Acute Rheumatic Fever & Rheumatic Heart Disease
Diagnosis, Management and Prevention

Physician Training Module
Contents

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2. Primary Prevention:  
   Diagnosis and management of Sore Throat
3. Secondary Prevention:  
   Diagnosis and management of Acute Rheumatic Fever
4. Safe Administration of Benzathine Penicillin
5. RHD and Control Programs
Course Objectives

To have good knowledge on:

1. Diagnosis and management of bacterial pharyngitis
2. Diagnosis and management of acute rheumatic fever
3. Safe administration of Benzathine penicillin
4. Rheumatic Heart Disease (RHD) and its control program
Pre- Test

Chose the best answer:

1. The best way to **diagnose** Bacterial Pharyngitis (BPh) in patients 3-18 years of age in endemic areas is by:
   A. Clinical findings                                     B. Throat culture and rapid antigen test
   C. High leukocyte count  D. High ESR

2. The best way to **treat** BPh in patients 3-18 years is:
   A. Oral penicillin or cephalosporin for 5-7 days  B. IM Benzathine penicillin (one injection)
   C. Azithromycin for 3 days                       D. Erythromycin for 7 days

3. **Primary prevention** of acute rheumatic fever (ARF) means:
   A. Prompt diagnosis and treatment of BPh  B. Giving 3 weekly penicillin
   C. Diagnosis and treatment of ARF  D. Management of rheumatic Heart Disease
4. Which one of the following is a **major** criteria of ARF:
A. Fever  
B. High ESR  
C. Monoarthritis  
D. High ASO

5. Which one of the following is a **minor** criteria of RF:
A. Monoarthritis  
B. Polyarthralgia  
C. Skin nodules  
D. Monoarthralgia

6. Which one of the following is **not** a feature of rheumatic carditis:
A. Pansystolic apical murmur  
B. Early diastolic murmur with large volume pulse  
C. Heart failure without murmurs  
D. Large volume pulse with Corigan sign

7. Diagnosis of ARF in **new patients** includes:
A. One major criteria plus high ASO titre  
B. 2 minor criteria plus high ASO titre  
C. Subclinical carditis plus high ASO  
D. Two major plus high ASO

8. Diagnosis of **RECURRANCE** OF ARF is made with:
A. Two minor criteria plus high ASO titre  
B. Is made in the same way of new episode ARF.  
C. Carditis without other criteria  
D. Fever with high ASO
9. Treatment of ARF includes all the following except:

A. High dose Aspirin   B. Bed rest   C. Benzathin penicillin   
D. Steroids in all patients with carditis.

10. Secondary prophylaxis of ARF means:

A. Giving 3 weekly benzathine penicillin to prevent recurrence 
B. Giving benzathine penicillin to all patients with high ASO titre 
C. Aspirin in a dose of 75 mg per kg per day for 4 weeks 
D. Single injection of benzathine Penicillin for sore throat.

11. When giving benzathine penicillin:

A. Skin test should NOT be done   B. You need to have adrenalin 
C. Lidocaine is used to decrease pain   D. All the above
Introduction
RHD

- RHD is inflammation of heart valves that follows infection with Group A beta hemolytic streptococcus, commonly pharyngitis.
Bacterial Pharyngitis

Acute Rheumatic Fever

Rheumatic Heart Disease: heart failure, heart surgery, death
RHD is a Global Health Problem

• 18 Million people affected, mainly from developing countries
• The most common cause of acquired heart disease in the young

Painful Facts

• Most patients in developing countries present with severe disease due to late diagnosis
• Only a minority have access to surgery
• Valve replacement: costs 4-10 000 USD and not readily available
• Poor long term outcome after surgery

RHD is preventable with early diagnosis and management of strep pharyngitis and ARF
The Levels of RHD Prevention
Primary Prevention

Secondary Prevention

Tertiary Prevention

Primordial Prevention

Socioeconomic conditions and access to health care

- Treatment of RHD
- Management of & Prophylaxis of ARF
- Treatment of Bacterial Pharyngitis
Primary Prevention
Definition of Primary Prevention

“Prompt diagnosis and treatment of Streptococcal pharyngitis”
Sore Throat

- Mostly viral
- Bacterial about 30% caused by Group A streptococcus (GAS)
- Diagnosis of Bacterial Pharynges is clinical
Bacterial Pharyngitis
- Pharyngeal Membrane
- Cervical lymph nodes
- Fever >38
- Absent runny nose and cough

Viral Pharyngitis
- Runny nose
- Cough
- Hoarseness
How can we diagnose bacterial pharyngitis?

