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PREVENTION AND CONTROL OF RHEUMATIC FEVER AND RHEUMATIC HEART DISEASE

Manual for Medical Officers

Directorate General of Health Services
Ministry of Health & Family Welfare
Government of India

2016

Prevention and Control of Rheumatic Fever and Rheumatic Heart Disease

Manual for Medical Officers

Developed by

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Directorate General of Health Services,

Ministry of Health & Family Welfare, Government of India

2016

Message from Director General Health Services

The 'Manual for Medical Officers' is intended for training of Medical Officers at the primary health care level (Primary Health Centres, Community Health Centres and District Hospitals) in the prevention and management of Rheumatic Fever (RF) and Rheumatic Heart Disease (RHD).

The manual would reinforce the conceptual understanding of the cause of Rheumatic Heart Disease, and its relationship with Rheumatic Fever and bacterial (Streptococcal) sore throat. It will provide guidance to the Medical Officers not only to diagnose and treat bacterial sore throat for prevention of Rheumatic Fever, but also to diagnose and treat cases of RF and RHD.

In the primary health care levels, the Medical Officers are expected to clinically diagnose bacterial sore throat and Rheumatic Fever and to treat them (wherever feasible) or to refer suspected cases to higher health facilities. They are also expected to identify cardiac murmur in children and refer suspected RHD cases for cardiac evaluation at the designated referral hospitals. The manual will provide an insight into the existing health programmes of NPCDCS (National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke) and RBSK (Rashtriya Bal Swasthya Karyakram), and the utilisation of the resources and infrastructure therein for the RF/RHD intervention in the existing health system.

This manual will also act as a ready reckoner for anyone involved in the management of Rheumatic Fever and Rheumatic Heart Disease.

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Abbreviations

AYUSH	:	Ayurveda, Yoga, Unani, Siddha, Homeopathy
ASHA	:	Accredited Social Health Activist
ANM	:	Auxiliary Nurse Midwife
GAS	:	Group A beta-haemolytic Streptococcus
CCU	:	Cardiac Care Unit
CHC	:	Community Health Centre
IEC	:	Information Education and Communication
INR	:	International Normalized Ratio
NCD	:	Non-Communicable Disease
NPCDCS	:	National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke
PHC	:	Primary Health Centre/ Primary Health Care
PT	:	Prothrombin Time
RBSK	:	Rashtriya Bal Swasthya Karyakram
RF	:	Rheumatic Fever
RHD	:	Rheumatic Heart Disease
Strep sore throat	:	Streptococcal sore throat

1. Introduction

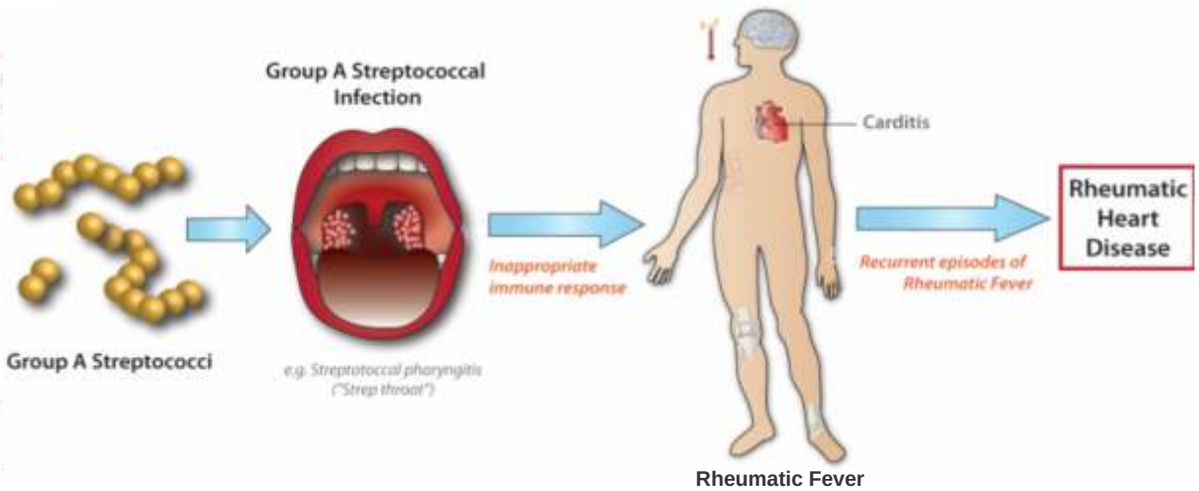
Rheumatic Heart Disease (RHD) is the most common cardiovascular disease in children and young adults, and remains a major public health problem in developing countries like India.

Prevalence of RHD has been increasingly seen in low-income, overcrowded communities with poor housing conditions, under nutrition and inadequate health care services.

Overcrowding and poor housing conditions increase risk of rheumatic fever

RHD manifests as chronic and irreversible heart valve damage, secondary to recurrent episodes of Rheumatic Fever. The damage to the heart valves may necessitate expensive cardiac surgery in severe cases. If the damaged heart valves are not repaired or replaced, the condition may become fatal.

Rheumatic Fever (RF) is an auto-immune disorder that usually manifests as pain and swelling in the joints, besides other signs and symptoms. RF occurs as a result of untreated pharyngitis caused by Group A Beta-hemolytic Streptococcus (GAS).

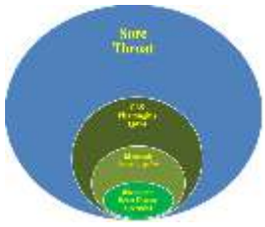


Genesis of RHD

It is important to understand that RF can be prevented by treating GAS infections. If the first RF episode is not prevented, recurrent episodes (which almost always lead to RHD) can be prevented with secondary prevention.

1.1 Burden of RF and RHD

RHD affects more than 1.5 crore people worldwide and causes over 2.3 lakh deaths per year. Almost 50 lakh new cases are added to this pool every year[1]. RF and RHD have been nearly eradicated in developed countries, probably because of better living conditions, and better access to health care facilities. However, it remains a major public health problem in certain pockets of developing countries like India. Since this disease affects children and young adults, its socio-economic impact is significant.



Burden of RF and RHD

1.2 Epidemiology of Rheumatic Fever/ Rheumatic Heart Disease in India

India contributes to about 25% to 50% of newly diagnosed cases of RHD of the world[2]. The disease affects young children and adolescents, mostly from families living in unhygienic and overcrowded conditions. RF occurs at a relatively younger age in India, affecting children as young as 3 years. Further, the disease progresses very rapidly and may produce severe Mitral Stenosis at a very young age. Some studies suggest that females are more severely affected than males[3].

The prevalence of RHD among school children varied from 1.8 to 11 per 1000 (average 6/1000) children in the 1970s and 1980s. Studies conducted in the 1990s showed a relatively lower prevalence of 1.0 to 3.9 per 1000 children[4,5]. Prevalence of 0.5/1000 children was reported from Gorakhpur (UP) in 2007[6], and 0.67/1000 from Vellore and Bikaner[7,8]. Indian Council of Medical Research (ICMR) has also sponsored school surveys in several parts of India at three time periods more than a decade apart[9,10]. The data obtained in these studies also shows a decline in prevalence of RHD, but still the prevalence of RHD in some parts of the country remain high.

