For the Ethiopian Health Center Team



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UNIT ONE

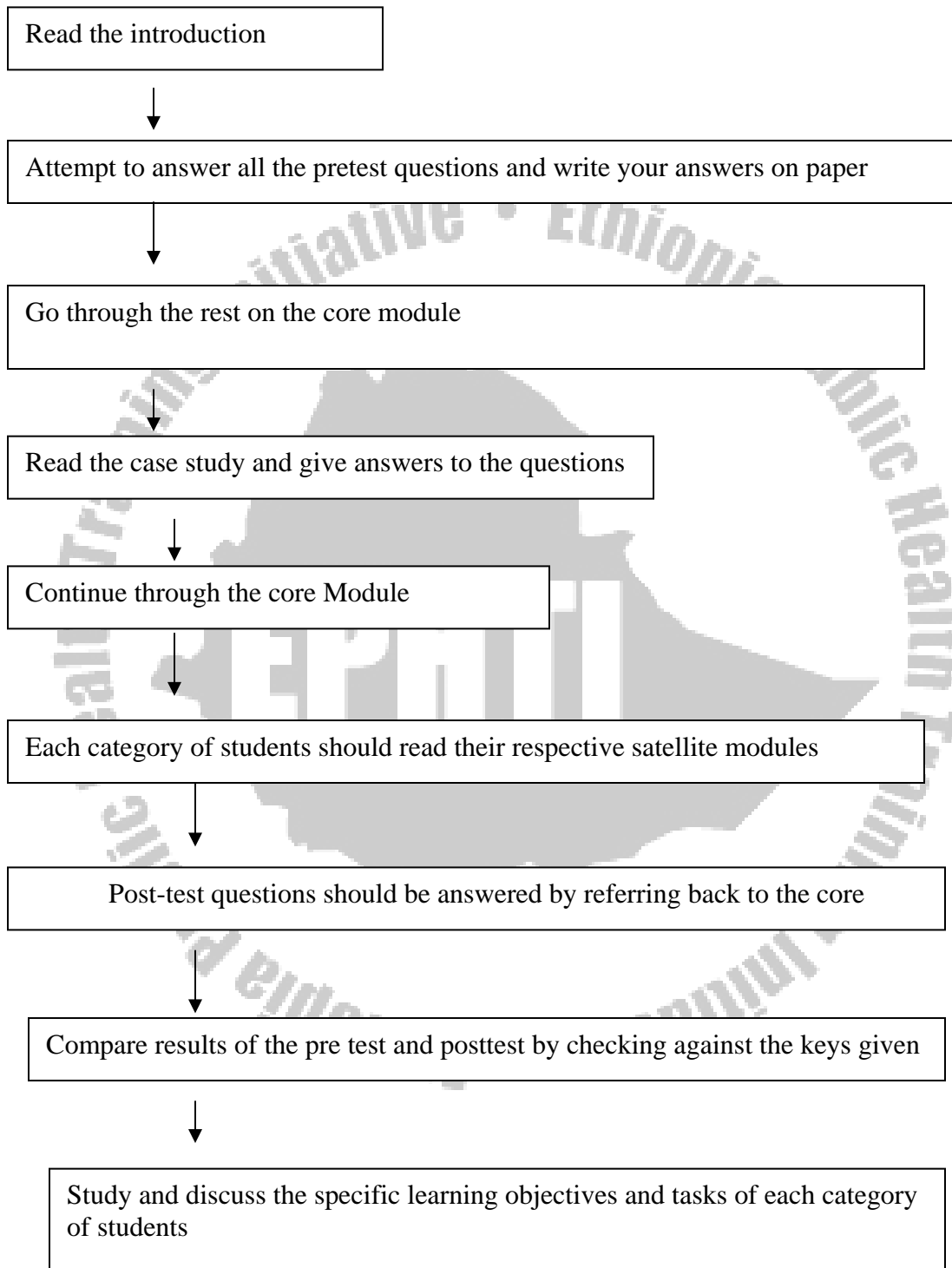
INTRODUCTION

1.1 PURPOSE AND USE OF THE MODULE

The scarcity of relevant teaching and learning materials in the higher training institutions of Ethiopia has been one of the bottlenecks in efficient task oriented and problem solving training. Preparation of teaching materials that will meet the fore mentioned mission is urgently needed.

Therefore this module will help the health center team comprised of health officers, public health nurses, laboratory technicians and sanitarians to correctly identify cases of rheumatic fever and rheumatic heart disease and manage them effectively as a team member. The core module reflects general activities for all categories of students and the satellite modules will emphasize the specific activities by each category of students.

1.2 DIRECTIONS FOR USING THE MODULE



UNIT TWO

CORE MODULE

2.1 PRE AND POST - TEST QUESTIONS

2.1.1 Pre and post- test Questions for all groups of the Ethiopia health center team

Answer both the short answer and multiple choice questions individually or in a group of 3-5 persons you make for the purpose in a separate blank sheet, you will find the key answers at the end pages of the module.

1. One of the following organisms causes tonsillopharyngitis, which may later complicate by acute rheumatic fever.
 - a) Staphylococcus aureus
 - b) Group A, B-hemolytic streptococcus
 - c) Group B streptococcus
 - d) Enterococcus
2. The commonest age group affected by acute rheumatic fever is
 - a) 2-4 years
 - b) 3-5 years
 - c) 5-15 years
 - d) Greater than 15 years of age
3. Which of the following strategies can help to prevent initial attack of ARF?
 - a) Avoiding overcrowding at home and school environment
 - b) Improved sanitation.
 - c) Early recognition and treatment of streptococcal throat infection
 - d) Over all rise in socio economic status
 - e) All

4. Identify circumstances that foster the transmission of streptococcal throat infection and/or development of ARF

- a) Overcrowding
- b) Low socio economic status
- c) Genetic predisposition
- d) Severity, frequency and duration of streptococcal throat infection
- e) All

5. Which of the following is not a component of primary prevention of ARF?

- a) Avoidance of contact with a person having colds and URTI
- b) Prevention of throat infection through facemask
- c) Early recognition and prompt treatment of streptococcal infection /sore throat/
- d) Improved standard of living and housing conditions
- e) Monthly benzathine penicillin injection

6. Which of the following is true about secondary prophylaxis of ARF?

- a) Should be given universally to patients with documented ARF or those with established RHD
- b) Is known to be able to prevent subsequent development of established RHD in those with rheumatic carditis
- c) Should be administered for life long for those with established RHD
- d) It is the most practical and feasible method of prevention of RHD in resource poor countries like Ethiopia
- e) All
- f) All except d

Short answer questions

Attempt all of the following questions first, go through the whole text and revise them again

1. List down some of the known risks that increase the susceptibility of an individual to ARF and hence RHD
2. Identify possibly modifiable risks and design interventional strategies that can be implemented by the health center team
3. What do you think is the ideal target for community intervention strategies and why?
4. What components should a health education on prevention of ARF or RHD include?

2.1.2 Pre and post test questions for health officer students

I. Choose the letter containing the correct answer. Key answers are found at the last pages of the module.

1. One of the following is true about acute rheumatic fever
 - a) Direct tissue damage by the bacteria is responsible for the development of acute rheumatic fever
 - b) Genetic predisposition is required for the development of acute rheumatic fever
 - c) It is common in females
 - d) Immune mediated damage is the most widely accepted theory for the pathogenesis of acute rheumatic fever
2. One of the following is not a clinical feature of acute rheumatic fever
 - a) Migratory arthritis
 - b) Carditis

- c) Sydenham's chorea
- d) None

3. Which one of the following laboratory investigation is used to diagnose acute rheumatic fever?

- a) ECG
- b) ASO titer
- c) CXR
- d) Throat culture
- e) There is no specific diagnostic laboratory test

4. Major organ/s affected by rheumatic fever with long-term sequel is

- a) Heart
- b) Joint
- c) Skin
- d) CNS
- e) All

5. The commonest valve involved in ARF and/or rheumatic heart disease

- a) Mitral valve
- b) Aortic valve
- c) Tricuspid valve
- d) pulmonary valve

6. Which of the following are used for prophylaxis of bacterial endocarditis in a patient with mitral regurgitation that is going to have dental extraction?

- a) Ampicillin/Amoxicillin
- b) Gentamycin
- c) Vancomycin
- d) All

7. Which of the following drugs prolong life expectancy in a patient with congestive heart failure?

- a) Furosemide
- b) Hydrochlorothiazide
- c) ACE inhibitors
- d) Digoxin
- e) All

II. Answer the following five questions based on the following patients' condition

8. A 14 years old male patient from wenago presented with fever, fatigue, joint pain and palpitation of one week. Physical exam showed flat JVP, tachycardia and soft, grade 2/6 ejection systolic murmur at the base of the heart. Which one of the following is correct?

- a) The patient has carditis
- b) He has Jones major criteria
- c) If ESR is 100mm in the 1st hour, ARF could be diagnosed
- d) Blood film to exclude malaria is not indicated
- e) None

9. A 12 years old female from anferara developed painful right knee joint swelling which after 4 days started to resolve and spread to involve the left ankle joint. She also had fever, fatigue and dyspnea. Physical exam showed: BP 100/80mmHg, PR 112bpm, T 38.3C axillary and RR of 26/min. has bibasilar crepitation, grade 3/6 holosystolic murmur at the apex. Which one of the following is required for the diagnosis of ARF?

- a) ECG
- b) CXR
- c) ASO titer of above 300
- d) History of arthralgia
- e) ESR

10. The management of this patient includes all of the following except

- a) Admit with bed rest
- b) Anti-inflammatory drugs
- c) Antibiotic prophylaxis
- d) Diuretics and digoxin
- e) None

11. The patient became well after 3 weeks of treatment and on discharge she did not have symptoms of congestive heart failure. Physical exam was remarkable for grade 1 systolic murmur. Which one of the following is incorrect?

- a) Monthly benzathine penicillin is not needed
- b) The Lasix and digoxin should be discontinued on follow up
- c) The risk of recurrence of acute rheumatic fever is 10 -100 times more compared to those without previous acute rheumatic fever
- d) Follow up visit every six months is needed
- e) None

12. A year later she developed painful swelling around carious tooth, which needed extraction. Her course was good without significant symptom. What will be your advice?

- a) She can go a head with tooth extraction
- b) She needs preoperative antibiotic prophylaxis
- c) She needs postoperative antibiotic prophylaxis
- d) She needs both pre and post tooth extraction antibiotic prophylaxis
- e) For those who were on regular monthly penicillin injection, there is no need for prophylactic antibiotics

2.1.3. Pretest/post test Questions for public health nurses

Instruction: Read carefully and attempt to answer the following questions

1. The nursing intervention for a patient with rheumatic heart disease include all *except*:

- a) Check vital signs frequently
- b) Maintain proper records
- c) Administer drugs properly
- d) Give individual and family health education
- e) all except c

2. During home visiting to a patient with rheumatic heart disease, the nurse assessment includes.
- Ventilation
 - Any febrile illness in the family
 - Compliance to secondary prophylaxis
 - Educational status of the family
 - All of the above
3. In the planning stage of nursing process, the nurse's accomplishment includes
- Setting priority
 - Identify appropriate nursing measure
 - Setting objectives and goals
 - Establish strategies
 - All of the above
4. During home visiting to control rheumatic fever, health education is given on: -
- Early medical help for sore throat infection
 - The importance of using medication regularly and risks of drug discontinuation
 - The importance of sanitation and proper ventilation
 - All
5. The three priority nursing diagnoses for a patient with rheumatic heart disease include:
- Pain, hypothermia, anxiety
 - Decrease cardiac out put, knowledge deficit, potential for injury
 - Fluid volume deficit, dyspnea, under nutrition
 - None of the above

6. While caring for a patient with rheumatic heart disease the role of the nurse includes:

- a) Provision of medications
- b) Evaluating the patient's progress
- c) Reporting unusual conditions
- d) All of the above

7. Which one of the following are ways of checking the patients understanding about a prescribed antibiotic?

- a) Asking to repeat instructions
- b) Asking to demonstrate what the patient observed
- c) Asking about the patient's plan to stick to the dosing schedule
- d) All of the above

8. Culture and belief have no influence on the control of rheumatic fever & rheumatic heart disease

- a) True
- b) False

9. Nursing care of a patient with rheumatic heart disease focuses on _____

- a) Identification of patient's problem
- b) Follow up and health education
- c) Symptom management
- d) b & c
- e) All of the above

10. The first line approach in preventing the initial attack of rheumatic fever is

- a) Recognizing streptococcal infections
- b) Treating streptococcal infection adequately
- c) Controlling epidemics in the community
- d) All of the above

2.1.4 Pre and posttests for the medical laboratory students

Instruction: Read carefully and attempt to answer the following questions

1. Which of the following is/are false about streptolysin O (SLO)?
 - a) It is oxygen-stable
 - b) It is antigenic
 - c) It is hemolytically active in its reduced state
 - d) Its biologic activity is completely inhibited by low concentrations (1.0µg/ml) of cholesterol & certain related sterols

2. Which is true about Todd Units?
 - a) The unit for ASO dilution
 - b) The unit used to express ASO titer
 - c) It is expressed as dilution of serum
 - d) It is expressed as the reciprocal of ASO titer

3. A useful test for diagnoses of rheumatic fever in the laboratory is:
 - a) The anti-DNAaseB B test
 - b) The Streptozyme test
 - c) Throat Culture
 - d) Test for ASO antibody

4. Which of the following is/are false about C-reactive proteins (CRP's)?
 - a) They are found in sera of patients in the acute phase of various infections.
 - b) An increased CRP is correlated with decreased ESR
 - c) It is used to evaluate a disease condition & response to treatment
 - d) The amount of increased C-reactive protein implies non-specific disease or the presence of inflammation.

5. Which of the following is/are true about the throat culture?
- a) The routinely used media to inoculate the throat swab is a plate of blood agar.
 - b) Silica gel can be used as a transport media for a throat swab to and from the health center.
 - c) *S. pyogenes* is sensitive to bacitracin (0.05 units).
 - d) All of the above
6. Name the four technical factors affecting the performance of the erythrocyte sedimentation rate (ESR).

2.1.5 Pre and post tests for the environmental health students

Instruction: Read carefully and attempt to answer the following questions

1. Which of the following can be considered a way of preventing rheumatic heart disease: -
- a) Adequate ventilation
 - b) Adequate treatment of all upper respiratory infections
 - c) Strengthened school health education
 - d) Avoidance of crowding
 - e) All
2. Where are the areas that we have to take into account for prevention of rheumatic heart disease?
- a) _____
 - b) _____
 - c) _____

3. What are the major areas of health education topics to the community for prevention of rheumatic heart disease?

- a) _____
- b) _____
- c) _____
- d) _____
- e) _____
- f) _____

4. The following are used in the prevention of rheumatic heart disease except one: -

- a) Pasteurization of milk
- b) Excluding people with skin lesions from food handling
- c) Avoidance of exposure to bad weather
- d) Education of the public about modes of transmission and treatment of the diseases.
- e) None

5. Clearing of purulent discharges and all articles soiled with the causative agent for rheumatic heart disease is used as a control of the disease (T/F)

2.2 Significance and brief description of rheumatic heart disease

Although a dramatic decline in the incidence, severity and mortality of acute rheumatic fever and hence rheumatic heart disease has occurred in developed nations since the turn of the 20th century, it's still a major public health problem for most developing countries. According to WHO's report, in 1999 cardiovascular diseases contributed to a third of global deaths of which 78% occurred in low and middle-income countries. Estimates suggest 10 to 20 million new cases per year occur in those developing countries in which 2/3rd of the world's population lives and where it claims the life of more than 400,000 people per annum. Generally rheumatic fever accounts for 1/3rd of cardiovascular diseases in those countries.