- Diagnosis is clinical
- Not practical to do throat cultures or rapid antigen test in limited resource settings.
ASO Titer:
NO role in acute Pharyngitis

Titers increase only 7 to 14 days after the onset of infection and remain high for weeks

Clinical Algorithms for Bacterial Pharyngitis
WHO: IMCI Program uses 3 Points

- fever **OR** Sore throat **AND**
  Two of the following:
  - Red (congested) throat
  - White or yellow exudate on the throat or tonsils.
  - Enlarged tender lymph node(s) on the front of the neck.

<table>
<thead>
<tr>
<th>STREPTOCOCCAL SORE THROAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Give benzathine penicillin.</td>
</tr>
<tr>
<td>□ Soothe the throat with a safe remedy.</td>
</tr>
<tr>
<td>□ Give paracetamol for pain.</td>
</tr>
<tr>
<td>□ Advise mother when to return immediately.</td>
</tr>
<tr>
<td>□ Follow up in 5 days if not improving.</td>
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</tbody>
</table>
WHO Algorithm: 3 POINTS

• 12% sensitive and 94% specific
• Missed 88% of children with positive cultures

2 Point Algorithms

Two of the following (sore throat, fever, pharyngeal erythema and pharyngeal exudates)

Sensitivity of 80% and specificity of 40%.


The Mosi-o-Tunya Call to Action

• Treat all children with sore throat with BPG

Bongani M Mayosi, Habib Gamra, Jean-Marie Dangou, Joseph Kasonde, for the 2nd All-Africa Workshop on Rheumatic Fever and Rheumatic Heart Disease participants. Rheumatic heart disease in Africa: the Mosi-o-Tunya call to action. The Lancet 2014;2:e438-9
Proposed Clinical Algorithm
In patients 3-18 years

High risk area

1. Sore throat
2. No runny nose/cough

Low risk area

Sore throat and No runny nose/cough and one of the following:

1. Cervical lymph node
2. Enlarged congested tonsils
3. A membrane on the throat/tonsils
Important

• Bacterial pharyngitis can affect tonsils (tonsillitis) or peritonsilar area
• Tonsillectomy may decrease but does not prevent ARF
Treatment of Bacterial Pharyngitis

• One injection Benzathine penicillin (IM)
  - 1.2 million units > 7 years
  - 600 000 units < 7 years of age
  - Ask about family members with sore throat and treat.
  - Educate family about B Pharyngitis

See section on safe administration of BPG
Why Benzathine Penicillin?

- Single injection
- Better bactericidal effect than oral
- Oral ttt needs **10 whole days** to be effective
- Oral macrolides: clinical improvement but no eradication of organism.
- Cost effective, evidence based.
- Parents and patients more satisfied.
Summary

• Simple clinical protocol for diagnosis of bacterial pharyngitis using one or 2 points

• Treat with BPG
Questions on Primary Prevention

1. The best way to diagnose Bacterial Pharyngitis (BPh) in patients 3-18 years of age in RHD endemic areas is by:
   A. Clinical findings                                   B. Throat culture and rapid antigen test
   C. High leukocyte count                               D. High ESR

2. The best way to treat BPh in patients 3-18 years is:
   A. Oral penicillin or cephalosporin for 5-7 days       B. IM Benzathine penicillin
   C. Azithromycin for 3 days                           D. Erythromycin for 7 days

3. Primary prevention of acute rheumatic fever (ARF) means:
   A. Prompt diagnosis and treatment of BPh              B. Giving 3 weekly penicillin
   C. Diagnosis and treatment of ARF                    D. Management of RHD
Adam is 7 years old complaining of sore throat for one day, which one of the following signs favors bacterial over viral pharyngitis:

a. Horse voice
b. High ASO titre
c. Cough
d. Fever of 37.8 degrees
e. Absence of runny nose
Secondary Prevention
Definition

Early diagnosis and management of acute rheumatic fever (ARF)
Bacterial Pharyngitis