There is no data on RHD prevalence in many States of India like Bihar, Jharkhand, Odisha and Chhattisgarh. However, it is more likely that these socio-economically less developed States might be having high burden of RHD. This assumption is further substantiated from the line listing of RHD registers at the Tertiary Care Hospitals in Metro cities of other States.

Similarly the factors associated with rural areas like poor housing, unhygienic living conditions, lack of access to effective health facilities and poor health seeking behaviour could favour the assumption that rural areas have higher RHD prevalence than urban areas.

1.3 Determinants of disease burden

It is well known that socioeconomic and environmental factors play an indirect, but important role in determining the burden of RF and RHD in the community.

The factors that influence the magnitude and severity of RF and RHD include the following:

- Low level of awareness of disease in the community
- Shortage of resources for providing quality health care
- Inadequate expertise of health-care providers
- Health seeking behavior of individuals

The table below gives the details of the determinants of disease burden.

Table.1 : Determinants, their effects and impact on RF and RHD burden.

Determinants	Effects	Impact on RF & RHD burden
Socioeconomic & environmental factors: • Poverty, poor nutrition, overcrowding, poor housing, lack of education	• Rapid spread of Group A Streptococcal strains. • Low-level awareness of the disease in the community • Difficulty in accessing health care facilities	• Higher incidence of acute streptococcal pharyngitis and subsequent complications • Higher incidence of RF • Higher rates of recurrent attacks of RF
Health system related factors: • Shortages of resources for health care; • Inadequate expertise of health-care providers; • Inadequate IEC activities by the health system	• Inadequate diagnosis and treatment of bacterial pharyngitis • Misdiagnosis or late diagnosis of RF • Inadequate secondary prophylaxis and/or non-compliance with secondary prophylaxis	• Higher incidence of RF and its recurrence • Patients unaware of the first RF episode • More severe evolution of disease • Untimely initiation or lack of secondary prophylaxis • Higher rates of recurrent attacks with more frequent and severe heart valve involvement • Higher rates of repeated hospital admissions and expensive surgical interventions

Key Messages

- *India has a large number of RHD patients*
- *RHD is the most common heart disease in children and young adults*
- *RF and RHD are caused by untreated sore throat due to Group A Streptococcus*
- *RHD is a disease of poverty, and so is widespread in low-income and overcrowded communities*
- *RHD can be prevented by prevention and management of Streptococcal pharyngitis and Rheumatic Fever*

Bacterial sore throat

Rheumatic fever

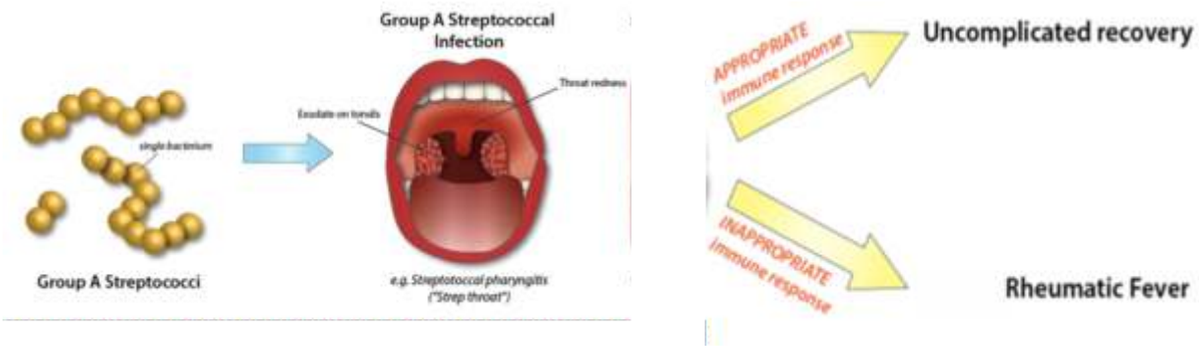
Rheumatic heart disease

2. Bacterial Sore Throat

Rheumatic Fever follows untreated infection with a bacterium called “Group- A Beta hemolytic Streptococcus” (GAS). In some susceptible individuals, when the immune system of the body tries to fight off the streptococcal infection it targets certain parts of its own body, thereby causing damage to these parts. This is called autoimmune reaction. An autoimmune reaction to Streptococcal throat infection produces Rheumatic Fever.

2.1 Group-A Streptococcal infection

Group-A Streptococcus is a bacterium that is commonly present in the environment, but may cause throat infection (also called ‘Strep sore throat’) or skin infection.

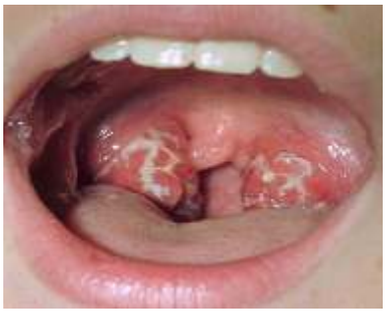


Inappropriate immune reaction to Streptococcal pharyngitis leads to RF

Most (80% or more) sore throats are caused by viruses. Strep sore throat is caused by bacteria (Group A Streptococcus), which colonise in the throat and tonsils. Sore throat caused by bacteria is generally more severe as compared to sore throat caused by virus.

Symptoms and signs of sore throat caused by GAS are as follows:

- It lasts longer than usual (over 5-7 days)
- Very painful
- Causes difficulty in swallowing, even own saliva
- Associated with high fever (>38^{o}C or 100^{o}F)
- Pus is present on back of throat and/or white patches seen over tonsils
- Hoarseness of voice may last for more than two weeks
- Swollen lymph nodes found in the neck



Signs of bacterial sore throat

Table.2: Differentiation of bacterial sore throat from viral sore throat

Symptom/ Sign	Bacterial sore throat (e.g. GAS)	Viral sore throat
Pain in throat	Severe	Mild or absent
Difficulty in swallowing	Very prominent	Mild
Fever	Always present High grade (≥38^{o}C or ≥100^{o}F)	Absent or mild (<38^{o}C or <100^{o}F)
Pus/white patches on back of throat/tonsils	Present	Absent
Enlarged neck lymph nodes	Present	Rarely seen
Duration of illness	More than 5-7 days	Less than 4-5 days
Hoarseness of voice lasting more than 2 weeks	May be present	Absent
Common cold symptoms like running nose, sinus congestion, conjunctivitis etc.	Absent	Very prominent

Streptococcus bacteria can easily spread from person to person as it is highly contagious. The bacteria spread to other people through coughing and sneezing, by not washing one's hands and by sharing toothbrushes, food utensils and drinks.

Children (5-15 years) tend to get strep sore throat most often during school years because they spend a lot of time in close proximity in class rooms. Overcrowding, unhygienic conditions, poor access to health care facilities and poor health seeking behaviour of individuals also increase the incidence of strep infection.

2.2 Diagnosis of Streptococcal sore throat

Although one can suspect strep sore throat clinically based on the signs and symptoms mentioned above, the final confirmation is by throat swab culture. Since culture results take time, antibiotics should be started empirically, if the clinical suspicion is strong. A rapid antigen test kit has been developed but is expensive and currently not available in India.

Examination of throat in a child having sore throat

2.3 Treatment of Streptococcal Pharyngitis

Being a bacterial infection, it is mandated to treat Streptococcal sore throat with antibiotics, besides symptomatic treatment. Treating strep sore throat will prevent development of Rheumatic Fever and its dreaded complication, Rheumatic Heart Disease.