The most plausible explanations for this geographic discrepancy of disease pattern are poor socio-economic status; associated over crowding, sub standard housing condition, ineffective case finding and inadequate management of initial bacterial pharyngitis.

In Ethiopia rheumatic heart disease is an important cause of mortality and morbidity. Analysis of medical admissions to different hospitals showed cardiovascular diseases to be responsible for up to 35% all admission of which rheumatic heart disease was the leading cause. Studies done in our country estimated the prevalence of rheumatic heart disease to be in the range of 4 - 6 /1000 school children (Butajira and A/Ababa studies respectively). This is considerably high compared to figures from developed nations (1/100,000)

This shows that our country, still having a very high burden of infectious diseases, is experiencing a double disease burden. Hence appropriate diagnosis, treatment and public health interventions are very important to control the disease. This can be effectively implemented by training the health center team

as they operate mainly within the community and have access to the public at large.

2.3 Learning Objectives for the core module

After completion of this core module the learner is expected to acquire the appropriate knowledge, attitudes and skills for the management and prevention of rheumatic fever and rheumatic heart disease.

1. Define rheumatic heart disease and rheumatic fever
2. Describe the global and local epidemiology of rheumatic heart disease and rheumatic fever.
3. Describe pathogenesis of rheumatic heart disease and rheumatic fever
4. Know about the clinical manifestations and diagnostic approaches of rheumatic heart disease and rheumatic fever
5. Outline the principles of management of patient with rheumatic heart disease and rheumatic fever
6. Explain methods of prevention of rheumatic heart disease and rheumatic fever

2.4 Case Study

Ato Shalemo is a middle-aged farmer living in a small village called Anferara, which is 60 kms from Yirgalem. He is the family head and has five children. The family's income is from subsistence farming and the children look after the goats and sheep. All the family members live in small hut with their cattle, which also serves as a kitchen.

Bisrat, who is 14 years old and the second child of the family, likes playing with her friends. She helps her family by looking after goats and sheep. She was very cheerful and vibrant in the family except occasional attack of sore throat, which disappears by itself after some time. Her families have never been worried about it as it was self limiting and benign in their belief. Years back she once had the usual sore throat, which was un attended. Two weeks later she developed sudden onset of fever, joint pain, on and off joint swelling along with chest pain and easy fatigability. Ato Shalemo thought that this could be malaria and brought her some tablets from near by drug vendor but it was for no avail. Her father then consulted a respected traditional healer who gave him un-identified root and said 'it will vanish after she take this'. Bisrat showed some improvement after a while, but since then, she was never healthy and cheerful as she used to be. She repeatedly complained of difficulty of swallowing, fever and headache. However no body in the family took those problems seriously. Her families thought this is just the usual child hood stuff and after all "no child has ever grown with out having cold". She started to have easy fatigability, could not play and run with friends and could not even carry out her routine activities. At that moment, her father also noticed progressive worsening of Bisrat's condition. The child started to have cough and difficulty of breathing especially when lying down and also developed swelling of both legs

Ato Shalemo thought the 'Devil' has possessed his child and took her to holy water. But Bisrat could not get any improvement, rather her symptoms got

worsened. She developed generalized body swelling and turned bed ridden. Her father then took her to nearby clinic from where she was referred to Yirgalem Hospital. There she was admitted, investigated and managed accordingly. When she began to show improvement, she was discharged with advice to come every month to collect medications and get injections. The family especially, the father, was told about the necessary precautions including the need to take the medications regularly. They were also told about the nature of the disease and the need to bring the child urgently to health institution if she got sick again.

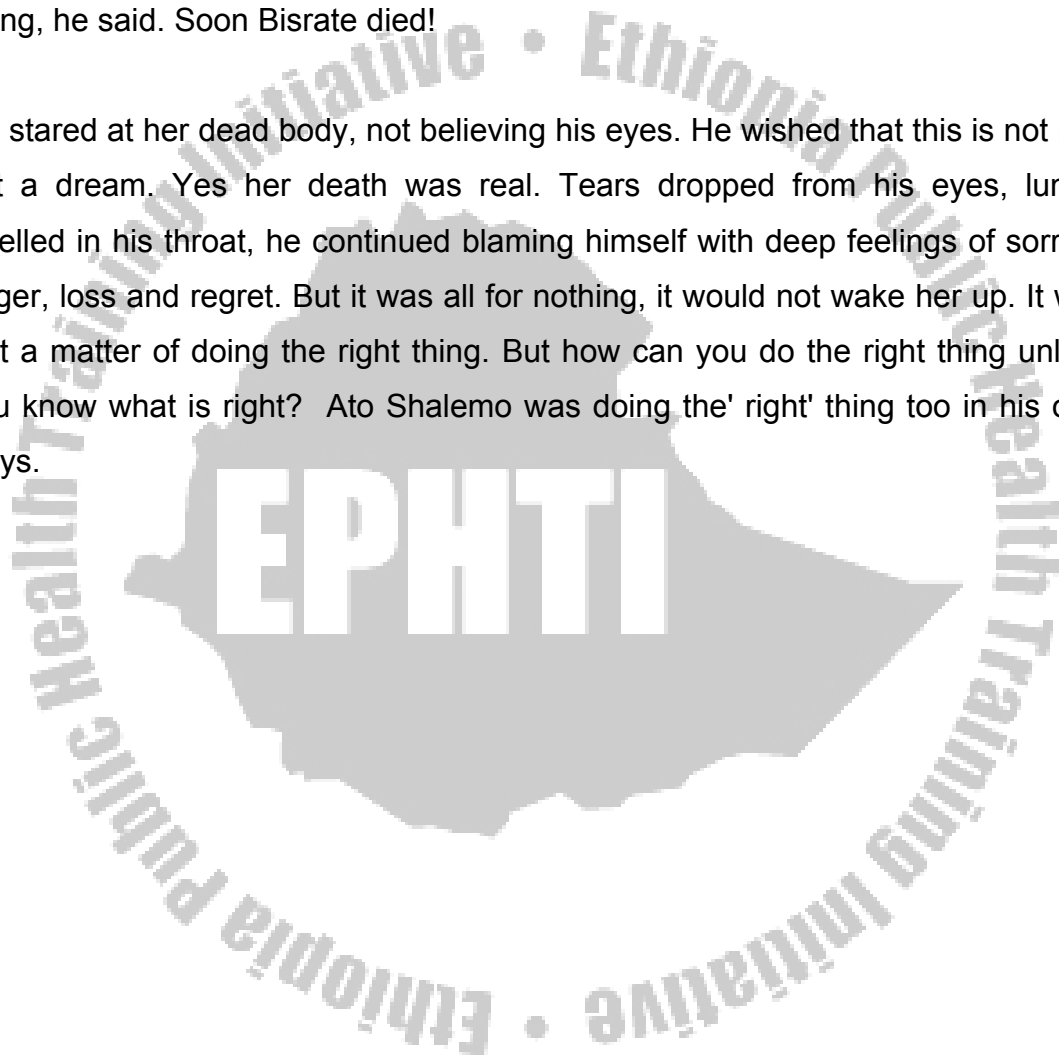
In the following years, Bisrat at times used to experience recurrence of the symptoms she had previously, especially when she stopped taking medications as her father became engaged with his farming duties and failed to collect the medications from the health institution. Even sometimes he deliberately avoided giving her medication with the belief that 'her body might get used to the drugs'.

One day Bisrat got a toothache and a local 'wegesha' made extraction. In two to three weeks time she again began sick and started to experience the previous symptoms. She also developed fever, palpitation and reddish discoloration of urine. Her father, who has now become desperate, discussed the situation with the neighbors and elder men in the vicinity. Finally they concluded that her condition is definitely related to "Buda". They became firmly convinced that her whole condition is not due to the disease, about which the doctor had once told them (as the medications she had been taking failed to cure her), it is, they said, "Buda" which really caused her problem, because she has once been beautiful and charming as a child!

Her father then took her to a re-knowned local healer who lives in a village far from Anferara. The poor farmer sold every thing he had so that he could give a huge some payment for the healer. The healer did so many rituals, gave her several herbs but it was for no avail. At last, he advised her family to take her to health institution. By then she was gravely ill, none communicating and part of

her body limply. Her families became desperate by her condition and disappointed by their acts. Ato Shalemo remembered the doctor's word one by one. He said" I should have listened to him; I should have done what I was told to". But it was too late then. On their way back home carrying Bisrat on a stretcher; Ato Shalemo felt a jerky movement in his shoulder. He looked at his daughter, who was turning cold, gasping and frothing from her mouth. Oh! She is dying, he said. Soon Bistrate died!

He stared at her dead body, not believing his eyes. He wished that this is not real but a dream. Yes her death was real. Tears dropped from his eyes, lumps swelled in his throat, he continued blaming himself with deep feelings of sorrow, anger, loss and regret. But it was all for nothing, it would not wake her up. It was just a matter of doing the right thing. But how can you do the right thing unless you know what is right? Ato Shalemo was doing the 'right' thing too in his own ways.



Learning activity: After you read the case study try the following questions and then go through the core module and try them again

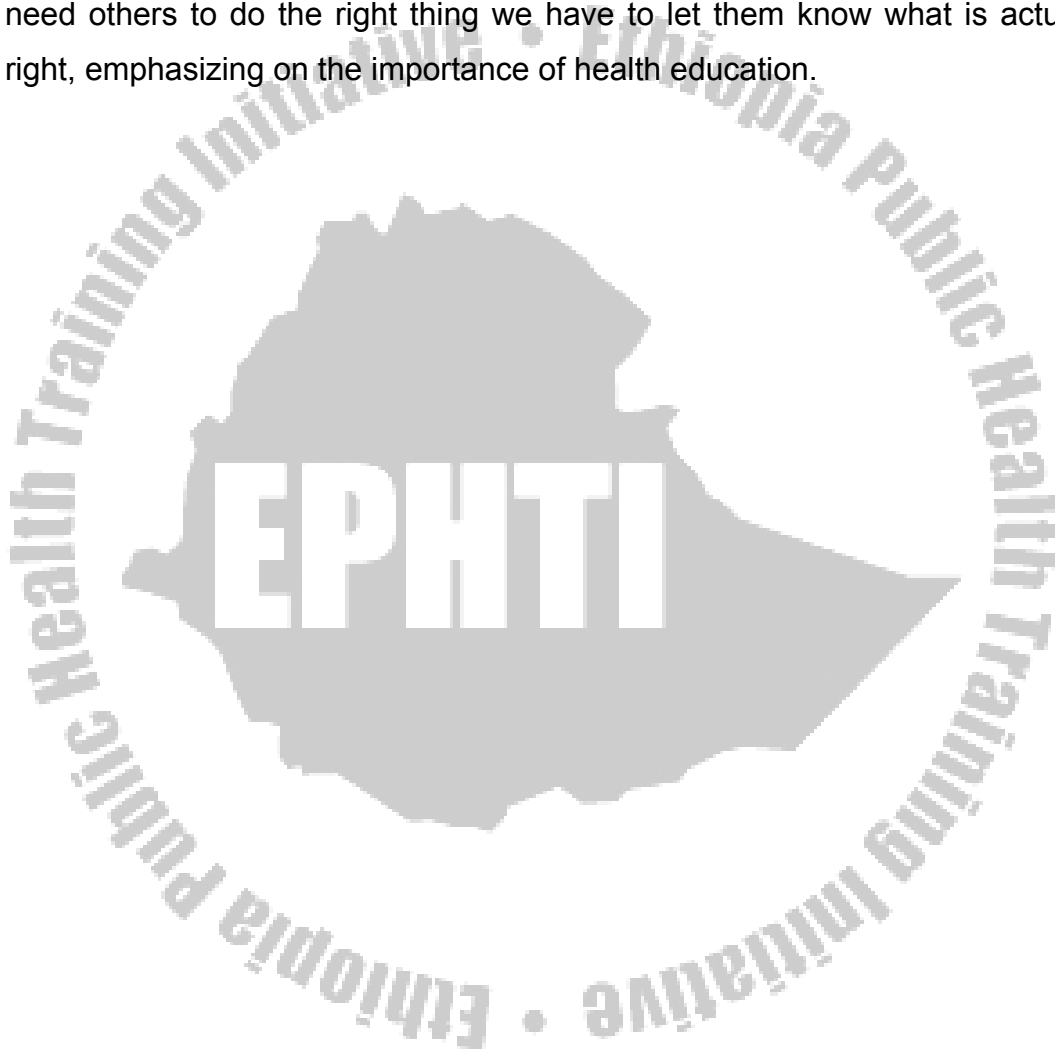
1. What risk factors for acute rheumatic fever have you identified from this case study?
2. What factor(s) helped for the progression of Bisrate's condition?
3. Which complications of RF/RHD are demonstrated in the case study?
4. What was the antecedent event that predisposed Bisrate to develop bacterial endocarditis?
5. What misperceptions/wrong acts that can potentially be targeted by health education are illustrated in the case study?
6. If you were the one who faced Bisrate, explain how you would proceed in managing her at each step.
7. Finally, what do you think the author wanted to emphasize on the last paragraph of the case study?

Answers

1.
 - Her age being in the highly affected range
 - Poor socioeconomic status
 - Crowded housing condition, and
 - Recurrent and untreated sore throat infection
2. Frequent recurrence of sore throat and possibly rheumatic fever and lack of secondary prophylaxis.
3. Congestive heart failure, SBE, arterial embolization and death
4. Dental extraction by a local 'wegesha' with out an aseptic technique and prophylactic antibiotics
5. Go through the whole text focusing on the management part
6.
 - Considering throat infection as benign event
 - Opting for traditional medicine over modern medicine
 - Attributing somatic illness to 'Devil's possession'

- Considering RF/RHD as curable illness
- Failure to have trust in health professional's opinion or advice
- Drug withdrawal thinking the body could adapt to it

8. It's to emphasize that the way people act and respond to a particular problem is mainly dictated by their understanding and level of awareness. So if we need others to do the right thing we have to let them know what is actually right, emphasizing on the importance of health education.



2.5 Rheumatic heart disease

2.5.1 Definition

2.5.1.1 Rheumatic fever:

It is a non-suppurative sequela of Group A, β -hemolytic streptococcal (GABHS) throat infection. The disease involves the joint (hence the word “rheumatic”), heart, skin, subcutaneous tissue and the brain. It is considered as acute when the illness lasts for less than 6 months or chronic, if it is greater than 6 months in duration.

2.5.5.2 Rheumatic Heart Disease

Rheumatic heart disease is the major long-term sequel of acute rheumatic fever, which involves the cardiac valves leading to stenosis or regurgitation with resultant hemodynamic disturbance.

2.5.2 Epidemiology

Rheumatic fever is a major cause of acquired heart disease in children world wide, with the disease occurring most frequently in underdeveloped countries where access to medical care is limited and children live in poverty and unsanitary crowded conditions. For instance, while the incidence of rheumatic fever in developed countries is in the range of 0.2 to 0.5 per 1000 but that for developing countries is variable from place to place reaching as high as 20 per 1000 children living in Johannesburg, South Africa.