Acute Rheumatic Fever

Rheumatic Heart Disease: heart failure, death, heart surgery
Bacterial Pharyngitis

Acute Rheumatic Fever

Rheumatic Heart Disease: heart failure, death, heart surgery
Acute Rheumatic Fever (ARF)

• Complication of Strep Pharyngitis.
• Occurs in 0.3-2% of patients who have GAS pharyngitis
Diagnosis: The Jones Criteria

1. Major criteria
2. Minor criteria
3. Evidence of strep infection: ASO titre
Jones Criteria – 2015 Update

1. Inclusion of subclinical carditis (echo diagnosed) as a major criteria.
2. Monoarthritis as a major criteria
3. Polyarthralgia as a major criteria
4. Monoarthralgia as a minor criteria

Jones Criteria (2015 Modification)

**Major Criteria**

1. Carditis (clinical or **echo diagnosed**)
2. Arthritis: polyarthritis; **monoarthritis & polyarthralgia** in high risk areas
3. Chorea
4. Erythema marginatum
5. Subcutaneous nodules

**Minor Criteria**

1. Fever
2. Polyrthritis, **monoarthralgia** in high risk areas
3. Increased acute phase reactants
4. Prolonged PR interval
3 Categories of ARF

**New Episode**
- 2 Major OR
- One major plus 2 minor
- High ASO

**Recurrent Episode**
- One major OR
- 2 minor
- High ASO

**Probable (atypical) ARF**
- Fewer criteria
- Variable ASO
Major Criteria: Arthritis and polyarthritis

• Migratory: Large joints
• Maximum severity in 12-24 hours, persists for 2-6 days
• Resolves spontaneously (dangerous as pt will not seek to medical care).
Major Criteria: Carditis

- Mitral regurgitation is the most common followed by combined aortic and mitral regurgitation.
Clinical Features of Carditis

- **Congestive Heart Failure with Murmurs (severe disease)**
  - Tachypnea
  - Tachycardia
  - Cardiomegaly
  - Hepatomegaly
  - Murmurs

- **Murmurs Only (milder disease)**
  - Pansystolic apical murmur
  - Mid diastolic apical flow murmur
  - Early diastolic aortic murmur

- **Sub clinical Carditis (early disease)**
  - No murmurs
  - Echo findings: morphologic and Doppler valve dysfunction
Echo Features of Subclinical Carditis

Mitral

Morphologic Criteria
- Anterior Mitral valve leaflet thickening
- Chordae thickening
- Excessive leaflet tip motion
- Restricted Opening

Doppler Criteria
- MR jet => 2 cm
- Seen in 2 views
- Velocity ≥3 m/s for one complete envelope
- Pan systolic jet of MR
Echo Features of Subclinical Carditis

Aortic

**Morphologic Criteria**
- Irregular thickening
- Cooptation defect
- Prolapse
- Restricted motion

**Doppler Criteria**
- AR jet => 1 cm
- Seen in 2 views
- Pan diastolic jet
- Velocity ≥3 m/s in early diastole
Excessive leaflet tip motion

Restricted Opening

Diagnosis of Subclinical Carditis

**Definite**
- Doppler criteria plus 2 morphologic criteria
- MS mean gradient > 4 mmHg
- Borderline disease of both mitral and aortic valves

**Borderline:**
- Doppler criteria with no morphologic criteria
- 2 Morphologic criteria
Sydenham’s Chorea

• Involuntary, purposeless movements. Emotional lability. Hyperextended joints, hypotonia, diminished reflexes

• When present alone it is enough evidence of ARF.
Erythema marginatum  

Subcutaneous nodules
**Management**

- **Treat Infection**: Benzathine penicillin stat and 3 weekly.

- **Treat Inflammation**: Aspirin in anti-inflammatory doses (75-100mg/kg/d) for 4-6 weeks.
  - Steroids if aspirin is not tolerated or inflammatory markers not coming down.