Penicillin has been shown to be very effective for treatment of strep sore throat. A course of Oral Penicillin (Penicillin V), if available, should be given for a total period of 10 days. Alternatively, one can use a single deep intramuscular injection of long acting Penicillin (Benzathine Penicillin), if facilities for its administration are present. However, Penicillin allergy must be ruled out before its administration.

In those allergic to Penicillin, other antibiotics (as detailed in table below) may be used for treatment of strep sore throat. However, it must be remembered that Sulphonamides or Tetracycline are not recommended for treatment of strep sore throat.

Table.3 : Details of antibiotics for treatment of Streptococcal Sore Throat [11, 13]

Drug	Dose	Frequency and duration
Penicillin V (Phenoxymethyl Penicillin) (oral) *To be given one hour before or two hours after meals. Contraindicated if Penicillin allergy present*	Children: 250 mg Adults: 500 mg	Three times a day for 10 days Two times a day for 10 days
Benzathine penicillin G (deep IM injection) *To be given after sensitivity test. Contraindicated if Penicillin allergy present*	For those >27 Kg: 12 lakh unit For those ≤27 Kg: 6 lakh unit	Single Dose Single Dose
Amoxicillin (oral) *Contraindicated if Penicillin allergy present*	Children: 25 mg/kg/dose Adults: 500 mg	Two times a day for 10 days Two times a day for 10 days
Cefadroxyl (oral)	Children: 15 mg/kg/dose Adults: 500 mg	Two times a day for 10 days Two times a day for 10 days
Cephalexin (oral)	Children: 10-15 mg/kg/dose Adults: 500 mg	Three times a day for 10 days Two times a day for 10 days
Erythromycin ethyl succinate (oral)	Children: 20 mg/kg/dose (maximum dose: 800 mg) Adults: 800 mg	Two times a day for 10 days Two times a day for 10 days

Since the Streptococcal infections are very contagious, children with untreated strep sore throat should be discouraged to attend school to avoid infecting other students. They should also be taught about practicing 'cough hygiene', i.e., covering the mouth either with handkerchief or with sleeve of elbow when coughing or sneezing, to prevent infection to others. Infected children should avoid sharing food or drink with others. However, once treated with antibiotics, they become non-infective to others very quickly.

"Cough-hygiene": Covering the mouth when coughing or sneezing

Key messages

- *Untreated bacterial sore throat causes Rheumatic Fever*
- *It is important to differentiate bacterial sore throat from viral sore throat*
- *Bacterial sore throat is very contagious*
- *Signs and symptoms of Bacterial sore throat:*
  - *High fever*
  - *Pain in throat*
  - *Difficulty in swallowing*
  - *Pus/ white patches on back of throat*
  - *Absence of symptoms of common cold such as running nose*
  - *Lasts more than 5-7 days*
  - *Early treatment with a full course of Penicillin or other antibiotics will prevent RF and thereby RHD*

3. Rheumatic Fever

Rheumatic Fever (RF) occurs as an autoimmune reaction to an untreated Group-A Beta hemolytic Streptococcal infection (GAS). Symptoms and signs of RF may develop in about 2-4 weeks after GAS infection of the throat.

RF is a multisystem disease affecting large joints of the body (arthritis) and the heart (carditis), in addition to skin, brain and subcutaneous tissue. Usually the first symptom is painful joints, with or without swelling of the joints.

3.1 Risk Factors for Rheumatic Fever

The following factors have been associated with an increase in the risk of developing RF:

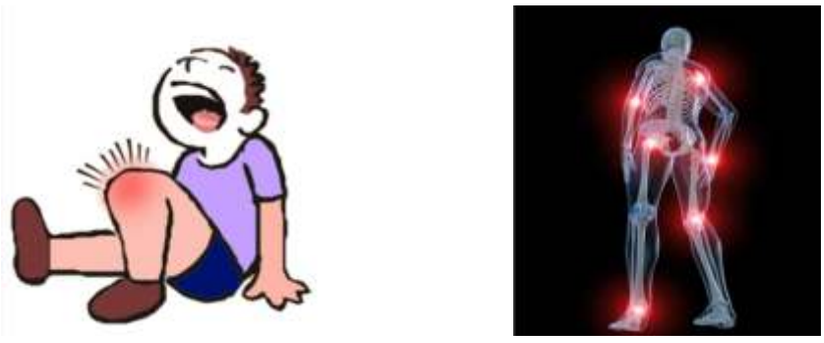
- Overcrowding and poor housing
- Age 5-15 years
- Reduced access to health care
- Tropical climate causing increased transmission of streptococcus
- Lack of knowledge that untreated sore throat can lead to serious heart disease

RF is most common between the ages of 5 and 15 years. It is less common after 35 years and is rare under 4 years or over 40 years of age.

3.2 Clinical Presentation

The manifestation of RF varies among individuals. Commonly, a sore throat may have resolved 1-2 weeks before symptoms of RF begin. Common clinical features of RF include one or more of the following:

a) ***Joint pains*****:** Painful joints is the first symptom of Rheumatic Fever. It is also the most common symptom seen in up to 75% of the first episode of RF. Joints become very painful, swollen and red (this is called arthritis). Typically it affects larger joints (e.g. knees, ankles, elbows) and more than one joint is usually affected (polyarthritis). Pain or swelling in one joint often subsides in a day or two, but only to be replaced by the same problem in another joint. This is called as 'migratory polyarthralgia/ migratory polyarthritis', or in layman's terms as 'shifting joint pain'.



Large joints are mainly affected in Rheumatic Fever

b) ***Fever:*** Fever is often present in initial part of illness, along with joint pain or joint swelling. The fever may not be of high grade, and usually subsides in a few days.

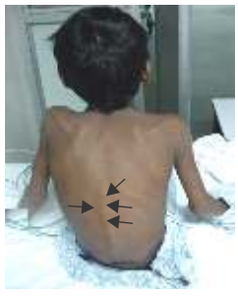
c) ***Carditis (inflammation of the heart):*** Carditis refers to inflammation of the heart and commonly presents as a heart murmur (due to inflammation around the heart valves, heart lining and heart muscle). It is the most serious consequence of Rheumatic Fever and may lead to permanent damage of the heart. Chest pain and breathlessness may occur in severe cases.

d) ***Sydenham's Chorea:*** It is characterized by the following features:

- Twitchy, jerking movements and muscle weakness (most obvious in the face, hands and feet)
- May occur on both sides or only one side of body
- More common in females and teenagers (rare after age 20 years)
- May begin up to 3-6 months after the streptococcal throat infection, and often occurs without other symptoms
- Usually resolves within 6 weeks (may rarely last 6 months or more)

e) ***Subcutaneous nodules*****:** The features of subcutaneous nodules are as follows:

- Painless lumps on the outside surfaces of elbows, wrists, knees, ankles, spine in groups of 3-4 (up to 12 in number),
- The skin is not red or inflamed
- Lasts 1-2 weeks (rarely more than 1 month)
- Nodules are more common when Carditis is also present



Arrows pointing to subcutaneous nodules over the spine in a child with RF

f) ***Erythema marginatum:*** The typical features of Erythema marginatum are as follows:

- Painless, flat pink patches on the skin that spread outward in a circular pattern
- Usually occurs early in RF, but may last for many months, or rarely years
- Usually occurs on the back or front of body, and usually never on the face
- Hard to distinguish in dark-skinned people

Non-specific symptoms of Rheumatic Fever may include cough and abdominal pain, etc., along with other clinical features.