In Ethiopia heart disease is said to account for nearly 35% of admissions to various hospitals of which rheumatic heart disease is the leading cause. Studies in school children estimated the prevalence of RF/RHD to be in the range of 4.6 to 6.4 per 1000 children. Surprisingly enough, not more than 15% of parents of these children know their children had some form of heart disease related with

infection and only 22% were on regular prophylaxis showing low knowledge and level of awareness about the disease. This demands urgent control program that enables active case detection, access to treatment and health education.

The epidemiology of rheumatic fever is identical to that of group A streptococcal upper respiratory tract infection. It is most common in children aged between 5-15 years, which also correlates with peak incidence of streptococcal throat infection. This streptococcal pharyngitis is transmitted through droplet spread and the attack rate of acute rheumatic fever following untreated sporadic and endemic group A streptococcal pharyngitis is 0.3% and 3% respectively. Out of which a good number of them (40-60%) develop rheumatic heart disease.

2.5.3 Risk Factors

1. **Age and sex:** - females and children between 5-15 years of age are affected more commonly. First attack of acute rheumatic fever is rare in children < 3 years and adults older than 40 years.
2. **Housing and socioeconomic status:** - Rheumatic fever is common in areas of high poverty, poor living conditions and poor nutrition, among others. Over crowded and unsanitary living conditions, especially during the rainy seasons in tropics and sub tropics foster transmission of streptococcal infection and hence the development of rheumatic fever.
3. **Season:** - streptococcal throat infection and hence rheumatic fever occur commonly during the rainy season.
4. **Genetic predisposition:** - Rheumatic fever tends to cluster in families. This may be due to contagious nature of throat infection as well as genetic predisposition.

2.5.4 Etiology and pathogenesis

2.5.4.1 Etiology of ARF

Rheumatic fever is caused by certain strains of Group A, β -hemolytic streptococcal throat infection. Rheumatic heart disease is sequelae of rheumatic fever involving the heart. Rheumatic fever doesn't follow GABHS skin infection.

2.5.4.2 Pathogenesis of ARF

The exact mechanism streptococcal throat infection result in rheumatic fever is not known. There is neither direct invasion nor toxin-mediated damage to the tissues involved.

The most popularly accepted theory is immune mediated damage, where antibodies produced against streptococcal antigen cross reacts with host tissue (like cardiac muscles, synovial and brain tissues, among others) .The m-protein is an antigenically variable cell wall component in some of these bacteria. There are more than 80 subtypes but m-subtypes 1,3,5,6 and 18 are most often associated with acute rheumatic fever.

2.5. 5 Clinical Manifestation of ARF

Patients usually present with an acute febrile like illness 2 - 3 weeks after streptococcal throat infection.

Usual Symptoms could be

- Non specific – fever, joint pain, loss of appetite, muscle ache
- Specific-- the presentation of which varies on the specific organ affected

Features of specific tissue organ involvement

1) **Joint**— commonly affected site, present with

- Swelling and pain of larger joints like knee, ankle, elbow and wrist occurring in rapid succession (hence the term 'migratory

arthritis'). Rarely affects fingers, toes or spine. It doesn't result in joint destruction

2) **Heart** – it causes inflammation of the whole layers of the heart (pancarditis)

- This is the most important site, which may result in long-term sequel. May present with palpitation, chest pain, shortness of breathe, leg swelling etc.

3) **Skin and subcutaneous tissues**

- Patients may have non-itching macular rash and painless, mobile nodules often over the joints and spines.

4) **Central Nerves System** – It's usually a late manifestation

- Patients may present with abnormal movements of the limbs with muscle weakness and emotional lability.

2.5.6 Diagnostic Approach

No specific diagnostic tests are available

⇒ It's mainly achieved using clinical criteria with supportive laboratory investigations which may not be found in all health care facilities

- Lab evidence for throat infection
 - Throat culture
 - Serology for streptococcal antigens and antibody
- Non specific evidence of inflammation
 - ESR ↑
 - CRP ↑
 - WBC ↑

NB: A typical clinical manifestation coupled with specific evidence of streptococcal throat infection is used for diagnosis.

2.6 Principles of Management

There are three major goals in the treatment of rheumatic fever

1. Symptomatic relief of acute disease manifestations
2. Eradication of streptococcal infection
3. Prophylaxis against future infection to prevent recurrence of rheumatic fever

2.6.1 Symptomatic relief of acute disease manifestations

- Bed rest
- Giving anti inflammatory drugs (e.g. Salicylates)
- Most commonly aspirin is given which controls both the fever and the Inflammation
- In those with severe carditis who are in congestive heart failure, steroids (commonly prednisone) are indicated together with conventional therapy for heart failure.

2.6.2. Eradication of throat infection

Antibiotic therapy with penicillin (erythromycin or sulfadiazine for penicillin allergic patients) should be started regardless of the presence/absence of pharyngitis at the time of diagnosis.

2.6.3. Prophylaxis against future infection

Patients with prior attack of rheumatic fever are more likely to develop recurrence (may reach up to 50%) during future episodes of throat infection emphasizing the importance of recurrence in disease progression. Hence, once rheumatic fever or rheumatic heart disease is diagnosed, future streptococcal infection should be universally prevented if disease progression is to be aborted. This can be

achieved by monthly intramuscular benzathine penicillin injection or daily erythromycin or sulfadiazine in case of penicillin allergy.

2.7 Prevention of rheumatic fever and rheumatic heart disease

Rheumatic fever is quite a preventable disease. The following are important ways to prevent acute rheumatic fever and rheumatic heart disease.

The most important determinant of acute rheumatic fever is socioeconomic rather than medical. Crowding is by far the most important risk factor. One has to improve crowding both at household and school level to reduce the incidence of the disease. This is obviously achieved over a long period at the national level through improved economy.

Other more important and practical measures include:

Primary prevention

- Improved environmental and personal hygiene
- Avoidance of contact with individuals having streptococcal throat infection
- Early recognition and treatment of streptococcal upper respiratory tract infection.

Secondary prevention

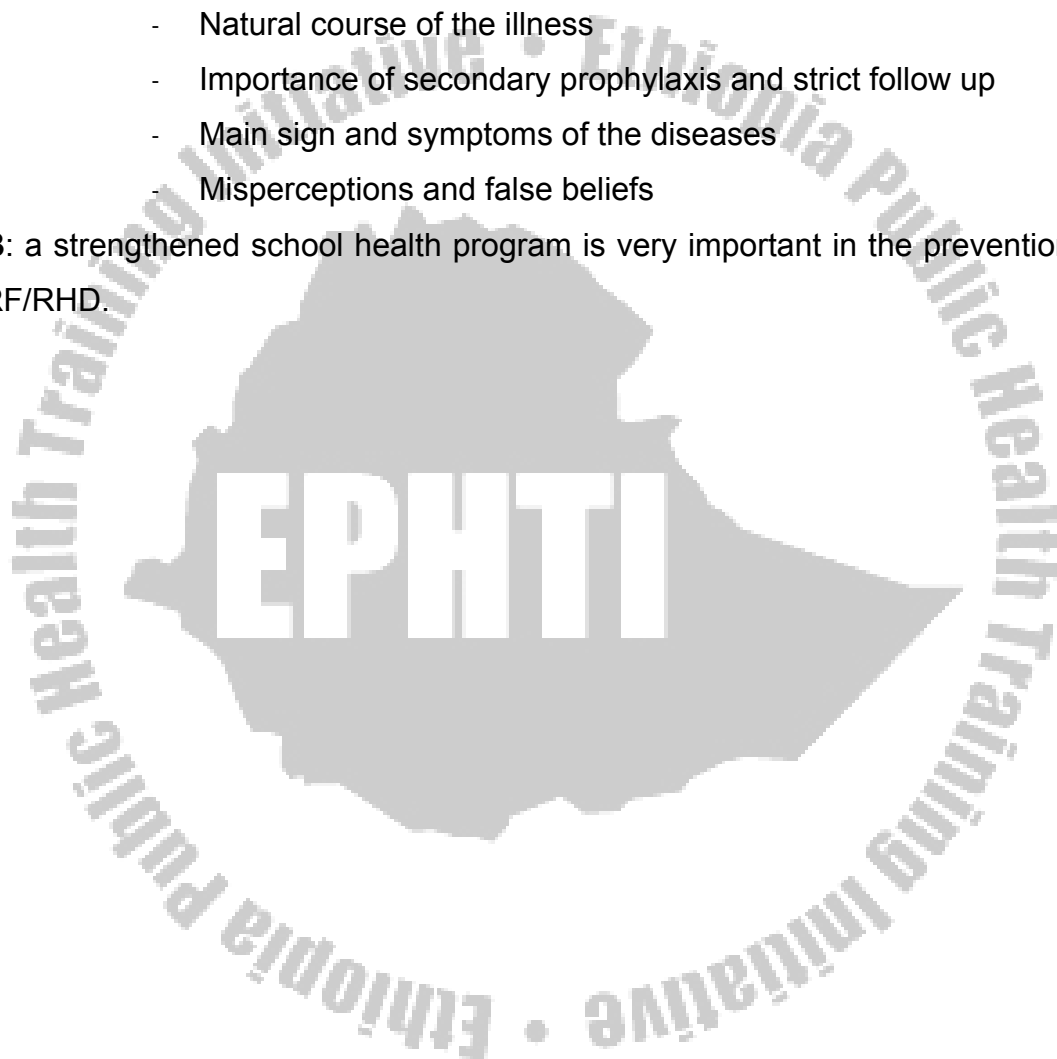
As is depicted above recurrence is the most important and frequent determinant of disease progression in patients with prior history of ARF/RHD. Hence, monthly benzathine penicillin injection is universally recommended for those with documented history of ARF/RHD and is considered as the single most effective measure.

Health education

Health education should focus on

- The importance of environmental and personal hygiene
- Mode of transmission
- Role of over crowding in fostering transmission
- Importance of early treatment of the throat infection
- Natural course of the illness
- Importance of secondary prophylaxis and strict follow up
- Main sign and symptoms of the diseases
- Misperceptions and false beliefs

NB: a strengthened school health program is very important in the prevention of ARF/RHD.



UNIT THREE

SATELLITE MODULES

3.1 Satellite Module for Health Officer Students

1. Introduction

1.1 Purpose

This satellite module is prepared for Public Health Officer Students to give emphasis only on specific issues which were not covered by the Core Module

1.2 Instruction for Using the Satellite Module:

- ◆ You must carefully study the Core Module before reading the Satellite Module
- ◆ Do the pretest and post tests of the Satellite Module before and after studying the module, respectively and try to appreciate the difference in the results
 - ◆ Refer to the Core Module when indicated
 - ◆ Carefully analyze the expected tasks to be accomplished by you

1.3 Learning Objectives

At the end of the training the health officer students should be able to:

- Discuss the pathogenesis and natural course of rheumatic fever
- List major manifestations of rheumatic fever
- Diagnose rheumatic fever
- Manage rheumatic fever
- Know about the different clinical presentations of rheumatic heart disease
- Manage rheumatic valvular heart disease
- Outline the preventive measures of rheumatic fever

Rheumatic fever and rheumatic heart disease

1.1 Rheumatic fever

1.1.1 Definition: -

See the Core Module

1.1.2 Epidemiology

See the Core Module

1.1.3 Pathogenesis: -

The pathogenetic mechanism that leads to the development of acute rheumatic fever is incompletely understood. Clearly streptococcal pharyngeal infection is regarded and other factors may influence the presentation. There is no evidence supporting direct tissue invasion or toxin mediated damage.

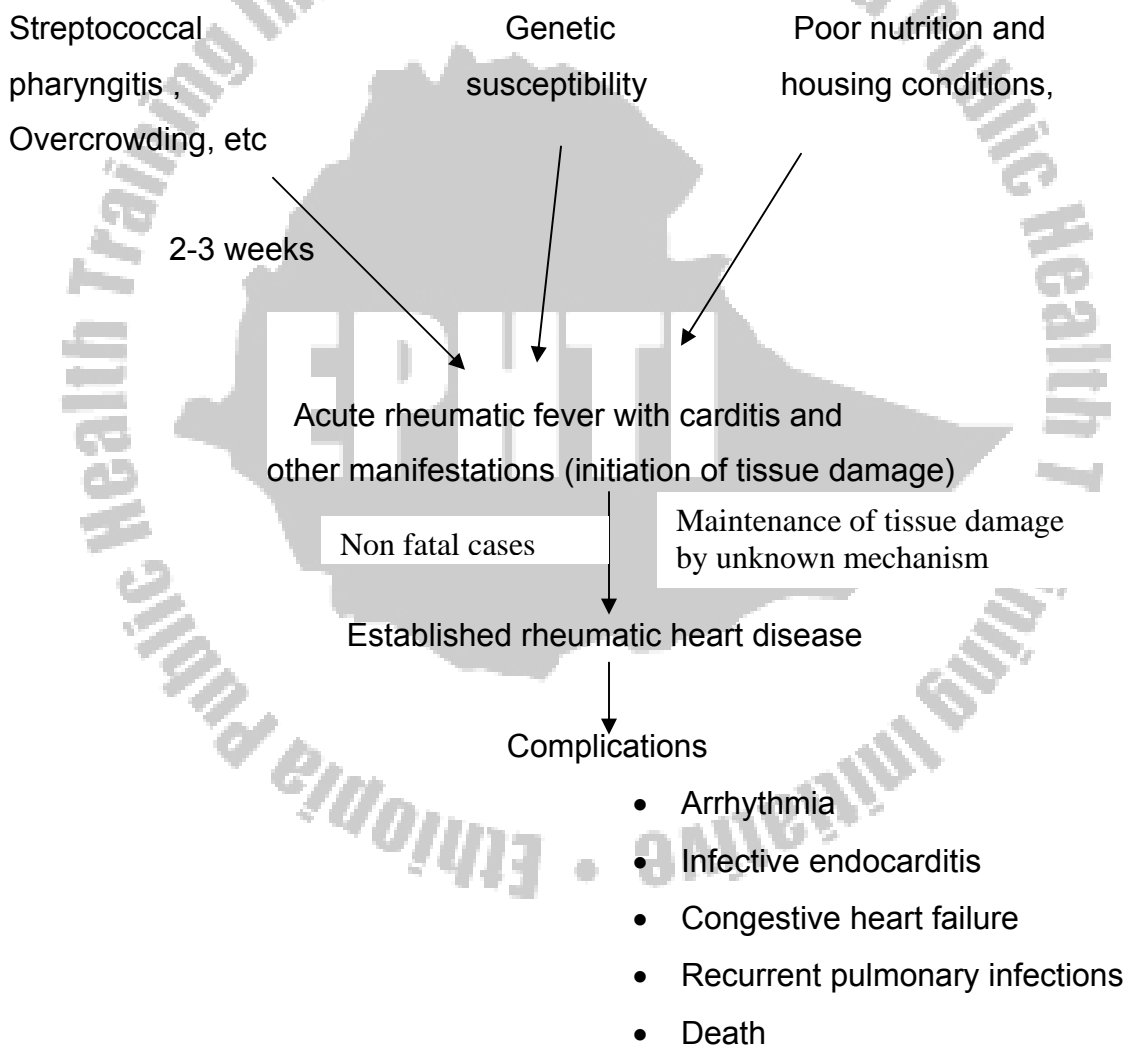
A latency period, usually of 2-3 weeks, is often present between the antecedent streptococcal infection and ARF.