- **Supportive ttt**: Bed rest, Treatment of heart failure.
Secondary Prevention

• Benzathine penicillin: IM Q3 weeks
  600 000 (<7y)
  1.2 million units (>7y)
Duration of Prophylaxis

• Patients **without carditis**: up to 25 years of age

• Patients **with carditis**: and after valve surgery: Lifelong
Rheumatic Heart Disease
Patho physiology of RHD

Left Sided Heart Failure
(Shortness of Breathing, Cough, Hemoptysis)

Congestive Heart Failure
(Left Heart Failure plus right HF with abdominal and lower limb edema)

End Stage Heart Failure
(Dominant Right Heart Failure with massive edema and decompensation)
Clinical Features of Carditis

Congestive Heart Failure with Murmurs (severe disease)
- Tachypnea
- Tachycardia
- Cardiomegaly
- Hepatomegaly
- Murmurs

Murmurs Only (milder disease)
- Pansystolic apical murmur
- Mid diastolic flow murmur
- Early diastolic aortic murmur

Sub clinical Carditis (early disease)
No murmurs
Echo findings: morphologic and Doppler valve dysfunction
Causes of Decomposition/Worsening

- Arrhythmia
- Pump dysfunction
- Endocarditis
- Recurrence of ARF
- Stopping heart failure treatment
When you see a patient with RHD

R/O active disease (ARF):

- Recurrence of ARF is often missed

Do ESR, CRP, ASO titre and consider *recurrence* of ARF if there is a major or 2 minor criteria and positive ASO

- Recurrence of ARF is often missed
Management of RHD

• **Medical**: anti heart failure treatment

• **Interventional:**
  - Transcatheter Balloon Dilatation: MS
  - Surgical: Valve repair

  Valve replacement

• Even after successful valve repair, recurrence of RHD can occur despite strict adherence to penicillin prophylaxis.
Post Valve Surgery

• Continuous follow up
• Don’t stop Benzathine Penicillin
• In patients with prosthetic valves:
  - Warfarin should not be stopped
  - INR control: target 2.5-3
• Endocarditis prophylaxis
• Dental hygiene
Case Study (2)

Sara is 15 year old girl who has been diagnosed as RHD 2 years ago, she presented with ankle pain for 2 days, which of the following is true:

a. If there is leucocytosis and high ASO, she should receive aspirin in a high dose
b. Recurrence of ARF needs to be considered only if she has fever.
c. We need 2 major criteria to diagnose recurrence of ARF
d. If she is compliant with BPG, no need to request further investigations
e. Ankle pain is considered a minor Jones criteria
Safe Administration of Benzathine Penicillin
## Problems of BPG can be solved

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>The drug is “heavy”</td>
<td>Use appropriate amount of diluents at room temp</td>
</tr>
<tr>
<td>The drug can block the needle</td>
<td>Use a large bore needle</td>
</tr>
<tr>
<td>The drug is painful</td>
<td>Dilute the powder in lidocaine 2% and inject slowly</td>
</tr>
<tr>
<td>Patients fear allergy</td>
<td>Serious allergy is very rare-reassure patients</td>
</tr>
<tr>
<td>Health workers fear allergy</td>
<td>Training of health workers on allergy management help them to be confident</td>
</tr>
</tbody>
</table>
Important

• Skin testing using diluted BPG has **NO ROLE** in prediction of allergic patients
• Don’t perform this Skin testing
• Go by the 5 Steps Protocol

Aiden Long (Associate Professor of Immunology, Harvard Medical School, USA)

Do we need to do skin testing using dilute BPG?. PASCAR RHD Committee Meeting, Cairo, 2017
5 Steps for BPG Administration

Step 1: Ask about BPG allergy

Step 2: Prepare the items needed

Step 3: Prepare the injection

Step 4: Prepare the patient and give injection

Step 5: Observe for 15 minutes
Step 1: Ask about the H/O Allergy

H/O Severe allergy (anaphylaxis)
- DON’T GIVE BPG
- Give Erythromycin

H/O Mild Allergy (hives, itching)
- Give a TEST DOSE: 1/10th of the dose IM
- Observe: If no reaction: Give the rest of the dose
- If there is reaction: Treat the reaction and give Erythromycin

No H/O allergy
Give BPG
Step 2: Prepare the following

1. One 10 ml syringe
2. One 5 ml syringe (Lure Lock)
3. One BPG ampoule 1.2 million units
4. One vial of local anesthetic lidocaine (Lignocaine) 2% (or water for injection)
5. One adrenaline vial 1:1000
6. One antihistamine vial
Lidocaine 2%
Adrenaline 1:1000
BPG 1,2 Million
Lure Lock 5 ml Syringe
10 ml syringe
Antihistamine
Step 3: Prepare the injection:

- Draw appropriate amount of local anesthetic as diluents for the BPG powder (make sure it’s not cold)
- Inject the diluent into the BPG vial
Mix gently till dissolved

Draw in a 5 ml syringe
Insert the large bore needle of the 10ml syringe
Step 4: Prepare the patient and give the injection:

- Ask the patient to lie on the abdomen
- Mark the site of the injection on the gluteus muscle (Figure)
- To minimize pain: press with your thumb over the site for 10 seconds
- Aspirate first to avoid veins then give slowly
Dose:

- For patients 7 years of age or more: 1.2 million units
- For patients less than 7 years of age: 600 000 units
IMPORTANT

NEVER EVER GIVE INTRAVENOUS THIS LEADS TO IMMEDIATE MORTALITY
Step 5: Observe and treat reaction

• Observe for 15 minutes
• If an allergic reaction develops:
  - Local Reaction: Itching, hives:
    - Antihistamine injection
    - Continue observation till well
Systemic: Anaphylaxis

1. Assess ABC: if needed perform CPR
   - Do steps 2, 3, 4 quickly at same time

2. Call for help

3. Inject adrenaline: 0.3 ml (<7 y), 0.5 ml (>7 y) of 1:1000 solution. Can be repeated in 15 minutes

4. Lie the patient with legs up

5. If distressed, give O2

6. IV line: give IV normal saline 10 ml/kg boluses. Can give adrenaline infusion

For Penicillin sensitive Patients

- **Erythromycin** BD for 10 days (for treatment) and for the duration of secondary prophylaxis

**Dose:**

- Less than 7 years: 250 mg BD for 10 days (for treatment) and for the duration of secondary prophylaxis
- More than 7 years: 500 mg BD for for 10 days (for treatment) and for the duration of secondary prophylaxis.
RHD in Pregnancy

- Important cause of maternal mortality
- All girls with RHD should be counseled before pregnancy
- Mild lesion: no problem, F/U and regular use of penicillin
- Severe lesion: contraception, treat lesion before pregnancy
- Early referral for tertiary center
RHD Control Program
Primordial Prevention

Primary Prevention

Secondary Prevention

Tertiary Prevention

- Medical and Interventional Treatment of RHD
- Management of & Prophylaxis ARF
- Treatment of Bacterial Pharyngitis

Improve Socioeconomic conditions and access to health care
Objectives

• To reduce RHD in those <25 years of age by 25% by the year 2025.

The 7 Key Actions to eradicate RHD

- Registries
- Good Quality BPG
- Reproductive Health
- Decentralization
- Tertiary Cardiac Centers
- RHD Control Program
- Partnerships

Steps to Control RHD
(1) Form a committee with all stakeholders
(1) Form a committee with all stakeholders

(2) Training Material (Guidelines and Modules)
(1) Form a committee with all stakeholders

(2) Develop Training Material (Guidelines and Modules)

(3) Integrate into MOH programs
(1) Form a committee with all stakeholders

(2) Develop Training Material (Guidelines and Modules)

(3) Integrate into MOH programs

(4) Public Awareness Material and Campaigns

(5) Basic and follow up data
   - Clinical Registries
   - Echo screening
(1) Form a committee with all stakeholders
(2) Develop Training Material (Guidelines and Modules)
(3) Integrate into MOH programs
(4) Public Awareness Material and Campaigns
(5) Basic and follow up data
   - Clinical Registries
   - Echo screening
(6) Advocacy
Form a committee with all stakeholders

Develop Training Material (Guidelines and Modules)

Integrate into MOH programs

Public Awareness Material and Campaigns

Basic and follow up data
- Clinical Registries
- Echo screening

Advocacy
Public Awareness
Clinical and Echo Data

- Early detection
- Echo screening
- Registries: Manual or electronic
Health Workers’ Training
Summary

1. Jones criteria were modified to include monoarthritis, polyarthralgia and echo as major and monoarthralgia as minor criteria.
2. New entity of Borderline ARF is introduced
3. management of ARF: High dose aspirin for 4 weeks, & BPG q 21 days
4. Use the 5 Step Guidelines for BPG administration, no need for skin testing.
Writing Committee

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