3.4 Investigations for diagnosis of RF

Rheumatic Fever must be suspected in any child presenting with pain or swelling of large joints, with or without fever, if the child has history of sore throat in the recent past. Symptoms of breathlessness, palpitations, chest pain are indicative of carditis due to RF and must be viewed by the medical officer as a serious disease.

Certain investigations to be done for suspected Rheumatic Fever cases include the following:

a. Blood tests:

- **Erythrocyte Sedimentation Rate (ESR):** A high ESR (>30 mm in first hour) is usual in RF. At times the ESR may be very high, going up to 70-80 mm/hour. It is a non-specific test suggestive of infection or inflammation and is not specific for RF. ESR is very useful in follow up of patients who are being treated for RF. It is a minor criterion for diagnosis of RF.

- **C-Reactive Protein (CRP):** This is also a nonspecific test. High CRP, indicative of inflammation, is not specific for Rheumatic Fever. High CRP (>3 mg/dl) is a minor criterion for diagnosis of RF.

- **Anti-Streptolysin O titre (ASO titre):** This test is specific to RF as it tests for evidence of antibodies produced by the immune system in response to the Streptococcal infection. Sometimes the initial value is within normal limits; a rising titre in such situations is very useful for diagnosing RF. The upper limit of normal ASO is considered as 250 units in adults and 333 units in children over 5 years of age. Other Anti-Streptococcal antibodies such as anti-DNASE B can also be used for diagnosis of RF.

b. *ECG:* Sinus tachycardia is commonly seen. Prolong PR interval on ECG is indicative but not diagnostic of RF. Prolongation of PR interval does not necessarily mean presence of carditis in RF. Those with significant involvement of heart valves show atrial and ventricular enlargement. Rarely the heart rate may be irregular due to atrial fibrillation.

c. *X-Ray Chest:* Heart size may be enlarged in those with significant valve disease. In such cases variable degree of features of pulmonary venous and pulmonary arterial hypertension is seen.

d. *Echocardiography:* The nature and severity of valve lesion can be better assessed by echocardiography. Small amount of pericardial effusion and nodular thickening of mitral and/or aortic valve are typical of RF with carditis. This investigation should be done, only if carditis is suspected.

3.5 Diagnosis of Rheumatic Fever

Diagnosis of RF is conventionally made using 'modified Jones criteria'. The 'Jones Criteria' was developed by Dr T Ducket Jones in 1944 as a set of clinical guidelines to help clinicians to make the diagnosis of RF. Since then a number of modifications have been made; most recently in 2015[12], in which the Major and Minor criteria have been defined separately for high risk and low risk populations. From the available data, India falls in the category of moderate/high risk population (i.e. prevalence of RHD is around 1 per 1000 school children or incidence of RF more than 2 per 100,000 school children). The Major and Minor criteria are as given in the table below.

Table.4: Revised Jones Criteria for Diagnosis of Rheumatic Fever

Major criteria	Minor criteria
• Carditis: Clinical and/or Subclinical* • Arthritis: Monoarthritis, Polyarthritis or Polyarthralgia • Sydenham's Chorea • Erythema marginatum • Subcutaneous nodules	• Monoarthralgia • Fever (≥38°C) • ESR ≥30 mm/h, and/or CRP ≥3.0 mg/dl • Prolonged PR interval, after accounting for age variability (unless carditis is a major criterion)

**Subclinical carditis indicates echocardiographic valvulitis.*
CRP: C-Reactive Protein; ESR: Erythrocyte Sedimentation Rate

I. The following criteria are taken into account in Indian context for making diagnosis of RF:

- All patients must have evidence of preceding GAS infection. This could be in the form of positive throat swab culture for GAS, high or rising Anti-Streptolysin O titre or other streptococcal antibodies (anti-DNASE B) etc.
- For diagnosing first episode of RF:
  - Two Major criteria or,
  - One Major plus two Minor criteria
- For diagnosing recurrence of RF:
  - Two Major criteria or,
  - One Major plus two Minor criteria or,
  - Three Minor criteria

II. Sometimes, RF may be difficult to diagnose because of the following reasons:

- A combination of signs and symptoms are often required for diagnosis, and many of these are also seen in other diseases.
- People with RF symptoms do not always present to the health system.
- Health workers are not trained enough to always recognize the signs and symptoms of RF.
- Lack of diagnostic facilities (laboratory facilities for throat culture, blood tests, echocardiography etc.).

Recurrent risk of rheumatic fever: Patients who develop one episode of RF following a strep sore throat, are at a much higher risk for developing further episodes of RF, if they develop recurrent streptococcal infections.

3.6 Treatment of Rheumatic Fever

Points to remember while treating Rheumatic Fever:

- Persons with symptoms of RF after confirmed diagnosis should be treated adequately.
- They should preferably be hospitalized to receive medical care.
- They should be educated about preventing further episodes of RF and development of RHD.
- Mechanism for long-term secondary prophylaxis should be ensured before discharge of patient from hospital.

I. Treatment of initial episode of Rheumatic Fever

- **Joint Pain and Swelling:** Anti-inflammatory medicine to treat the joint pain and swelling is to be prescribed. Paracetamol may be used until the diagnosis is confirmed. Aspirin may be used for confirmed RF cases only in the dose of 50-60 mg/kg/day in 4-6 divided doses. The dose can be increased to 80-100 mg/kg/day in refractory cases for a short period.
- **Chorea:** Most mild to moderate cases of Chorea do not need medication. Haloperidol (0.5 mg/kg/day in three divided doses), Carbamazepine (10 mg/kg/day in two to three divided doses) or Valproic acid (10-15 mg/kg/day in two divided doses) can be given for severe cases. The doses can be increased gradually in non responsive cases.
- **Carditis:** Referral to a higher centre for diagnosis and follow-up care with a physician/ cardiologist is recommended for cases with suspected carditis. Echocardiography is indicated to confirm damage to the heart valves in suspected RHD. Mild carditis may be treated with oral aspirin, given over a long period. However if carditis is severe and associated with heart failure, steroids may be indicated along with treatment of congestive heart failure.
- Bed rest for 2-12 weeks is recommended depending upon the severity of carditis, and presence or absence of heart failure.

II. Management after control of initial episode

People who have had previous attack of Rheumatic Fever are at high risk for a recurrent attack, and this worsens the damage to the heart. Prevention of recurrent attacks of RF is known as secondary prevention. This involves regular administration of antibiotics (preferably Benzathine Penicillin) and has to be continued for many years, as detailed in next section.

Steps to be taken for secondary prevention:

1. Ensure that mechanism for secondary prophylaxis is in place, and initiate treatment.
2. Counseling about treatment adherence and importance of follow up as advised by doctor.
3. Provide information about the disease to the patient with RF and the family.
4. Notify and record in the RHD register.
5. Organize future specialist reviews (if required).
6. Arrange dental review (and provide advice about endocarditis prevention).

3.7 Secondary Prophylaxis

Secondary prophylaxis is the regular administration of antibiotics to prevent recurrence of RF. All cases of RF should receive secondary prophylaxis.

I. Secondary prophylaxis is indicated for the following:

- RF confirmed by the Jones Criteria
- RHD confirmed on Echocardiogram
- RF or RHD not confirmed, but highly suspected

II. Important points to remember about secondary prophylaxis are as follow:

- Secondary prophylaxis is recommended for all people who have a history of RF or RHD.
- Most effective antibiotic is Benzathine Penicillin G given by intramuscular injection at regular intervals.
  - Oral Penicillin may be used; however daily compliance over many years is a concern.
  - Oral Erythromycin is used if there is allergy to Penicillin.
- Regular secondary prophylaxis for the recommended period is very important.