The most popular is the theory of antigen mimicry. In this theory, antibodies liberated against streptococcal antigens, especially m-protein, cross-react with host tissue due to molecular similarity between the streptococcal antigens and certain host proteins. These cross-reactions will induce inflammation in the involved organs/tissues (joints, heart, central nerves system tissues, subcutaneous tissue and skin) through which tissue damage is initiated.

In most tissues this acute inflammation subsides without any sequelae except carditis, which can lead to chronic degenerative changes in the valves. The degenerative changes start with the formation of tiny nodules along the surface of the valve. Leaflet thickening leading to loss of normal valve morphology occurs

which eventually brings about stenosis (narrowing) and/or insufficiency of the valves.

These degenerative changes often develop over the span of decades. However, when there is a severe primary rheumatic insult with intense inflammation, as is seen in some developing countries, commissural adhesion could lead to mitral stenosis in younger patients before the actual degenerative changes occur.



1.1.3 The natural Course of ARF

Among those with acute rheumatic fever nearly half of them may develop carditis. Fifty percent of those with rheumatic carditis recover with out sequela. The progression of disease in the remaining patients depends on the frequency of subsequent recurrences, which emphasizes the indispensable role played by secondary prophylaxis in aborting disease progression.

1.1.4 Clinical manifestation of rheumatic fever

Patients typically present with acute rheumatic fever 2-3 weeks following streptococcal pharyngitis.

The manifestations include:

- A) Non-specific symptoms: - fever (100%), arthralgia, myalgia, and malaise.
- B) Tissue specific symptoms

i) Arthritis (75%): -it's the earliest symptomatic manifestation and classically affects large joints like the knee, ankle, elbow and wrist in a migratory fashion (i.e. affecting one joint after the other) each being affected for 1-2 weeks period. Its natural history can be altered by treatment with aspirin or other NSAIDS.

ii) Carditis (40-60%): - Rheumatic fever produces usually pancarditis (affecting the pericardium, myocardium and endocardium).

Features of carditis include:

- New murmur or changing in previous murmur character
- Deviated apical impulse
- Cardiomegally on CXR
- Severe carditis, which may manifest with signs and symptoms of congestive heart failure

N.B. Carditis is the only feature of acute rheumatic fever that can have chronic complications

iii) Sydenhams chorea (10-20%): - is a neurological disorder characterized by abrupt, purposeless, non-rhythmic, repetitive dancing type of involuntary movements with associated muscular weakness and emotional changes.

It subsides during sleep. Chorea has a longer latent period (up to 8 months), so other manifestations may be lacking or decreasing by symptoms of Chorea for the first time. For this reason its can be diagnostic of rheumatic fever by itself.

iv) Subcutaneous nodule (5-10%): - This is mobile, painless nodule usually found on the extensor surfaces of joints of the hand specifically near or on the olecranon process. It's seen commonly in patients with carditis.

v) Erythema marginatum: - This is an erythematous, evanescent, non pruritic skin rash mainly found on the trunk and some times at the proximal part of the extremities like subcutaneous nodule. It is also seen commonly in association with carditis.

1.1.5 Laboratory findings in patients with rheumatic fever

1. Elevated acute phase reactants
 - C-reactive protein
 - Erythrocyte sedimentation rate
2. Increased ASO titer
3. Increased PR interval on EKG
4. Positive throat culture,
5. Others: -positive rapid streptococcal antigen test,
e.g. -Anti DNAaseB
-Antihyaluronidase

1.1.6 Diagnosis

Revised Jones criteria

Major criteria	Minor criteria
Carditis	1. Clinical
Arthritis (Migratory polyarthritis)	Fever
Sydenham's chorea	Arthralgia*
Subcutaneous nodules	2. Laboratory
Erythema marginatum	↑ESR, ↑CRP
	Prolonged PR interval on EKG**

*in the absence of arthritis

** in the absence of carditis

- No single laboratory test is diagnostic
- The revised Jones **criteria** are used to diagnose acute rheumatic fever.

Diagnosis

Two major criterion or 1 major + 2 minor criteria

+

Laboratory evidence of recent streptococcal pharyngitis

- Positive throat culture
- ↑ASO titer
- ↑Anti DNAaseB
- ↑Antihyaluronidase
- Positive Rapid streptococcal antigen test

Exceptions

- Indolent carditis and chorea by themselves are diagnostic if other causes are ruled out. This is because patients may not have other manifestations of acute rheumatic fever and evidence of streptococcal infection by the time they develop chorea or have indolent carditis.

- To diagnose recurrence only one major criterion or two minor criteria with evidence of recent streptococcal infection may be used.

1.1.7 Differential diagnosis

- Rheumatoid arthritis
- Septic arthritis
- Infective endocarditis
- Viral myocarditis
- Huntington's Chorea

1.1.8 Management

1.1.8.1 Control of acute manifestations / symptomatic relief/

I. Supportive:

- Bed rest
- High caloric diet
- Management of congestive heart failure state (see management of congestive heart failure)

II. Anti inflammatory agents:

They are important to control symptoms but don't change the future development of valvular heart disease.

The main stay of treatment for acute rheumatic fever remains anti-inflammatory agents most commonly aspirin.

- Arthritis and mild to moderate carditis
Aspirin 80 – 100 mg/kg/24hr (up to maximum of 1-2 gm) taken every six hours for 4-6 weeks
- Severe carditis (those in congestive heart failure)
Prednisolone 1-2 mg/kg/day up to a maximum dose of 60 mg/day for 2 weeks then taper the dose over the coming 2-4 weeks depending on the clinical and laboratory response. In the mean time, aspirin should be started at the recommended dose mentioned above.

1.1.8.2 Eradication of streptococcal pharyngitis.

Antibiotic should be universally given for those with acute rheumatic fever regardless of evidence of throat infection. The drug of choice is Penicillin. The following is the dosage regimen of benzathine penicillin

- below 3 years 300,000 IU IM stat
- 3 to 6 years 600,000 IU IM stat
- 7 to 9 years 900,000 IU IM stat
- above 9 years 1.2 Mill IU IM stat

For those with penicillin allergy

- Erythromycin 40 mg/kg/24hr (up to a maximum of 1000 mg/day) in 2 to 4 divided doses for a total of 10 days is given. Sulfadiazine is also another alternative in patients with penicillin allergy.

1.1.8.3 Prevention of recurrence (2^o prophylaxis)

- Benzathine penicillin every 3 to 4 weeks intramuscular
- For those with penicillin allergy sulfadiazine 1 gm daily can be given

1.2 Rheumatic Heart Disease (Rheumatic Carditis): -

As already mentioned the only feature of acute rheumatic fever, which has a late sequela, is carditis. Carditis can occur in the acute form of rheumatic fever. Approximately 50% of those with evidence of carditis develop organic valvular damage. In addition up to 75% of patients with documented recurrence of rheumatic fever have some form of valvular diseases after 45 years.

Mitral valve is the most commonly affected (90%) valve With regards to the relative frequency of valvular involvement in rheumatic heart disease

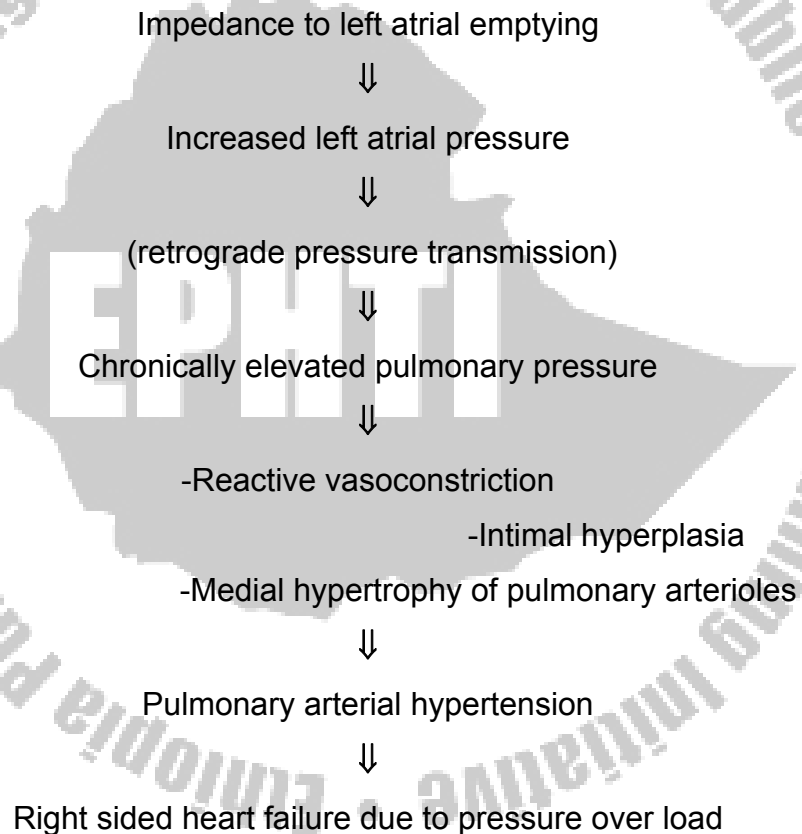
- Isolated mitral valve = 50%
- Mitral valve + aortic valve = 40%
- Mitral valve + aortic valve + tricuspid valve = 5%
- Aortic valve alone = 3%
- Other = 2%

1.2.1 Pathophysiology and clinical features of common rheumatic valvular lesions.

1.2.1. Mitral stenosis (MS)

1.2.1.1 Pathophysiology of mitral stenosis

The main pathology in this condition is impedance of diastolic emptying of atrium, as a result of which, the following sequence of events happen.



1.2.1.2 Summary of pathophysiology and complications of mitral stenosis.

I. Elevated left atrial pressure, hence pulmonary venous, and pulmonary capillary pressure loads to:

- Exercise intolerance
- Dyspnea
- Orthopnea
- Pulmonary edema
- Hemoptysis and pulmonary hemorrhage
- Recurrent pulmonary infections

II. Dilated left atrium leads to

- Cardiomegally
- Atrial fibrillation
- Systemic embolism

III. Pulmonary hypertension leads to

- Right ventricular failure with right ventricular and atrial dilatation, which may be complicated by pulmonary embolism.

IV. Abnormal valvular structure with roughened surface together with abnormal hemodynamics leads to infective endocarditis.

1.2.1.3 Symptoms and signs

➤ Symptoms

- Symptoms related to pulmonary congestion
 - Dyspnea
 - Orthopnea
 - Paroxysmal nocturnal dyspnea
 - Hemoptysis
- Symptoms of right sided heart failure
 - Right upper quadrant discomfort
 - Leg swelling
- Symptoms of low cardiac out put

N.B: Symptoms of pulmonary congestion improves when right heart fails (because of decreased pulmonary perfusion)

➤ **Signs (physical findings)**

- Distended neck vein
- Silent precordium with epigastric pulsation
- Apical impulse is often localized
- Palpable p_2
- Left parasternal heave
- Diastolic thrill at apex
- S_1 accentuation,
- Opening snap of the mitral valve
- Loud P_2
- Mid diastolic rumbling murmur best heard at the apex with presystolic accentuation

1.2.2. Mitral regurgitation (MR)

The immune response in rheumatic fever leads to structural changes in the valves with thickening and shortening of the chordae tendineae. As a result there will be regurgitation of blood to the left atrium during ventricular systole. This leads to enlargement of the left atrium as well as left ventricle.

Clinical presentations depend on the severity of the valvular lesion. If mild, signs of heart failure will not be present and precordium will be quiet. There will be a holosystolic murmur at the apex, radiating to the left axilla. With severe insufficiency, features of heart failure may be present. This includes easy fatigability, body swelling, and dyspnea of variable degrees.

Physical examination reveals

- Variable degrees of respiratory distress
- Active precordium with displaced apical impulse and point of maximal impulse (PMI)

- Apical holosystolic thrill and murmur that radiates to the left axilla or to the sternal edge.
- Muffled 1st heart sound and a prominent 3rd heart sound

1.2.3. Aortic Insufficiency

Chronic rheumatic heart disease involving the aortic valve usually results in sclerotic changes, leading to distortion and retraction of the cusps. This in turn leads to regurgitation of blood to left ventricle during diastole. Therefore there will be volume and pressure overload and subsequent dilatation and hypertrophy of the left ventricle. Clinically, patients with mild insufficiency may be asymptomatic but if moderate to severe patients present eventually with palpitation, excessive sweating dyspnea on exertion and later at rest.

Physical examination reveals: -

- Wide pulse pressure (i.e. ↑systolic BP and ↓diastolic BP)
- Bounding peripheral pulse
- Displaced apical impulse
- Apical heave
- Diastolic thrill and murmur at upper and middle left sternal border radiating to the apex and aortic area. It is easily heard with full expiration.

1.3 Treatment of Congestive Heart Failure

Congestive heart failure is the ultimate complication of patients with established rheumatic heart disease. Most patients with rheumatic heart disease usually present to health institutions in state of congestive heart failure. Therefore, it is worth discussing the management of congestive heart failure.

Principles

- I. Treatment of underlying cause
- II. Treatment of precipitating factors
- III. Treatment of the congestive state

1.3.1 Treatment of Underlying Cause

Treatment of underlying heart diseases is possible in certain conditions of heart failure. It's the definitive management of heart failure. But this is not possible in many situations and hence other modes of therapy remain the main stay in managing congestive heart failure.

For example:

In congestive heart failure caused by anemia, treating the anemia will reverse the heart failure state.

In valvular heart diseases caused by rheumatic fever, surgical intervention (valvuloplasty/valve replacement) is another example of treating underlying heart diseases.

1.3.2 Treatment of precipitating factors: -

Patients with congestive heart failure often have immediate precipitating factors apart from the underlying cause. Identification and correction of precipitating factor(s) is crucial component of patient care.

Precipitating causes include:

Hypertension

Fetus (pregnancy), failure to collect drugs (Non compliance)

Emotional excess (stress), emboli

Arrhythmia

Anemia

Infection, Ischemia

Recurrence of rheumatic fever

Load (salt)

Thyrotoxicosis

Sub acute bacterial endocarditis

NB. In this particular discussion the precipitating factor for the congestive heart failure we are referring to be ARF.