The precautions to be taken and procedure of administering Penicillin injection are detailed in subsequent Chapters.

Table. 5: Drugs and regimen for secondary prophylaxis [11,13]

Drug	Dose	Interval of doses
Benzathine Penicillin G (deep IM injection) *To be given after sensitivity test. Contraindicated if Penicillin allergy present*	• If body weight >27 Kg: 12 lakh unit • If body weight ≤27 Kg: 6 lakh unit	Every 21 days Every 14 days
Penicillin V (oral) *To be given one hour before or two hours after meals. Contraindicated if Penicillin allergy present*	250 mg	Two times a day
Erythromycin ethyl succinate (oral) *Contraindicated in liver disease*	250 mg	Two times a day

There is no data on Azithromycin, Cephalexin or any other antibiotic for secondary prophylaxis in Rheumatic Fever.

It is very important that the child with RF/ RHD does not miss an injection.

III. Duration of Secondary Prophylaxis

The following points should be considered carefully when deciding about the duration of secondary prophylaxis:

- Age: RF recurrence is less common after age 25 years and usually rare after age 40 years.
- Severity of RHD: An additional RF illness could be life-threatening for people with moderate or severe RHD and following valve surgery.
- Carditis during initial RF: Early heart damage increases the risk of further damage with recurrent RF.
- Length of time since last RF: RF recurrence is less common after 5years of last episode.
- Compliance: Regular prophylaxis in the first few years after the initial RF may provide greater protection from recurrences than irregular prophylaxis for many years.
- Disease progression: Evidence of worsening RHD at any stage may require extended prophylaxis.

Table.6: Recommendations for duration of secondary prophylaxis

Category	Duration of Secondary Prophylaxis
Rheumatic Fever with no proven carditis	Minimum of 5 years after last RF episode, or Until age 18 years *(whichever is longer)*
Mild carditis (or healed carditis)	Minimum 10 years after last RF, or Until age 25 years *(whichever is longer)*
Moderate or severe RHD and following Cardiac Surgery	Lifelong (or up to 40 years of age)

Key messages

- *RF is most common between the ages of 5 and 15 years*
- *Risk factors for RF are poverty, overcrowding, poor sanitation, lack of awareness and poor access to health care*
- *Diagnosis is made using modified Jones criteria, but health workers must keep a high index of suspicion in anyone presenting with joint pains*
- *Large joints are involved and joint pain may be migratory in nature*
- *Medical officers must evaluate suspected RF patients for carditis by careful auscultation for a heart murmur*
- *In a suspected case, the diagnosis of RF is confirmed by presence of evidence of recent/past streptococcal infection (e.g. high Anti-Streptolysin O titre etc.)*
- *Cases suspected of having carditis should be referred to a higher centre for cardiac evaluation*
- *It is very important to ensure compliance with regular secondary prophylaxis in all patients of RF to prevent any further damage to heart*
- *Benzathine Penicillin is the drug of choice for secondary prophylaxis*

Rheumatic fever is not infectious to others	**Rheumatic fever does not get inherited**	**Rheumatic fever licks the joints and bites the heart**

4. Rheumatic Heart Disease

Rheumatic heart disease (RHD), which occurs secondary to RF, is a chronic, permanent heart disease. Repeated episodes of RF lead to worsening damage to the heart valves and therefore early diagnosis of RHD is very important. Once diagnosed, regular secondary prophylaxis can prevent further episodes of RF, thereby preventing further progression of valve damage. Echocardiography is an important tool in the diagnosis and regular follow-up of RHD patients.

The mitral valve is affected in over 90% of cases of RHD. The next most commonly affected valve is the aortic valve. Aortic valve disease is generally associated with disease of the mitral valve. The tricuspid valve is rarely affected in RHD, but it can be incompetent due to pulmonary hypertension related right heart failure. Pulmonary valve is hardly ever involved in RHD.

Of all valve abnormalities in RHD, mitral regurgitation is the most common. However mitral stenosis patients are generally much more symptomatic and are more likely to present to a health care facility. In India severe mitral stenosis is common in very young patients and the disease often follows a rapidly progressing course. This is called Juvenile mitral stenosis. A common complication of mitral stenosis is atrial fibrillation. Atrial fibrillation results from fast, chaotic atrial rhythm and an irregular heart rate. Of the aortic valve lesions, aortic regurgitation is common. Aortic stenosis is almost never seen as an isolated lesion and tends to develop as a long term complication of aortic regurgitation.

4.1 Symptoms of RHD

The symptoms of RHD depend upon the valve lesion and its severity. It is important to remember that patients with mild or moderate valve lesions may remain asymptomatic for a long time. With recurrent episodes of RF, the valve lesion progresses and then symptoms appear.

The common symptoms of RHD are as follows:

- Breathlessness on exertion
- Palpitations
- Feeling tired/fatigue
- Chest pain (rarely)

In those with severe valve damage, symptoms progress and these patients develop the following symptoms indicating heart failure:

- Orthopnea (breathlessness on lying down)
- Paroxysmal nocturnal dyspnoea (waking at night with shortness of breath)
- Pedal/Peripheral edema

Some patients, particularly those with atrial fibrillation, may present with a neurologic thromboembolic stroke. People with aortic valve disease may experience angina and syncope in addition to shortness of breath.

4.2 Diagnosis of RHD

History and physical examination are quite typical and therefore clinical diagnosis of RHD is generally quite obvious.

I. General Physical examination

Clinical assessment should be conducted carefully because early detection of RHD in its mild stage can markedly change the outcome. Detailed examination should be done including:

- Heart rate: Beats per minute, regular/ irregular, high volume/ normal volume
- JVP: Raised or normal
- Peripheral edema: Mostly seen on feet
- Respiratory system: Fine crepitations over lung fields suggest evidence of pulmonary edema.
- Examination of precordium: Evidence of cardiomegaly in the form of shift of apex beat. Loud pulmonary component of second heart sound suggesting pulmonary arterial hypertension. Presence of left parasternal lift and thrills. Presence of murmurs.

II. Auscultation for Cardiac Murmurs

Cardiac murmurs are hallmark of RHD. Careful auscultation should be undertaken for timing, duration and site of murmurs. Some of the typical murmurs heard in RHD are summarized below.

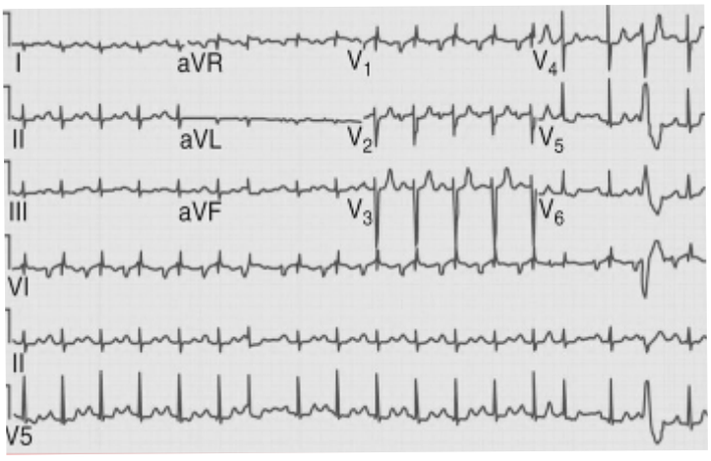
- Mitral regurgitation: The characteristic murmur is a pansystolic murmur heard best at the apex and radiating laterally to the axilla.
- Mitral stenosis: The characteristic murmur is a low-pitched, diastolic rumble heard best at the apex with the bell of the stethoscope and with the person lying in the left lateral position. It is often associated with a thrill.
- Aortic regurgitation: The characteristic murmur is a diastolic blowing decrescendo murmur best heard with the diaphragm of the stethoscope at the left sternal border with the person sitting up and leaning forward in full expiration.
- Aortic stenosis: The characteristic murmur is a loud, low pitched mid-systolic ejection murmur best heard in the aortic area, radiating to the neck.