1.3.3 Treatment of the congestive heart failure state

This is divided into three

1.3.3.1 Decreasing pre load

- Diuretics
- Salt restriction

-If refractory referral for mechanical removal of fluid
(Paracentesis, thoracentesis)

➤ *Diuretics*

I. Furosemide

- Dose: 40 -160 mg/day (2-5 mg/kg/day)
- Preferred for rapid diuresis like in a patient with pulmonary edema
- Can be given in renal failure
- Side effects include:
 - Hypokalemia, which requires K⁺ replacement with 600mg Potassium chloride tablet per day or we can combine with K⁺ sparing diuretics
 - Hypotension, which also demands cautious diuresis (monitoring of BP is important while giving diuretics)

II. Hydrochlorthiazide

- Dose: 25 – 100 mg/day (2-4 mg/kg/day)
- Not given in renal failure
- Side effects include:
 - Hypokalemia
 - Hyperuricemia
 - Metabolic acidosis
 - Glucose intolerance (not preferred in diabetics)
 - Dyslipidemia

III. Spirinolactone

- Dose :50-400 mg /day (1.5 - 3 mg/kg/day)
- Not given in renal failure
- Is K⁺ sparing and therefore can be combined with other diuretics
- Slowly acting

- *Salt restriction* - < 2 gm/day, and do not add salt to the food
- *Mechanical removal of excess body fluid*
(Paracentesis or thoracentesis in severe refractory heart failure)

1.3.3.2. Increasing inotropic state (cardiac contractility)

a) Digitalis

Digoxin

Digitalization = achieving maintenance therapeutic serum level

1. Slow digitalization takes 5 days (starting with maintenance dose)
2. Rapid digitalization – over one day

Digoxin:

- ▶ Digitalization po (1/2 initially, followed by 1/4th every 8-12 hours, 12X2)

- ▶ Maintenance hours

NB. IV-dose is 75% of po dose

Dosage

- premature: 20µg/kg
- Full term neonate: 20-30µg/kg
- Infant/child: 25-40µg/kg
- Adolescent/adult: 0.5-1mg
- 5-10µg/kg/day, divided every 12

Indications

- Systolic dysfunction
- Hypertensive heart disease (if systolic failure)
- Dilated cardiomyopathy
- Arrhythmia (Supraventricular)

Side effects

Digitalis toxicity

Predisposing conditions – hypoxia, Hypokalemia, renal failure

Manifestations: Nausea, vomiting, arrhythmia

Treatment

- Discontinue the drug
- Treatment of Hypokalemia and other precipitating causes
- Refer if patient has arrhythmia

1.3.3.3. Reducing after load

- Decreasing work load, stress (emotional and physical)
- Bed rest (until the acute situation subsides)

- Weight decrement should be Individualized
- Vasodilators

I. Vasodilators

-Usually given for refractory heart failure in a hospital set up where intensive care is available.

Examples Include:

Nitrates, like nitroprusside, and Diazoxide

II. Other drugs (Cardio protective drugs)

- Increase life expectancy
- Include ACE inhibitors (captopril, Enalapril), β -blockers like atenelol, metoprolol, bisoprolol (may not be available)
- Indicated in chronic congestive heart failure

1.3.4 Monitoring of response

- Vital signs
- Daily weight measurement
- Symptomatic improvement
- Decrement of edema and organomegaly
- Pulmonary examinations for disappearance of rales and plural effusion (if there exist)
- Daily measurement of JVP
- Assessment of precordial findings
- Monitoring for drug side effects

Follow up of patients with RHD is very crucial which helps to ensure compliance and enables early recognition of disease progression or ensuing complications. As a result patients should be seen in no later than six months and on top of that they need to be informed that they have to show up any time while having urging conditions. During the follow up, the following has to be looked for:

- A detailed review of Compliance to drugs including secondary prophylaxis and other instructions should be addressed.
- Features of worsening underlying disease and complications should be asked

- Clues that may point to possible precipitating factors should be sought
- A detailed physical examination focusing on CVS, Chest, Abdomen, and lower extremity should be done.
- Weight should be routinely measured

1.3. 5. Sub acute bacterial endocarditis prophylaxis

i) Oral cavity, respiratory tract, or esophageal procedures

A. Standard regimen

- Amoxicillin Adults 2.0g ,children 50mg/kg ,po 1hour before the procedure

B. Inability to take oral medication

- Ampicillin Adults 2.0g ,children 50mg/kg, IV or IM 30 minutes before the procedure

C. Penicillin allergy

- Adults Erythromycin 500mg ,children 15mg/kg , po 1 hour before the procedure

ii) Genitourinary and gastrointestinal tract procedures

- Adults Ampicillin or amoxicillin 2gm, children 50mg/kg, IV or IM + gentamycin 1.5 mg/kg (not to exceed 120 mg) 30 min before the procedure.
- Repeat Ampicillin or Amoxicillin 1 gm after 6 hour. For patients with Penicillin allergy
- Adults Vancomycin 1gm, children 20mg/kg, over 1-2 hour plus IV/IM gentamycin

Refer to the Case Study in section 2.3 of the Core Module and discuss the following questions.

1. Describe the cause of the illness of Bisrate?
2. Mention the factors responsible for worsening of Bisrate's illness
3. Discuss the proper management of the disease and complications that Bisrate suffered from.

3.2. Satellite Module for Public Health Nurses

1.0 Introduction

1.1 Purpose

This satellite module is prepared for public health nurse students to help them manage, control and prevent rheumatic fever and rheumatic heart disease.

1.2 Instruction for Using the Satellite Module:

- Students must read the core module before going in to the satellite module. .
They are also advised to refer to the core module wherever indicated

- The following points are explained in detailed in the core module

- Definition
- Epidemiology
- Etiology and pathogenesis
- Clinical feature
- Diagnosis
- Case management
- Prevention and control

1.3 Learning objectives

Up on completion of the satellite module you will be able to

1. Discuss the methods used to assess a patient with rheumatic fever and rheumatic heart disease

2. State individual and family focused nursing diagnosis of a patient with rheumatic fever and rheumatic heart disease
3. Describe the activities by using nursing process in planning to manage a patient with rheumatic fever and rheumatic heart disease.
4. 4. Discuss Nursing intervention to treat, prevent or control rheumatic fever and rheumatic heart disease at a health center setting
5. Describe ways of evaluating the nursing care provided to a patient with rheumatic fever and rheumatic heart disease and also to the family.

Nursing management plan

- Nurses together with physicians and health officers are involved in the primary prevention of rheumatic fever.
 - The first approach to preventing initial attack of rheumatic fever is
 - To look for and treat streptococcal infections adequately
 - Control epidemics in the community
 - Secondary prevention is the specific preventive care of the patient with rheumatic heart disease or documented previous rheumatic fever
 - The medical and nursing intervention for people with rheumatic fever is to control and alleviate infecting streptococci if they are still present with the purpose of protecting the heart against the damaging effect of carditis
 - Additional management includes observation for and control of heart failure and carditis
 - Pharmacological intervention includes antibiotics, salicylates and steroids

1.4 Nursing Assessment

- History of the present illness
- Signs and symptoms of rheumatic fever and/or rheumatic heart disease.
- Review of systems
- Physical Assessment: - on vital signs, and general body condition
- Subjective and objective data on: -

- The patient's cardiac function
- Tolerance to activities; activity limitations
- Patient knowledge about the nature and possible intervention for rheumatic fever and rheumatic heart disease.

1.5. Nursing Diagnosis

- the diagnosis common to patients with rheumatic fever and rheumatic heart disease derived from these data are as follow :
 1. Decreased cardiac output related to cardiac valve dysfunction due to established rheumatic heart disease as manifested by a decreased in blood pressure, tachycardia, and fatigue
 2. Potential for injury from the risk of arterial embolization related to the presence of valvular vegetations and thrombi predisposing to risk of embolization
 3. Potential knowledge deficit regarding the disease process of rheumatic fever and rheumatic heart disease
 4. Anxiety related to diagnosis of heart disease and fear of death

1.6. Nursing plan

(Give priority for life threatening conditions)

1. To restore and maintain the hemodynamic status
2. To detect early the signs and symptoms of streptococcal throat infection
3. To evaluate frequently for rapid pulse, dyspnea, fatigue, and other signs of heart failure
4. To detect early signs of embolism
5. To prevent complications including venous thrombosis
6. To give health education about the cause, complications and prevention of rheumatic fever and to provide the necessary information treatment for rheumatic fever and rheumatic heart disease.

1.7. Nursing Intervention

1. Hospitalize the patient (if signs of heart failure, or severe carditis present) until features of heart failure improve.
 - Evaluate frequently for
 - Rapid pulse
 - Dyspnea
 - Fatigue
 - Sign of heart failure (like body swelling, basal crepitation on the chest together with orthopnea)
 - And give proper nursing care
2. Detect early signs and symptoms of infection
 - Recording temperature at least twice daily on a graph to identify any patterns of elevation
 - Taking vital sign at least twice daily to detect widening pulse pressure and hemodynamic changes
 - Checking for heart murmurs through cardiac auscultation (a new murmur or changing murmur may indicate worsening of conditions)
 - And control the fever, and also if change in vital sign report to the team leader
3. Prevent infection through observing basic general principles of asepsis such as
 - Hand washing
 - Wearing of masks, gowns, and gloves
4. Observe the patient for any sign of reaction such as rash, urticaria, diarrhea, anaphylactic reaction and other adverse response to the antimicrobial therapy and report to the doctor.
5. Do range of motion exercises and frequent change of position to decrease the risk of thrombi formation
 - Wear antiembolism shoes to promote venous return
 - Administering anticoagulants as prescribed

- Providing meticulous care of intravenous sites to diminish the chance of irritation and infection
6. On going assessment to detect early signs and symptoms of thromboembolism
- Check and record peripheral pulse every 4 hours or as necessary
 - Check tenderness of calf muscle area in the leg (Homan's sign), swelling in the ankle joint area.
 - Check level of consciousness, visual change, severe headache, upper left abdominal pain radiating to the left shoulder, chest pain, shortness of breath, reduced urine output, hematuria, (any such sign should be reported immediately because embolism is life threatening)
7. Assessing the patient's knowledge of the disease, use of medications and treatment
- The teaching plan includes:
- The cause of rheumatic fever and rheumatic heart disease and their course
 - Purpose of long term antibiotic administration
 - Need for prophylactic antibiotic when undergoing dental procedures and surgical interventions.
 - The importance of ongoing assessment to evaluate treatment and identify the early signs of complications.
 - The importance of good daily oral hygiene
 - Instruction to the patient that he/she will inform a health professional of their disease history
 - Instruction to the patient to monitor their temperature daily and record it (Fever, chills, weight loss, and increased fatigue should be reported to the primary care provider)
 - Nutritional diet which contains low salt but meets daily need for calories, protein, vitamins, minerals and other nutrients

- Importance of personal and environmental hygiene as well as adequate ventilation in disease prevention
- Follow up on defaulters who don't get their monthly benzathin penicillin

1.8 Evaluation

Should address the following questions

- Does the patient show hemodynamic stability by having a stable blood pressure and pulse, being mentally alert and oriented, and having adequate urine output and no new heart murmur development?
- Are there signs of resolutions of thromboembolisms?
- Can the patient accurately discuss the nature of rheumatic heart disease, identify situations requiring prophylactic antibiotics, and demonstrate the correct method of oral hygiene?
- Can the patient carry out activities of daily living without fatigue or dyspnea?
- Can the patient be able to verbalize relief of anxiety and health status information without fear?

N.B If the above questions are answered negatively, go back through all the steps again checking where the problems are.

1.9 Nursing process at home and school level

School health service is an important part of prevention of rheumatic fever. School health provides the target population in one accessible area. Hence, screening and management of pharyngitis, which is common during school years, is a cost-effective way of promoting primary and secondary prevention. Besides maintenance of a healthy school environment in terms of student density, aeration, and illumination in collaboration with school administrative provides one of the best ways to prevent not only rheumatic heart disease but also other communicable diseases.

1.9.1 Plan a home visit to follow up on the patient's condition after discharge (if possible)

1.9.2. Establish rapport

1.9.2.1- assess: -

1. the presence of similar or febrile illness in other family members
2. Culture and beliefs of the family related to rheumatic fever
3. The traditional treatment and supportive health practices for rheumatic fever
4. The nutritional status
5. Immunization status
6. Ventilation of the house
7. Educational status of the family
8. Income of the family
9. Mortality & survival of children in the family

1.9.2.2. Identify the most important problems for the family (family focused nursing diagnosis)

1.9.2.3 Set your objectives and prioritize the problem using the nursing measure to address the problem

1.9.2.4 Nursing intervention

Provide health education on: -

- Rheumatic fever and rheumatic heart disease: How it is caused, early signs & symptoms and complications
- Importance of early treatment and visits to health workers
- Ventilation
- Immunization
- Prophylaxis :monthly or daily antibiotic

1.10. Methods used

- Health talk and discussion
- Home visit and discussion about proper ventilation
- Home care of upper respiratory tract infection

1.11 Evaluation at home level

- Check whether the patient and family have an understanding of what you have discussed able to demonstrate what they have observed
- Asking questions

Note: - Plan to revisit home

E.g. Check whether the medications are being taken based on recommendations and how much the caregiver has co-operated with the advice given.

Refer to the Case Study on in section 2.3 of the Core Module and discuss the following questions.

1. What important problems can you assess about Bisrat's case?
2. List three-priority Nursing diagnoses for Bisrat's case.
3. What are the predisposing factors for her clinical deterioration and death?
4. On what points can you give health education to Bisrat's family?

3.3 Satellite Module for Medical Laboratory Technician

1. Introduction

1.1. Purpose and use of the module

This section of the module on rheumatic fever and rheumatic heart disease is believed to give basic theoretical and practical skills that need to be acquired by Medical Laboratory Technology students that are in the actual training or those already in service for diagnosis of rheumatic fever. After going through this module, we believe, Medical Laboratory Technicians will have the appropriate knowledge to help diagnose patients with rheumatic fever and rheumatic heart disease. It is also believed that the readers will be provided with valuable skills that can be utilized locally in the Ethiopian system.

1.2. Directions to use this module

- Attempt the pre-test questions in section 2.1, page 9 of the core module and evaluate your knowledge on rheumatic fever and rheumatic heart disease before going through the module
- Try to understand the learning objectives
- Read the case studies presented
- Go through the details under each of the subtopics
- Work on the post-test questions and re-evaluate your knowledge again
- To substantiate your understanding of RHD refer to the listed references at the end of the core module

1.3 Learning Objectives

At the end of reading this module, the Medical Laboratory Technician will be able to:

- Identify laboratory tests that contribute to the correct diagnosis of RF
- Properly collect specimens used for diagnosis of RF

- Describe methods of performing tests used for the diagnosis of RF diagnosis
- Discuss the principles of those tests used for diagnosis of RF
- List factors affecting the accuracy of the tests
- Follow the standard procedures to carry out tests for diagnosis of RF
- Take responsibility for maintaining the integrity of the tests by controlling the conditions affecting each test
- Perform the tests and diagnose cases of RF
- Record the results of each test used for diagnosis of RF

1.4 Laboratory Tests Used to Diagnose RHD

RF/RHD is one of the post- complications. The common tests used for detection of GABHS infection and hence for the diagnoses of rheumatic fever use the interaction of the extracellular products of *Streptococcus pyogenes* & antibodies produced against those products (hemolysins).

Moreover, tests for DNase B antibody, Streptozyme test can serve as indirect evidence of infection; and throat culture can be used for direct detection of *S. pyogenes*.

1.4.1. Tests for ASO

ASO is an antibody produced against the toxins called Streptolysin O of *S.pyogenes*.

Properties of Streptolysin O (SLO)

- It is oxygen-labile unlike Streptolysin S (SLS)
- It is antigenic; that is it elicits the production of an antibody
- It is haemolytically active in its reduced state
- Its biologic activity is completely inhibited by low concentrations (1.0µg/ml) of cholesterol & certain related sterols
- It is cardiotoxic

Estimation of ASO titer is very important in the investigation of RF/RHD since this complication develops at the stage when it is not possible to isolate *S.pyogenes* in throat culture.

1.4.1.1. ASO microtitration or Tube Hemolysis Test

It is one of the commercially available tests for the investigation of raised ASO antibody levels.

Principle:

In the titration test, a constant amount of streptolysin O antigen reagent (reduced form) is added to a series of dilutions of the patient's serum. Following a period of incubation, Group O washed human or rabbit red cells (not supplied with the kit) are added. The tubes are then examined for lyses of the red cells. Hemolysis occurs in those tubes in which there are insufficient antibodies to neutralize the antigen.

The highest dilution of serum showing no hemolysis is the ASO titer (the titer of ASO antibody in the serum is directly proportional to reciprocal of the serum dilution). In most titration tests, ASO titer is expressed in Todd Units. For example, 512 Todd units are equivalent to an ASO titer of 512 (1 in 512 serum dilution).

Advantages:

- Small amount of serum can be used
- Commercially available

Disadvantages:

- Once reconstituted, the SLO antigen reagent must be used within a few hours (uneconomical)
- Mostly done in Reference Laboratories

- False-positive results may be seen with rheumatoid arthritis, pneumococcus pneumonia, gonorrhoea, tuberculosis, hepatitis, lipaemic serum, bacterially contaminated serum or reagents, or oxidized SLO antigen

Materials Required

1. Saline – 0.85 percent
2. Streptolysin O buffer – this is commercially available from a number of supply houses. It is prepared as follows:
 - 7.4 gm sodium chloride
 - 3.17 gm potassium phosphate
 - 1.081 gm sodium phosphateAdd to 1,000 ml of distilled water. The final pH should be between 6.5 and 6.7. The buffer may be stored at 4⁰ c for up to 1 week.
3. Streptolysin O - this is available in dehydrated form from commercial supply houses and should be rehydrated just prior to use. Once rehydrated, the solution should not be subjected to vigorous shaking, and it must be used within 1 hour or discarded, because the active reagent is subject to inactivation by oxidation.
4. Red blood cells - a 5 percent suspension of fresh (not more than 1 week old) human red blood cells (group O) is most commonly used in this test, although rabbit red blood cells and equally sensitive to SLO. The cells must be washed three times in diluent, and the buffy coat (white blood cells) must be removed. The final centrifugation should be at 1,500 rpm for 10 minutes, following which the packed red cells may be measured to achieve a 5 percent suspension. Prepare the final suspension in SLO buffer.
5. Test tubes - 12X100 mm are commonly used (round bottom).

Procedure

1. Prepare dilutions of fresh or inactivated serum as follows, using SLO buffer as a diluent:

1:10 - 0.5 ml of serum+ 4.5ml of buffer

1:100 - 1.0 ml of 1:0 serum dilution +9.0ml of buffer

1:500 - 2.0 ml of 1:100 serum dilution + 8.0 ml of buffer

The first two serum dilutions are usually sufficient for preliminary titrations.

2. Set up the test according to the protocol given in Table 1 below:

Interpretation

Table 1. Protocol for Antistreptolysin O Titration														
Serum dilutions	1:10		1: 100					1:500			Red cell	SLO		
control														
Tube	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Add serum dilution, ml	0.8	0.2	1.0	0.8	0.6	0.4	0.3	1.0	0.8	0.6	0.4	0.2	0	0
Add buffer solution, ml shake gently to mix	0.2	0.8	0	0.2	0.4	0.6	0.7	0	0.2	0.4	0.6	0.8	1.5	1.0
Add Streptolysin O, ml	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Shake gently to mix. Incubate at 37° C for 15 minutes														
Add 5 percent red cell suspension ml	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Shake gently to mix. Incubate at 37° C for 45 minutes, shaking tubes after first 15 minutes. Following incubation centrifuge tube for 1 minute at 1,500 rpm														
Todd unit value	12	50	100	125	166	250	333	500	625	833	1250	2500		

The ASO titer expressed in Todd units is the reciprocal of the serum dilution that completely neutralizes the SLO. For example, a serum showing no hemolysis in tubes 1 through 4, a trace of hemolysis in tube 5, and marked to complete emolysis in the remaining tubes is reported as containing 125 Todd units. Before reporting results, always ensure that the controls given the expected results.

1.4.1.2. Rapid Latex Agglutination Test for Antistreptolysin O

This is another commercially available test to screen for significantly raised ASO titers and if indicated to semi quantify the antibody.

Principle:

In the latex test, the patient's serum is first incubated with streptolysin O reagent (reduced form) containing 200 IU antigen/ml. One drop of latex suspension (latex particles coated with streptolysin O antigen) is then mixed on a slide with the serum-streptolysin O reagent and the preparation examined for agglutination.

If the patient's serum contains more than 200 IU ASO antibody, the excess antibody will agglutinate the antigen in the latex reagent. If no agglutination occurs, the antibody level is below 200IU/ml. When the antibody level is greater than 200IU/ml further testing is required to estimate the approximate titer of the antibody.

Advantages:

- Once reconstituted, the latex reduced Streptolysin O antigen reagent can be used for up to 5 days.
- Lipoproteins, oxidized SLO or bacterial growth products do not interfere with this test

Disadvantages:

- Generally less frequently used
- Screens for ASO antibody levels over 200 IU/ml
- Non-specific reactions can be seen with bacterial contamination of the specimen, with lipemic serum or plasma or if the reaction is observed after 3 minutes
- A titer of 200 U/ml or greater may be associated with rheumatic fever (RF) or glomerulonephritis

Materials Required

The kit contains:

1. ASO latex reagent coated with streptolysin O. Store at 2⁰ to 8⁰C. Mix well before use.
2. 0.9 percent NaCl solution. This is a saline solution containing sodium azide as a preservative.

3. Positive control serum. A prediluted serum containing at least 200 U/ml of ASO. This control should exhibit visible agglutination at the end of the 3-minute test period.
4. Negative control should exhibit a smooth or slightly granular appearance at the end of the 3-minute test period.
5. Glass slides with 6 wells. Use only the glass slide provided. The slide should be rinsed in distilled water and thoroughly dried with a soft cloth or tissue after each use.

Additional materials required but not provided in the kit:

1. Applicator sticks
2. Timer
3. 12X75 mm test tubes
4. Pasteur pipettes and rubber bulb
5. Serologic pipettes and safety bulb
6. 50 μ l disposable pipettes and safety bulb
7. High-intensity direct light

Procedure (Screening Test)

1. Label a 12x75 mm test tube for each patient to be tested
2. Pipette 1 ml of saline into each test tube
3. Add 1 drop of patient serum to each of the appropriately labeled test tubes using a Pasteur pipette. Cover the tube and mix the dilution thoroughly by inverting the tube several times.
4. Label 1 division of the 6- cell slide for the positive control, negative control, and the respective patient sera to be tested.
5. Pipette 50 μ l of the controls and patient sera onto the appropriately labeled cells. Use a fresh pipette for each specimen.
6. Add 1 drop of latex reagent to each cell
7. Mix each specimen with a separate applicator stick. Spread the mixture evenly over the cell

8. Rotate the slide for exactly 3 minutes
9. Examine immediately with a bright source of direct light.

Note: All reagents and specimens should be at room temperature before testing

Interpretation

Agglutination indicates a positive result and no agglutination indicates a negative result, provided that the controls have given the expected results, Agglutination demonstrates 200U/ml or more of ASO. Positive results should be retested quantitatively. In semi quantitative testing, the U/ml of the highest dilution of serum to produce visible agglutination is the reported value.

The patient's serum should be prepared as follows:

<u>Dilution</u>	<u>U/ml</u>
1:30	300
1:40	400
1:60	600
1:80	800
1:100	1,000

Discussion

False-positive reactions can result from bacterial contamination of the specimen or if the reaction is observed after 3 minutes. Markedly lipaemic serum or plasma may produce nonspecific reactions,

Most individuals will have a detectable ASO titer that varies with age and geographical location. A titer of 200U/ml or greater may be associated with rheumatic fever or glomerulonephritis. A patient with an elevated titer should be retested over a period of 4 to 6 weeks to plot the course of the titer.

1.4.1.3. Estimation of DNase B antibodies

This test is useful for diagnosis of rheumatic fever and rheumatic heart disease in a minority of patients who don't show rise in ASO antibody titer. The rise in DNaseB antibody usually occurs later than the ASO antibody.

Advantages:

- More sensitive than ASO antibody test

Disadvantages:

- Once reconstituted the antigen (Streptococcal DnaseB) should be used within a few hours.
- It is done in the Microbiology Reference Laboratory
- More expensive than the ASO titration test kits
- Requires experts to perform the test

1.4.1.4. Streptozyme test

Facilities for these procedures are not available in a health center set up and detailed account on each is beyond the scope of this module.

1.4.1.5. Tests for C-Reactive Proteins (CRP)

CRPs are proteins not found in normal human serum. They are found in sera of patients in the acute phase of various infections as well as with inflammation. They can be precipitated with nitrogenous polysaccharides, the C-substance, from rough pneumococcus with light dilutions of the sera of patients during the acute phase of pneumonic infections. They appear in less than 24hrs after the onset of symptoms of pneumonia, remain at a high-level during the disease and decrease sharply in 3 days after the disease when the temperature returns to normal. It is not type-specific and agglutinins do not appear in patient's sera until the crises and persisted thereafter during convalescence, after disappearance of the reactive protein. Sera of patients with streptococcal and staphylococcal infections, acute rheumatic fevers, and other diseases confer some abnormal protein capable of precipitating with the pneumococcal C-substance. It has been

isolated and crystallized and found to migrate electrophoretically as a β - or γ -globulin.

The amount of increased C-reactive protein implies non-specific disease or the presence or inflammation.

Application:

- To evaluate a disease condition & response to treatment. We can use CRP to diagnose patients if disease is inflammatory or not. CRP can be detected after about 24 hrs of infection.
- The increased CRP is correlated with increased ESR and it has practical value. There is demarcation of ESR in normal & abnormal conditions. Detecting any amount of CRP in patients is indicative of an abnormal condition. CRP appears in patients earlier than ESR. Therefore, we can know the infection early.
 - We can evaluate ESR by testing for CRP.
- Note: There may be increased ESR in normal conditions like pregnancy but this is evaluated by testing for CRP. ESR can also be seen in anemic patients but we can evaluate by testing for CRP.

Serological Tests to detect CRP

1. Precipitation test with purified pneumococcal C-polysaccharide

- This is a tube precipitin test which is not convenient & is difficult to perform
- There may be a false positive reaction if there is antibody against C-polysaccharide (but our aim is to look for CRP). So, it is not used in most labs now.
- Requires 1 to 3 days & is time consuming

2. Hemagglutination test for CRP

- The red blood cells coated with CRP (Ag) or anti-RBC antibody is used
- It can be passive or active

- This test is more specific than the precipitation test using polysaccharides

3. Precipitation test for CRP

- This test is rapid, passive, & is more sensitive
- The latex suspension contains dyes, which color the reaction so that the agglutination will be more visible.

Reagent: Anti-CRP latex reagent (Antibody coated on latex particle is used as a reagent)

Together with the reagent, the positive and negative controls are included. The positive control contains anti-CRP antibody & the negative control contains no CRP.

Sample: Serum is sample of choice. If the serum has been kept at 2-8⁰C the reagent has to reach the room temperature.

4. A. Qualitative Slide Agglutination test

- Used to detect the presence or absence of CRP in patients' serum.

Procedure:

1. Place 1 drop of the positive control (0.050μl) on the card.
2. Place 1 drop of patient's serum on a card & add one drop or 1 ml of mixed anti- CRP reagent to both.
3. Mix the preparation using different applicator sticks. Rotate the card.
4. Observe for agglutination within 3 to 5 minutes. If delayed the part of the reagent may evaporate and dry and give false positive results. Therefore keeping time of reading is very important.

Reporting:

- Report as negative if no agglutination is & as positive if there is agglutination

Note: The negative result could be due to the prozone effect. Therefore, we have to dilute the serum (1:10 or 1:20) and retest the preparation. If no agglutination in the diluted serum it is a true negative.

4. B. Semi-quantitative slide test

- Used to quantify the amount of CRP

Procedure:

1. Add 1 drop of 10 μ l serum & 50 μ l successively on a card.
2. Add 1 drop of anti-CRP latex reagent to each card & mix using a stick.
3. Rotate the card & read within 3 to 5 minutes.

Reading:

- If there is no reaction in the 10 μ l serum & 50 μ l compared to the control serum, the CRP is supposed to be less than 7 plus or minus 1mg/l.
- If there is no reaction in the 10 μ l serum & reaction in the 50 μ l serum, the CRP is supposed to be in between 7 & 20 and is considered as positive test result.

In the 10 μ l serum we have low concentration of CRP, if present, & the anti-CRP is high (prozone effect). Therefore, the result may not be visible consequently showing negative result.

- If there is reaction in the 10 μ l serum & no reaction in the 50 μ l serum, the CRP is supposed to be approximately equal to 20-200mg/l.
- If there is reaction in both serums, the concentration of CRP is supposed to be greater than 200mg/l.

When it is negative in the 50 μ l serum the concentration of CRP is very high (post zone effect) i.e., the antigen is high. We can also do serial dilution to quantify the amount of CRP in serum. We interpret as negative in the 10 μ l & 50 μ l serums because less than 7 plus or minus 1mg/l is not an expected amount of CRP in the 50 μ l. Therefore, we report as negative. The test is sensitive to [CRP] > 7 mg/l.

Interpretation:

- Normal adults have less than or equal to 5mg/l of CRP in serum.
- The concentration increases in inflammatory and malignant diseases (cancer).
- Rheumatoid factor may cause a false positive test result but the probability of being FP in this case is only about 2%.
- The quantification of CRP depends up on the manufacturer, which has its own standard concentration to the sensitivity of the test.

1.4.1.6. Throat Culture

Culture of throat swabs is used to isolate pathogens in the upper respiratory tract such as GA β HS.

Collection of throat swabs:

1. In a good light & using the handle of a spoon to depress the tongue, examine the inside of the mouth.

With a streptococcal sore throat, the tonsils are inflamed & often covered in whitish or yellow spots.

2. Swab the affected area using a sterile cotton or alginate wool swab. Taking care not to contaminate the swab with the saliva, return it to its sterile container.

Note: For 8 hours before swabbing, the patient must not be treated with antibiotics or antiseptic mouth-washes (gargles).

3. Within two hours of collection, send the swab with a request form to the laboratory or store the swabs in tubes containing 3-5 g of dried silica gel & send to the Microbiology Laboratory within 3 days.

Culture of the Specimen

The routinely used media to inoculate the throat swab is a plate of blood agar.

If the swab is received in silica gel (e.g. from a health center), moisten it first with sterile nutrient broth and then inoculate the plate.

Sheep, goat, or horse blood but not human blood should be used in preparing plates.

Add a bacitracin disc (0.05 units) to the plate to help identify *S. pyogenes*, which is sensitive.

Incubate the plate preferably anaerobically or in a CO₂ enriched atmosphere overnight at 35-37°C.

S. Pyogenes show beta-hemolysis with larger zones when incubated anaerobically.

Reporting of throat swab cultures: if a beta-hemolytic *Streptococcus* sensitive to bacitracin is isolated, report the culture as 'S. pyogenes presumptive Group A isolated, Lance-field group to be confirmed'.

1.4.1.7. Erythrocyte Sedimentation Rate (ESR)

The ESR, also known as the sedimentation rate is a nonspecific laboratory test that determines the rate at which erythrocytes separate from plasma & settle to the bottom of a tube.

Its results don't show a specific disease but they indicate a general condition such as the presence of acute or chronic inflammation.

A series of sedimentation rates allow the physician to evaluate a course of treatment by following the progress of an inflammatory condition.

The speed at which the erythrocytes settle out of plasma in a blood sample depends on four factors:

- Size of the erythrocytes
- Concentration of the erythrocytes
- Shape of the erythrocytes
- Composition of the plasma proteins

The two methods used for determining ESR are the Wintrobe method & the Westergren method.