It is quite usual to hear more than one murmur in a given patient, either due to stenosis and regurgitation coexisting or due to involvement of both mitral and aortic valves. Pansystolic murmur at left lower sternal border due to tricuspid regurgitation is not uncommon, especially in patients with mitral stenosis as pulmonary hypertension is common in them.

III. Investigations

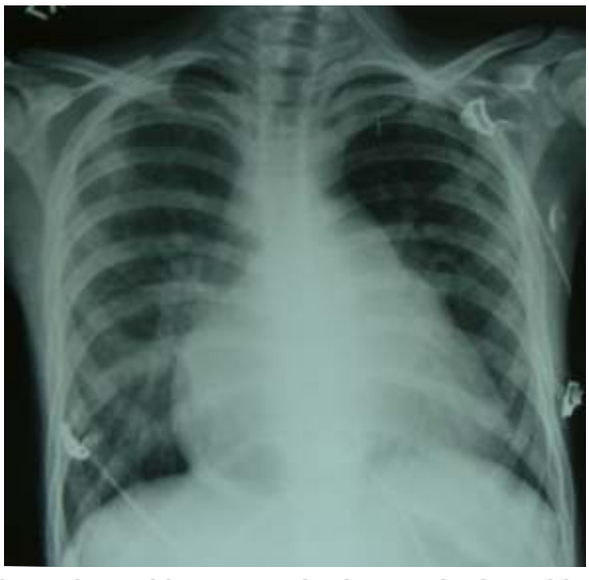
X-ray chest, ECG and Echocardiography further help to determine severity of the valve damage.

a. ECG: In mild cases ECG may be normal. In those with significant valve lesion, ECG shows left atrial enlargement. The left ventricle is also enlarged in patients with mitral and/or aortic regurgitation. The right ventricle is enlarged and hypertrophied secondary to pulmonary hypertension, most noticeable in severe mitral stenosis. In older patients with long standing RHD, ECG shows atrial fibrillation.



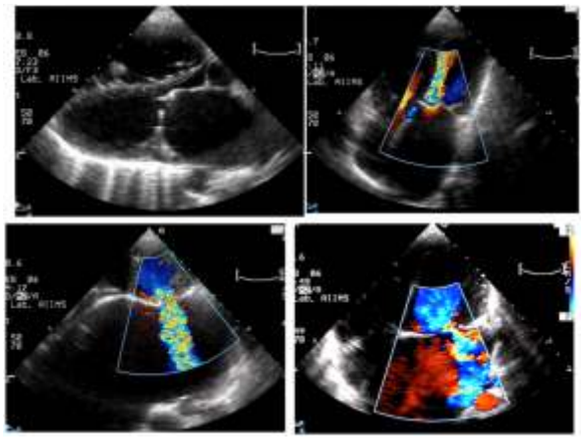
ECG showing severe Mitral Stenosis, sinus rhythm, left atrial enlargement with right ventricular hypertrophy and occasional ventricular ectopic beats in RHD patient

b. Chest X-Ray: In cases with significant valve abnormality, cardiomegaly is common. The left atrium is almost always enlarged. Enlargement of left atrial appendage produces straightening of left cardiac border, a typical feature of RHD. X-ray chest also aids in assessing chamber size and in detecting signs of cardiac failure (pulmonary congestion). Features of pulmonary hypertension may also be present.



X-ray chest of a patient with severe mitral regurgitation with cardiomegaly

c. Echocardiography: All persons with murmurs suggestive of RHD and those with a past history of RF should be referred for ultrasound examination of the heart, i.e. echocardiography. Echocardiography helps in detecting damage to heart valve caused by rheumatic process and differentiates from other causes of valve damage. Assessment of severity of valve disease is best done by echocardiography and it should be done at periodic intervals in those with RHD to detect any progression or regression of the disease. Regular echocardiography plays a critical role in follow-up.



Echocardiography showing thick mitral valve, severe mitral stenosis and regurgitation

4.3 Management of Rheumatic Heart Disease

The management of RHD is complex and requires careful co-ordination. The main goal is to prevent disease progression and to avoid, or at least delay, valve surgery. Secondary prophylaxis for prevention of recurrent RF is the main strategy to achieve this, the details of which have been given in earlier chapter. Regular clinical review is essential and follow-up echocardiography is important to follow the progress of heart lesions. Management of RHD depends on the severity of disease.

I. The key elements in the effective management of RHD are:

- Effective baseline consultation, referral and education
- Routine review and structured care planning
- Adherence to secondary prophylaxis
- Regular clinical assessment
- Regular follow-up echocardiography
- Management of cardiac failure (diuretics and ACE inhibitors)
- Management of atrial fibrillation (digoxin and anti-coagulation)
- Infective endocarditis prophylaxis (for patients with prosthetic valves)
- Dental care
- Counselling of patient and educating family about the disease
- Appropriate surgical intervention: Surgery is often required to repair or replace heart valves in patients with severely damaged valves, the cost of which is very high and a drain on the limited health resources of poor countries.
- Special consideration in particular circumstances (e.g. pregnancy).

II. Guidelines for management of chronic or established RHD

a. Mild RHD: These patients are likely to be completely asymptomatic and diagnosed either on screening or at the time of developing RF. Their management includes the following:

- Secondary prophylaxis
- Review by medical officer every year
- Refer for review by cardiologist every 2-3 years (earlier if required)
- Echocardiogram (if available) every 2-3 years

b. Moderate RHD: These patients may or may not be having cardiac symptoms. Symptoms are mild and there is no evidence of heart failure. Their management includes the following:

- Secondary prophylaxis
- Review by medical officer every 6 months
- Refer for review by cardiologist/physician every one year (earlier if required)
- Echocardiogram yearly
- X-zray chest and ECG: optional and depending on clinical status
- Dental check up yearly

c. Severe RHD: These patients are symptomatic and may have features of congestive heart failure. Many of them require valve surgery and need to be referred to a higher centre. Their management includes the following:

- Secondary prophylaxis
- Refer for review by cardiologist to decide for valve surgery
- If surgery not advised by cardiologist, review by medical officer every 6 months (or earlier)
- Ensure compliance with medicines other than secondary prophylaxis
- Refer for follow up as per advice of cardiologist
- Dental review every one year

d. Following prosthetic valve replacement or valve repair surgery: These patients are likely to be free of all symptoms. Patients who have had a mechanical or prosthetic valve replacement are given oral anticoagulation for long term. They need very meticulous monitoring of their anticoagulation status to avoid prosthetic valve dysfunction. This is done by measuring prothrombin time (PT) and international normalized ratio (INR), a test done on patient's blood. Long term anticoagulation is not required after valve repair surgery. Management of these patients include the following:

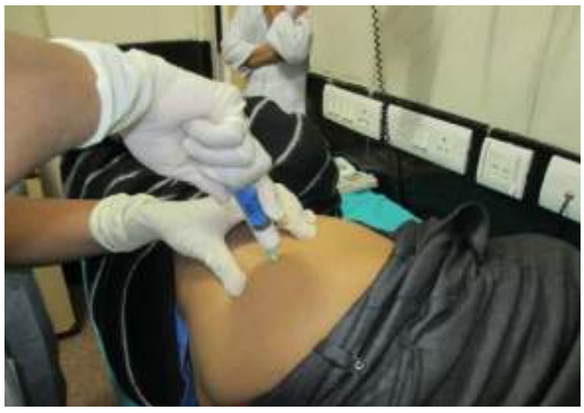
- Secondary prophylaxis
- Ensuring compliance with anticoagulants (blood thinner medicine, e.g. Warfarin)
- Frequent monitoring of PT and INR and modification of dose of blood thinner drug, if required
- Review by cardiologist every one year
- Echocardiogram every one year
- X-ray chest and ECG: Optional and depending on clinical assessment
- Dental review every one year

Key messages

- *RHD is chronic, irreversible damage to heart valves secondary to RF*
- *Mitral valve is most commonly affected, followed by aortic valve*
- *The valve may become stenotic or regurgitant or both*
- *Common symptoms include breathlessness on exertion, tiredness, swelling of feet*
- *Patients with severe valve disease may present with orthopnea, paroxysmal nocturnal dyspnoea and heart failure*
- *Murmurs are common on auscultation of heart*
- *Patient should be referred to a tertiary care centre for echocardiography*
- *Regular secondary prophylaxis must be ensured to prevent further damage to heart*

5. Administration of Benzathine Penicillin Injection

The process of giving Penicillin injection has to be followed very carefully. If improperly prepared or administered, it can harm the patients. Benzathine Penicillin G is most effectively given as deep intramuscular injection, into the upper outer quadrant of the buttock or the antero-lateral thigh. A skin sensitivity test is recommended before giving the full intramuscular injection. However a negative skin sensitivity test is not a guarantee for absence of allergic reaction and all precautions must be taken when administering the full dose.



Skin test (for allergy to Penicillin) followed by full intramuscular injection of Benzathine Penicillin in a patient

5.1 General Guidelines for administration of Benzathine Penicillin Injection

I. Precautions to be observed when recommending secondary prophylaxis with Benzathine Penicillin injection

- Allergic reactions to Benzathine Penicillin injections are well known but are uncommon. Fatal reactions are very rare, especially in children. The risk of allergic reaction does not appear to increase with long-term use.
- Benzathine Penicillin G and Penicillin V should not be given to persons with proven, serious Penicillin allergy. History of previous drug allergies must be asked before commencing secondary prophylaxis. Any reported Penicillin allergy should be confirmed and alternate drugs like Erythromycin should be used.
- Penicillin causes no risk to the foetus and should be continued during pregnancy. Erythromycin is also safe and can be continued during pregnancy to prevent RF.
- Benzathine Penicillin injections should be continued during anticoagulant therapy (Warfarin) unless there is a major intramuscular bleed following injection despite normal INR.

II. Assessment of the patient prior to injection

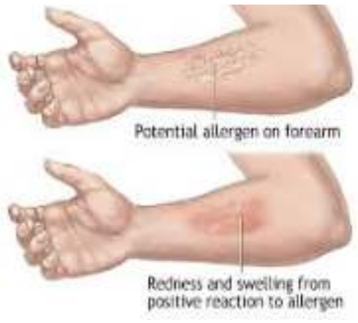
- Confirm the person's identity.
- Confirm any known drug allergies.
- Discuss and record any RF or RHD symptom since last injection.
- Obtain verbal consent for injection after explaining to patient about Penicillin injection, its need and possible side effects.

III. Preparation of the Injection Solution

- Check medication name, strength and expiry date.
- Remove the tin foil covering Penicillin vial. Don't touch or remove rubber stopper.
- Unwrap the disposable syringe.
- Fit the needle (size 21G) to the syringe, without touching the needle with your fingers.
- Draw 3 ml of distilled water into the syringe.
- Inject the distilled water into the Penicillin vial through rubber stopper.
- Shake the bottle vigorously to dilute the Penicillin. Make sure it is well diluted and no solid particles remain undissolved before administering it.

IV. Skin testing for Penicillin sensitivity

- Draw out 0.1 ml of this solution diluting this further with 1 ml distilled water.
- In the left forearm introduce 0.1 ml injection subcutaneously as to raise a wheal.
- Circle this area on the forearm and note the time of giving this injection.
- Wait for 10 to 15 minutes. If there is no feeling of fainting/dizziness, itching at site of the test, sweating, feeling of apprehension or any other unusual symptoms, the person is not sensitive to Penicillin and can be given the injection.
- In case of doubt, repeat on the other arm with double strength test dose.



V. Administering the Intramuscular Penicillin injection

- Draw the diluted Penicillin into the syringe and withdraw the syringe from the vial.
- Point the syringe upwards and expel air bubbles that may be present over the drug column.
- Clean the gluteal region (upper outer quadrant) or thigh (anterolateral) with spirit swab.
- Introduce the needle into this clean area by stab technique (holding the syringe like a pen and introducing the needle with one quick movement/jab)
- Draw the piston of syringe slightly to ensure that the needle has not entered a blood vessel.
- If no blood has been drawn, gently inject the drug (preferably over 2-3 minutes).
- Withdraw the needle and clean the area again with a spirit swab.
- Dispose off used needles and syringes in a puncture-proof container, as per biowaste management guidelines.
- Benzathine Penicillin G should be given immediately after being drawn into the syringe.

VI. Documentation of Penicillin Injection

Record has to be maintained for every Penicillin injection given. The following should be written in the clinic injection book and/or medical record:

- Drug dose and batch number.
- Date injection given and date next due.
- Signature (of person giving the injection).
- Record the next date due on the clinic card (if applicable).
- Provide the above information to the RHD register (if applicable).

VII. Measures for Pain Reduction

The following strategies have been found to reduce pain following Benzathine Penicillin injection:

- Warm up the cold syringe to room temperature by rotating between hands before injecting (if applicable).
- Apply gentle pressure for 10 seconds with the finger or thumb before injection.
- Ensure that skin swabbed with alcohol is dry before injecting.
- Deliver the injection slowly (preferably over at least 2 or 3 minutes).
- Use distraction to focus attention away from the injection.
- Encourage movement (e.g. walking, bike-riding) following injection.
- In adults one can use 3.2 ml of 1% Lidocaine hydrochloride as a diluent for 12 lakh unit of Benzathine Penicillin G Penicllin powder; it provides good analgesia[14]. For children, use 1.6 ml of 1% Lidocaine hydrochloride as diluent (for 6 Lakh unit of Penicillin powder).
- Use of Cold Needle can also reduce pain. After withdrawing the solution into the syringe with a 21 G needle, a different 21 G sterile needle packaged separately and kept in an ice box/refrigerator maybe used to alleviate pain.

5.2 Drug Allergy/Anaphylaxis and its Management

Reactions following administration of injection Benzathine Penicillin are very rare, particularly in children in the age group of 5-15 years. However, to be on the safer side, the Penicillin Sensitivity Test should be routinely done prior to injection of Penicillin.