A. The Wintrobe Method

- Uses a Wintrobe sedimentation tube & a long-stemmed Pasteur Pipette. A Wintrobe tube is a glass cylinder, 1mm in diameter, with a capacity of 1mL. It is graduated from 0 to 100mm from top to bottom on one side of the scale & from bottom to top on the other side. The system includes a special rack that holds the tube in a vertical position.

Procedure:

1. Collect a venous whole blood sample in a stopper tube with EDTA.
2. Using the long-stemmed pipette, fill the Wintrobe tube to the 0-mm line with the well-mixed blood sample.
3. Place the tube into the rack and let the tube stand undisturbed for exactly 1 hour. The erythrocytes & plasma will separate, leaving the plasma at the top of the tube, above the red cells that have settled to the bottom of the tube.
4. Measure the sedimentation rate by noting the number (reading down from 0) at which the meniscus of RBCs crosses the scale etched on the Wintrobe tube. That number is recorded in millimeters per hour.

B. The Westergren Method

- Uses a pipette graduated from 0 to 200mm & a rack for holding the calibrated pipettes.
- This test is more sensitive than the Wintrobe & more complex to perform, because it requires the blood to be diluted with 3.8% of sodium citrate.

Procedure:

1. Collect the venous blood with anticoagulant preferably 3.8% Sodium Citrate. Do not forget to thoroughly mix the blood with an anticoagulant.
2. Transfer the blood up to the 0mm mark on the Westergren tube.
3. Place the tube in the rack for 1 hour.
4. After 1 hour, immediately read the results and report in millimeters per hour.

Technical Factors Affecting the ESR

- The slightest variation from a vertical position in the sedimentation tube can increase the ESR. A variation as small as a 3° angle can increase the ESR by 30%.
- Taking the reading before or after the specified time gives a result that is too low or too high.
- Any movement of the sample during the test period can increase the ESR.
- Do not jar or move the rack holding the sedimentation tube.
- Blood that has been drawn more than 2 hours before the test or blood that has not been properly mixed with the correct anticoagulant will not yield a true ESR.
- Change in environmental temperature can cause changes in ESR.
- The rate of sedimentation will vary with any change in the size, shape, or dimensions of the sedimentation tube.
- Even a small variance in volume affects the measurement of the ESR.

Reference Values for the ESR

ESR reference values vary with age, sex, & method of testing. Elderly patients & pregnant women often show an elevated ESR.

Table 2: Reference Values for ESR

Wintrobe (mm/hr)	Westergren (mm/hr)	
Man		
< age 50 yrs	0-7	0-15
> age 50 yrs	5-7	0-20
Woman		
< age 50 yrs	0-15	0-20
> age 50 yrs	25-30	0-30

Adapted from Watson, J, & Jaffe, MS: Nurses Manual of Laboratory & Diagnostic Tests, FA Davis, Philadelphia, 1995, p. 39

3.4. Satellite Module for Environmental Health Technician

1. Introduction

Environmental Health technicians like any other health workers, are involved in the prevention and control of rheumatic fever and rheumatic heart disease. It is necessary to equip this category of health workers with the up to date knowledge on rheumatic fever and rheumatic heart disease. Environmental health technicians should also be sufficiently skilled to educate the patients, the public as a whole on ways of preventing and controlling the disease. This module, therefore, deals with equipping the environmental health technicians with the appropriate knowledge and skills for handling rheumatic fever and rheumatic heart disease and propagate sanitary practices related to disease prevention.

1.1 Purpose and use of the module

This module can be used in the health center by the Environmental Health Technicians for the control and prevention of rheumatic fever and rheumatic heart disease.

1.2 Direction for using this module

Proceed through the modules as follows:

- Read the direction for using the modules in section- and follow the instructions.
- After doing so read the core module, do the pretests, do the exercises and then go through this satellite module.
- After wards, you may also read the satellite modules of other categories of health professionals, too.

1.3 Learning objectives

At the end of the session the students should be able to

- Identify the role of environmental health technician in the control and prevention of rheumatic fever and rheumatic heart disease.
- Describe the ways of prevention and control of rheumatic fever and rheumatic heart disease
- Be able to give health education for the patients, public and health worker as a whole.

1.4 Ways of prevention and control of rheumatic fever and rheumatic heart disease

1.4.1 The fundamental aims are:

1. Environment control:

To improve housing & homes following the principles of healthful housing:

- Providing adequate illumination
- Providing adequate ventilation
- Maintain the recommended size of house for the family to:
 - * avoid over crowding
 - * to increase privacy
- The house should be constructed in such a way that it should avoid-
 - * in door air pollution
 - * Injuries
- Provide recommended sanitary facilities.
 - Safe & adequate water supply
 - Safe disposal of wastes (solid and/or liquid wastes)
- Avoid noise pollution to provide sufficient bed rest for the patients
- Avoidance of exposure to bad weather
- Avoidance of over heating or chilling

2. Diet: Good nutrition is important for the prevention of rheumatic fever

3. *Primary prophylaxis*: to detect and treat symptomatic *S. Pyogenes* sore throat with either Benzathine penicillin 1.2 mega units, penicillin V for 10 days or benzyl penicillin.
 - All upper respiratory infections and attacks of acute tonsillitis should be given adequate treatment.
 - The early use of penicillin in all streptococcal infection
4. *Secondary prophylaxis*: to establish and maintain effective secondary prophylaxis of streptococcal infection in those with known rheumatic heart disease or documented history of rheumatic fever. This should include establishment of effective system both for giving Benzathine penicillin every 3-4 weeks and for immediate recall of those who do not attend for their injection. It is very difficult to maintain such follow-up even with dedicated community nurses. Therefore a continuous health education focusing on importance of compliance of secondary prophylaxis is extremely important.
5. Provide easily accessible laboratory facilities for recognition of GAS/HIS
6. Pasteurize milk and exclude infected people from handling milk likely to become contaminated.
7. Exclude people with skin lesions from food handling

1.4.2 Control of patients, contacts and the immediate environments

1. Report to the local authority. There is an obligatory report of acute rheumatic fever in some localities.
2. Isolation: Drainage/secretion precaution may be terminated after 24 hours of treatment with penicillin or other effective antibiotics, therapy should be continued for 10 day to avoid development of rheumatic heart disease.
3. Concurrent disinfections of purulent discharge and all articles soiled with discharges.

1.5 Health education:

➤ To the patients

- Explain all tests and treatments to the patients.
- Tell the patients to resume activities of daily living slowly and to schedule rest periods in to the routine for a while.
- Tell the parents or patients to stop penicillin therapy and contact health clinic immediately if the patients develop a rash, fever, chills or other signs of allergy.
- Instruct the patients and his family to watch for and report early signs of left ventricular failure, such as shortness of breath & a hacking, non-productive cough.
- Teach the patients and his family about this disease and its treatment. Warn the parents to watch for and immediately report signs of recurrent streptococcal throat infection. Urge them to keep the child away from people with respiratory tract infections and sore throat.
- Help the patients' family understand the frustrations of associated with chorea (nervousness, restlessness, poor coordination weakness, and inattentiveness) Emphasize that these effects will resolve but can last for months.
- Make sure the patient & his families understand the need to comply with prolonged antibiotic therapy and follow-up care and the need for additional antibiotics during dental surgery or other surgical procedures. Arrange for a visiting nurse to over see home care, if necessary.

➤ To the public and Community health workers

The public and community health workers should be taught:

- The mode of transmission
- The control of rheumatic fever and rheumatic heart disease
- Prevention of rheumatic fever and rheumatic heart disease which includes:

Improving environmental condition

- Healthful housing
- Proper nutrition
- Sufficient rest
- Importance of early treatment of the disease and follow up
- The proper use of the prescribed antibiotics
- The need to report the recurrence of the disease

Refer to the Case Study on in section 2.3 of the Core Module and discuss the following questions.

1. What do you think are the predisposing factors for Bisrat's illness?

- A) _____
- B) _____
- C) _____

2. List the methods to prevent recurrences of Bisrat's illness.

- A) _____
- B) _____
- C) _____

3. Which ones should be focus areas for health education to Bisrat's family?

- A) _____
- B) _____
- C) _____
- D) _____

3.5 Satellite Module for Community Health Workers

Introduction

Sore throat and the danger of rheumatic fever

For the sore throat that often comes with the common cold or flu, antibiotics should usually not be used and will do no good treat with gargles and acetaminophen (paracetamol).

However, one kind of sore throat called streptococci sore throat should be treated with penicillin. It is most common in children and young adults. It usually begins suddenly with sore throat and fever, often without signs of a cold and cough. The back of the mouth and tonsils may become very red, and the lymph nodes under the jaw may become swollen and tender.

Give penicillin orally for 10 days or a single injection of benzathin penicillin (1.2 million units in adults and 25,000units/kg to maximum of 1.2million units).If penicillin is given early and continued for ten days, there is less danger of getting rheumatic fever .A child with streptococci sore throat should eat and sleep far apart from others to prevent them getting it also.

Rheumatic Fever

This is a disease of children and young adults. It usually begins 1 to 3 weeks after the person has had a streptococci sore throat.

Principal signs (usually only 3 or 4 of these signs are present):

- ❖ Fever
- ❖ Joint pain, especially in the wrists and ankles, later the knees and elbows as well. Joints become swollen, and often tender.
- ❖ Lumps under the skin
- ❖ In more serious cases, weakness, shortness of breathe and perhaps heart pain.

N.B. Rheumatic fever often causes scarring of the heart valves and is a very common of heart disease in children and adults in Ethiopia. Some studies show that over half of the heart disease in Ethiopia is caused by rheumatic fever.

Treatment:

If you suspect rheumatic fever, refer to a health center. There is a risk that the heart may become damaged.

Take Aspirin in large doses (100mg/kg/24hours) in four divided doses.

Give Ampicillin/Amoxicillin 50mg/kg/24hours 3-4X/day for ten days or a single dose of benzathin pencillin IM

Prevention:

To prevent rheumatic fever, treat streptococci sore throat early.

To prevent return of rheumatic fever and added heart damage, a child who has once had rheumatic fever should take penicillin at the firs sign of sore throat. If he already had heart damage, he should take penicillin on a regular basis or has monthly benzathin pencillin injection, perhaps for the rest of his/her life.

Follow the advice of an experienced health worker or a doctor.

ANNEX I. ROLE AND TASK ANALYSIS BASED ON LEARNING OBJECTIVES AND ACTIVITIES

Table 1: Knowledge objective and activities for professionals

S.N	Learning objective	Health officer	Environmental health technician	Public health Nursing	Medical Laboratory technician
1	Define rheumatic fever and rheumatic heart disease	Define rheumatic fever and rheumatic heart disease	Define rheumatic heart disease and rheumatic fever	Define what rheumatic fever & rheumatic heart disease mean.	Define what rheumatic fever & rheumatic heart disease mean.
2	Describe the epidemiology of rheumatic heart disease	Describe the epidemiology of rheumatic heart disease	List risk factors for rheumatic fever & rheumatic heart disease Explain mode of transmission	List risk factors for rheumatic fever & rheumatic heart disease Explain mode of transmission	Describe the epidemiology of rheumatic heart disease
3	Describe pathogenesis of acute rheumatic fever	Explain the pathogenesis of acute rheumatic fever and rheumatic heart disease	Identify the etiology of rheumatic heart disease and rheumatic fever Out line the pathogenesis of rheumatic heart disease and rheumatic fever	Describe the major cause of rheumatic fever & pathogenesis of rheumatic heart disease	Describe the pathogenesis of acute rheumatic fever
4	Know about the clinical manifestations and diagnostic approach about acute rheumatic fever ad rheumatic heart disease	Describe each clinical manifestation of acute rheumatic fever and describe the modified Jones criteria for the diagnosis of acute rheumatic fever	List the clinical manifestation and diagnostic approach	List the clinical feature and know different diagnostic approach of rheumatic heart disease & rheumatic fever	List the different laboratory tests used in the diagnosis of acute rheumatic fever and mention the methods of performing each diagnostic test

5	Describe the principles of management acute rheumatic fever and its complications	Describe the management of a patient with acute rheumatic fever and rheumatic heart disease	Explain the methods of prevention and control	Understand the principles of management of rheumatic fever	Explain the methods of prevention and control
6	Explain ways of prevention of acute rheumatic fever and rheumatic heart disease	Explain ways of prevention of acute rheumatic fever and rheumatic heart disease		Explain different methods of prevention for rheumatic fever & rheumatic heart disease	

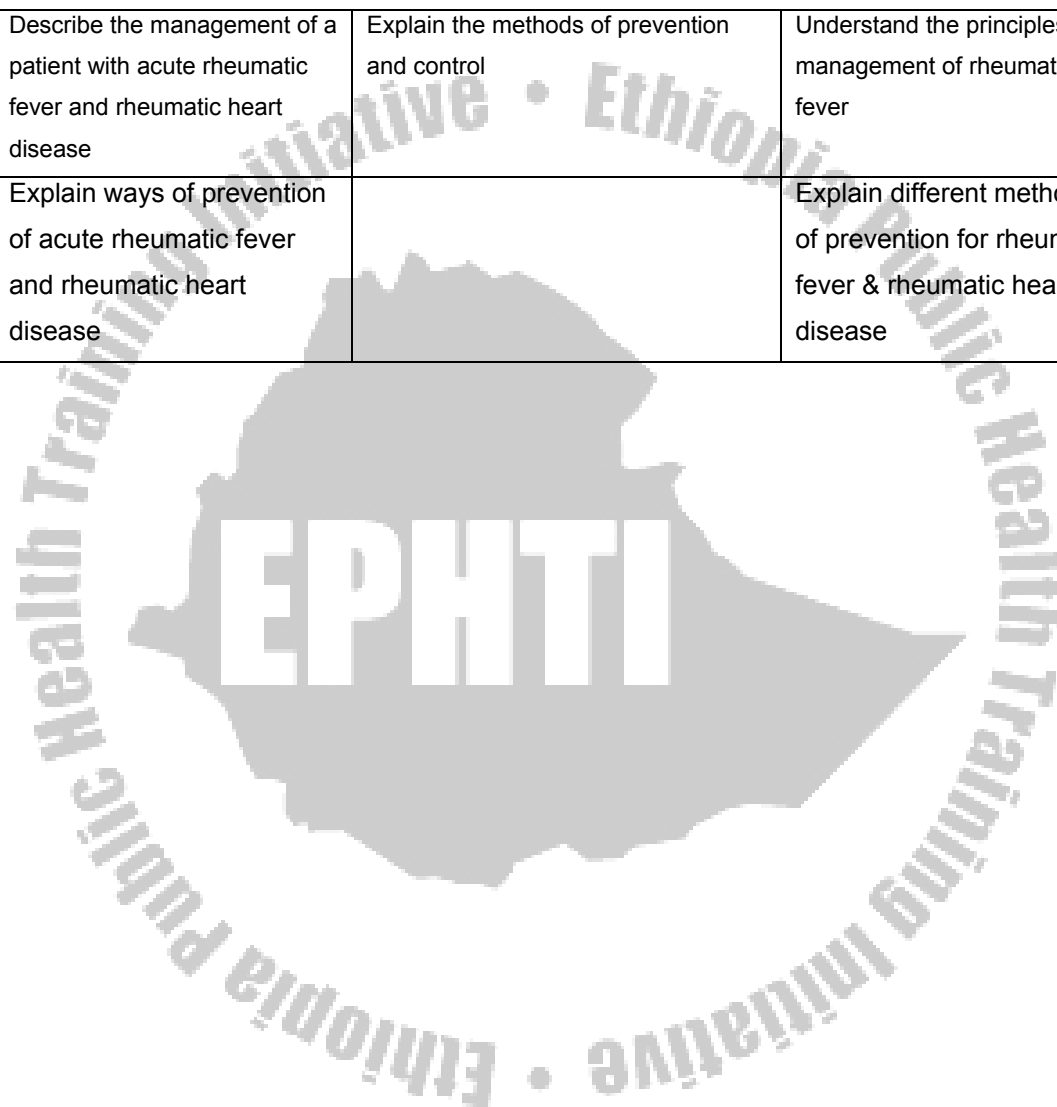


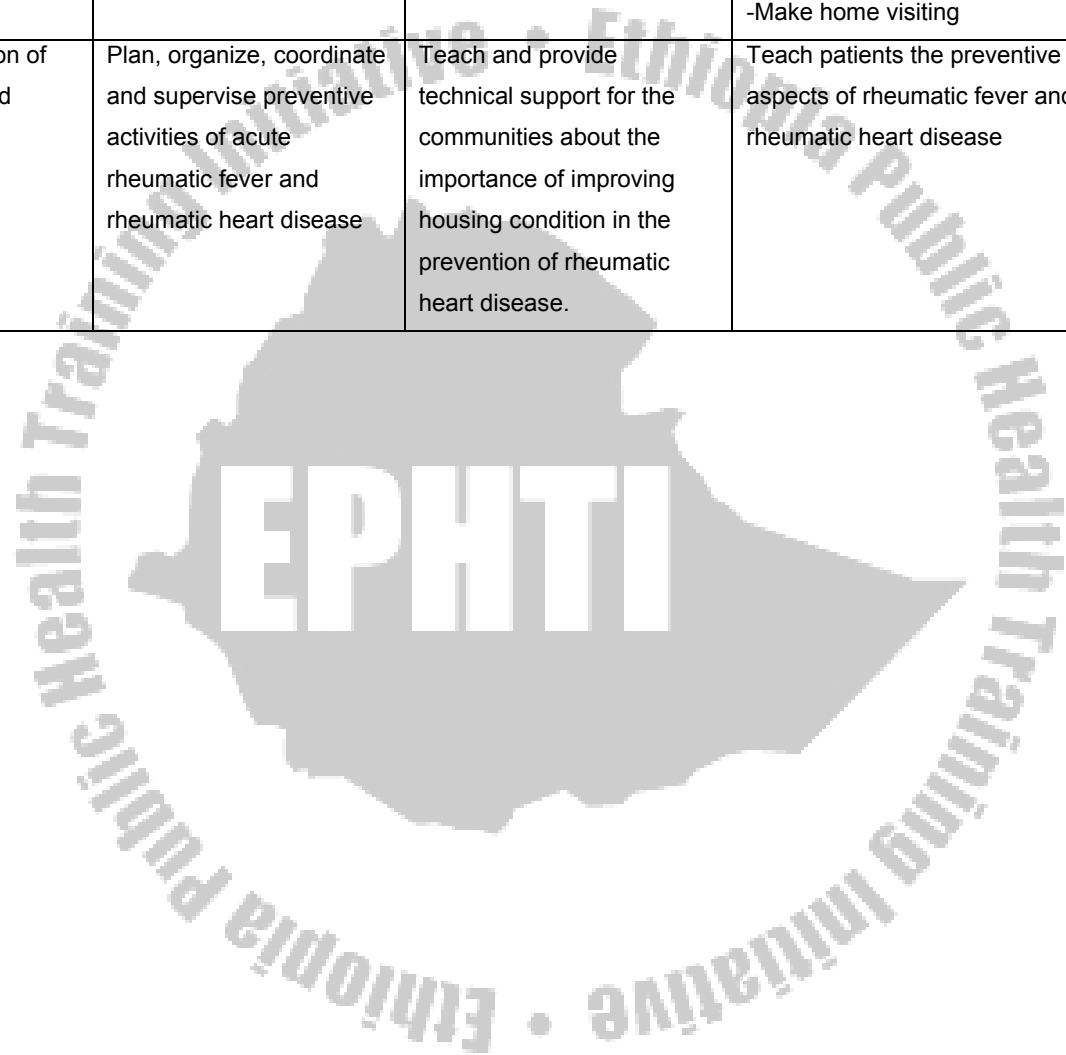
Table 2. Attitude objectives and activities professional students

S.N	Learning objective	Public Health officer	Environmental Health Technician	Public Health Nursing	Medical Laboratory Technician
1	Be encouraged to know about rheumatic fever and rheumatic heart disease	Be encouraged to know about rheumatic fever and rheumatic heart disease	Be encouraged to know about rheumatic fever and rheumatic heart disease	Be encouraged to know about rheumatic fever and rheumatic heart disease	Be encouraged to know about rheumatic fever and rheumatic heart disease
2	Believe on the importance of the epidemiology of rheumatic heart disease	Discuss the difference between the epidemiology of rheumatic heart disease in developed and developing nation	Discuss the role of risk factors in prevention of the disease	Discuss the role of risk factors in prevention of the disease	Discuss the role of risk factors in prevention of the disease
3	Give value to the pathogenesis of acute rheumatic fever	Discuss the pathogenesis of acute rheumatic fever and rheumatic heart disease		Give value to the pathogenesis of acute rheumatic fever	Give value to the pathogenesis of acute rheumatic fever
4	Give emphasis about the clinical manifestation ad diagnostic approach about acute rheumatic fever ad rheumatic heart disease	Give emphasis about the clinical manifestation ad diagnostic approach about acute rheumatic fever ad rheumatic heart disease	Give emphasis about the clinical manifestation ad diagnostic approach about acute rheumatic fever ad rheumatic heart disease	Promote treatment seeking behavior of the patient and family when sign and symptoms of acute rheumatic fever and rheumatic hear disease are observed	Justify on the importance of the collection of blood & throat specimens for diagnosis of acute rheumatic fever
5	Give value to the principles of management acute rheumatic fever and its complication	Give value to the principles of management Acute rheumatic fever and its complication		Believe in the care of a patient with rheumatic fever and rheumatic heart disease and its complication	
6	Accept the importance of ways of prevention of acute rheumatic fever and rheumatic heart disease	Verify ways of prevention of acute rheumatic fever and rheumatic heart disease	Believe in importance of contacts and the immediate environments in the control of the disease	Accept the importance of ways of prevention of acute rheumatic fever and rheumatic heart disease	Accept the importance of ways of prevention of acute rheumatic fever and rheumatic heart disease

Table 3. Practice objective and activities professional students

s. N	Learning objective	Health officer	Environmental health technician	Public health Nurse	Medical laboratory technician
1	Define rheumatic fever and rheumatic heart disease				
2	Show why rheumatic fever and rheumatic heart disease are prevalent in developing nation	Carry out a small scale research to show why rheumatic fever and rheumatic heart disease are prevalent in your area of working	Coordinate with the health team in Showing why rheumatic fever and rheumatic heart disease are prevalent in developing nation	Coordinate with the health team in showing why rheumatic fever and rheumatic heart disease are prevalent in developing nation	Coordinate with the health team in showing why rheumatic fever and rheumatic heart disease are prevalent in developing nation
3	Draw the summary of the pathogenesis of acute rheumatic fever	Draw the summary of pathogenesis of acute rheumatic fever		Draw the summary of pathogenesis of acute rheumatic fever	Draw the summary of pathogenesis of acute rheumatic fever
4	Draw the summary of the clinical manifestation and diagnostic approach about acute rheumatic fever and rheumatic heart disease	Draw the summary of the clinical manifestation and diagnostic approach about acute rheumatic fever and rheumatic heart disease		Practice different ways of assessment of patient -Gathering information by interview -Physical assessment like vital sign	Carry out the tests properly for diagnosis of cases of rheumatic fever
5	Manage a patient with acute rheumatic fever and its complications	Manage a patient with acute rheumatic fever and its complications		-Treat the patient as prescribed -Give medication properly as prescribed -Practice aseptic technique during administration of medication	Do appropriate diagnostic assays and present result to the treating health professional

				-Follow up the patient -Make home visiting	
6	Explain ways of prevention of acute rheumatic fever and rheumatic heart disease	Plan, organize, coordinate and supervise preventive activities of acute rheumatic fever and rheumatic heart disease	Teach and provide technical support for the communities about the importance of improving housing condition in the prevention of rheumatic heart disease.	Teach patients the preventive aspects of rheumatic fever and rheumatic heart disease	Teach patients the preventive aspects of rheumatic fever and rheumatic heart disease

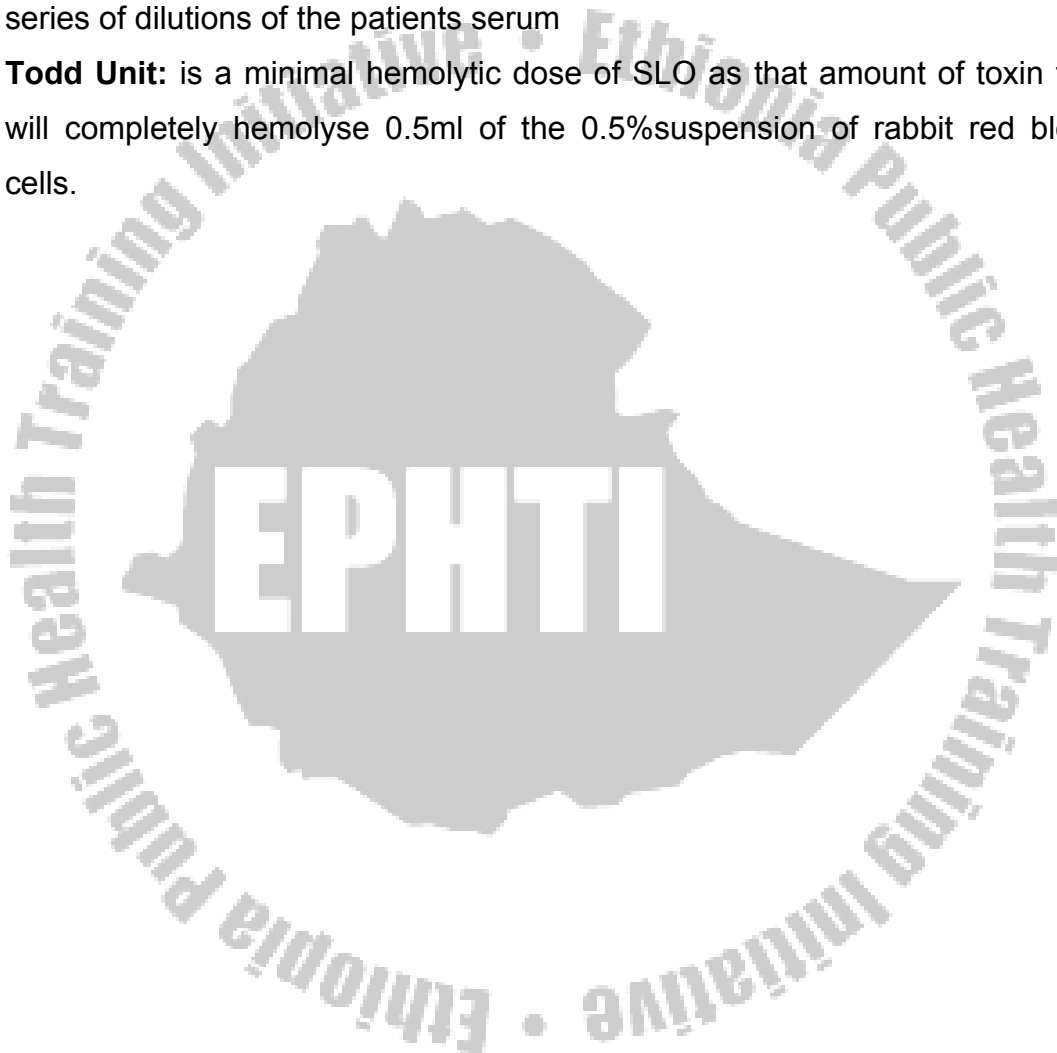


ANNEX II

GLOSSARY

2. **Nursing process** is a short hand term used to convey a systematic process of recognizing and acting on those human needs with which nurses can help
3. **Nursing assessment** is the act of gathering and analyzing information, which designates problems that requires nursing help
4. **Nursing diagnosis** is a problem plus its cause and manifestations which is a response to a health or illness situation for which the patient needs help
5. **Nursing Implementation /Intervention** refers to the actual carrying out of the plan, with continual monitoring of the expected effects vis-à-vis what one sees happening at the moment.
6. **Evaluation** refers to comparing the actual out comes to those expected (the out come criteria on the care
7. **Predisposing (risk) factors** - factors that make a person at risk of getting disease or problem
8. **Migratory arthritis** - inflammation of a joint, which moves from one joint to the other.
9. **Macular lesion** - flat skin lesion.
10. **Arthritis** – inflammation of a joint.
11. **Arthralgia**- joint pain
12. **Agglutination:** is the visible clumping together of polymerse latex particles coated with SLO antigen corresponding antistreptolysin O antibody
13. **Anti-DNAaseB B:** is antibody against the streptococcal enzyme DNAaseB that breaks down Deoxyribonucleic acid
14. **Anti-hyaluronidase:** is an antibody against the streptococcal enzyme Hyaluronidase that breaks down hayaluronic acid
15. **Anti-streptokinase:** is an antibody against the streptococcal enzyme Streptokinase that causes fibrinolysis
16. **Antistreptolysin O:** are antibodies that effectively neutralize the hemolytic action of streptolysin O

17. **EDTA:** is an anticoagulant used in collection of venous blood
18. **Hemolysins:** substances causing lyses of red and white blood cells
19. **Hemolysis:** lyses of red and white blood cells
20. **Streptolysin O:** is a bacterial toxin produced by virtually all strains of *S. Pyogenes*.
21. **Titration:** is an addition of a constant amount of streptolysin O antigen to a series of dilutions of the patients serum
22. **Todd Unit:** is a minimal hemolytic dose of SLO as that amount of toxin that will completely hemolyse 0.5ml of the 0.5% suspension of rabbit red blood cells.



ANNEX III

ABBREVIATIONS

RHD:	Rheumatic Heart Disease
RF:	Rheumatic Fever
ARF:	Acute Rheumatic Fever
SLO:	Streptolysin O
ASO:	Antistreptolysin O
DNAaseB:	Deoxyribonuclease B
IU/ml:	International Unit per milliliter
NaCl:	Sodium Chloride
FP:	False Positive
EDTA:	Ethylenediamine tetra-acetic acid
CRP:	C-reactive protein
ESR:	Erythrocyte sedimentation rate
SBE:	Subacute bacterial endocarditis
GABHS:	Group A β -hemolytic streptococci
ACE:	Angiotensin converting enzyme
MR:	Mitral regurgitation
AR:	Aortic regurgitation
CHF:	Congestive heart failure
JVP:	Jugular venous pressure
QID:	Every 6 hours (4x/day)
CXR:	Chest x-ray
EKG:	Electrocardiogram
ASA:	Acetyl salicylic acid
WBC:	White blood cell count
BP:	Blood Pressure
PR:	Pulse Rate

ANNEX IV

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