In every health facility where Penicillin injection is being administered, the doctor and health staff should be trained to administer the injection and to handle Anaphylactic Shock. The Injection Room should have the “Anaphylaxis Treatment Kit” ready before an injection of Penicillin is administered.

I. Reactions arising out of fright or nervousness

Some children may present with certain symptoms arising due to the fear of injection. This is not a true reaction but a nervous reaction arising out of fright. It is characterized by feeling of fainting, face turning pale, sweating and weak or rapid pulse (vasovagal reaction). However these symptoms also require close observation to rule out true reaction.

Management

Ask the patient to lie down, loosen the clothes and reassure him/her. Talk to the patients and allay his/her fears, by explaining that the condition is transient and he/she would be alright in 10-15 minutes.

II. True Reactions: True reactions are of two types:

1. **Minor Reaction:** The signs and symptoms of minor reactions include the following:
   - Fever
   - Nausea/vomiting
   - Itching all over body or at site of injection
   - Urticaria/Rashes all over body

Management of Minor Reactions

- Give your total attention to every case of suspected or frank reaction arising due to injection Benzathine Penicillin and seek help immediately.
- Reassure the patient, ask him/her to lie down and loosen the clothes.
- Administer 2 ml of injection Hydrocortisone intramuscularly.
- Feel the pulse of the patient. If the volume is low, raise the foot end.
- If itching, rash and/or difficulty in breathing are dominant features, give 2 ml of injection Pheniramine maleate intramuscularly (1 ml in children 5-10 years).

2. Major Reaction:

Anaphylactic shock is a major reaction and is not a dose dependent reaction. Reaction may occur within 30 seconds to an hour after injection. Anaphylactic shock is characterized by the following signs and symptoms:

- Low blood pressure
- Tachycardia
- Sweating
- Dizziness
- Difficulty in breathing
- Wheezing
- Progressive swelling of lips, face or below eyes
- Syncope
- Cardiac arrest in very severe cases

Management of Anaphylactic Shock due to Penicillin injection

- Inject 0.5 ml Adrenalin subcutaneously, repeat same dose after 3 minutes if required.
- Try to secure an Intravenous line and start infusion of normal saline.
- Start oxygen inhalation through mask.
- Give Injection Hydrocortisone 100 mg intravenous.
- Administer Injection Pheniramine maleate 2 ml intravenous.
- If hypotension persists start intravenous infusion of Dopamine.
- If heart rate is below 50 beats/ minute, give 1 ml of Atropine Injection intravenous.
- If patient has bronchospasm and is not improving with above mentioned measures, give Aminophyllin intravenous.
- If patient continues to be in hypotension and/or develops respiratory arrest, cardiopulmonary resuscitation to be started.
- In those with cardiorespiratory arrest, endotracheal intubation with Ambu bag ventilation should be done, if possible.
- If not improving, patient should be transported to ICU if patient's condition allows and facilities are available.

The risk of a serious reaction is less in children under the age of 12 years, and the duration of Penicillin prophylaxis does not appear to increase the risk of an allergic reaction. Allergic reactions to Benzathine Penicillin injections are very rare.

Anaphylaxis Treatment Kit

For patient's safety, injection room must have the following to deal with severe reaction to Penicillin injection:

- Oxygen
- Adequate quantities of Injection Adrenalin (1:1000 solution), Injection Hydrocortisone, Injection Dopamine, Injection Pheniramine maleate, Injection Aminophyllin, Injection Atropine
- Disposable syringe (insulin type) having 0.01 ml graduation
- Disposable syringe (5 ml): 2 sets
- 24 and 26 G IM needles: 2 sets
- IV fluids (ringer lactate or normal saline): one unit
- IV fluids (5% dextrose): one unit
- IV drip set: one
- IV stand
- Patient trolley
- Suction machine
- Endotracheal intubation set and ambu bag
- Cotton wool and adhesive tape
- Adverse reaction reporting form

A well equipped room for administering injection of Benzathine Penicillin

Key messages

- *Benzathine Penicillin G is the drug of choice for secondary prophylaxis*
- *It is given as deep intramuscular injection in the gluteal region*
- *Allergy to Penicillin is rare in children*
- *Skin sensitivity testing should be done prior to full injection to test for allergy to Penicillin*
- *Alternate antibiotics are used in those allergic to Penicillin*
- *Most allergic reactions are mild and easily managed with antihistaminic drugs*
- *Serious reaction to Penicillin could produce anaphylaxis and requires immediate treatment*

6. Prevention of Rheumatic Fever and Rheumatic Heart Disease

Once Rheumatic Heart Disease develops, heart surgery is often required to replace the damaged valve. Sometimes the valve may be amenable to repair, but repair is dependent on surgeon's skill. Surgery is expensive and most developing countries where RHD is rampant do not have the resources to provide this facility. Also patients with mechanical prosthetic valve have to take blood thinner medicines daily for their entire life. These medicines are greatly affected by diet and other drugs and therefore require close monitoring of their dose.

RHD is a type of cardiac disease that is completely preventable. Though RF and RHD are non-communicable diseases, the aetiology (bacterial sore throat) is communicable in nature. It is therefore important to have knowledge about the various strategies for prevention; the foremost being prevention of episodes of Rheumatic Fever, which is the precursor of RHD.

Four Levels of Prevention Strategies

6.1 Primordial prevention

This refers to prevention of general risk factors e.g. social, economic and environmental initiatives to reduce the burden and transmission impact of Group A Streptococcal infection in a population.

The various measures for primordial prevention include the following:

- Awareness about RF/RHD and the cause
- Better access to health care facilities
- Improved housing conditions with less overcrowding
- Maintaining good hygiene such as frequent washing of hands, covering mouth while coughing, etc.
- Improved sanitation with proper waste disposal
- Educating families about the importance of sanitation and hygiene

Frequent hand washing with soap and water and covering mouth during cough may prevent risk of streptococcal infection

6.2 Primary prevention

This term refers to any action that aims to prevent the first episode of Rheumatic Fever. It is achieved by treatment of Group A Streptococcal throat infections in a timely and proper manner. Primary prevention can be quite challenging for various reasons; one of the primary reasons being lack of health-seeking behaviour in people having sore throat.

Various measures to ensure primary prevention include:

- Educating health staff about the importance of treating sore throat
- Early referral of patients with bacterial sore throat to health centre
- Training of staff to differentiate viral and bacterial sore throat
- Collection of throat swab in sore throat cases for culture, if facilities available
- Early treatment of bacterial sore throat with antibiotics
- Ensuring compliance of patients with full course of antibiotics

6.3 Secondary prevention

Secondary prevention means preventing occurrence of RHD or recurrence of RF in a person who already has had one or more episodes of RF. Secondary prevention is important because even if heart is damaged to some extent, the disease progression as well its complications are prevented. Secondary prevention with long term Penicillin injections is the most effective strategy for prevention of RF and RHD.

Secondary prevention is primarily achieved by:

- Benzathine Penicillin (long acting Penicillin) injection: Penicillin injections for secondary prophylaxis are given every 3 weeks (in adults) or 2 weeks (in children). Details of treatment and secondary prophylaxis are given in previous Chapters.
- Alternate antibiotics (as discussed in previous chapters) are used in patients with Penicillin allergy.

Patients and their families should be educated about importance of treatment and prophylaxis with Penicillin. Health care staff must ensure compliance with treatment.

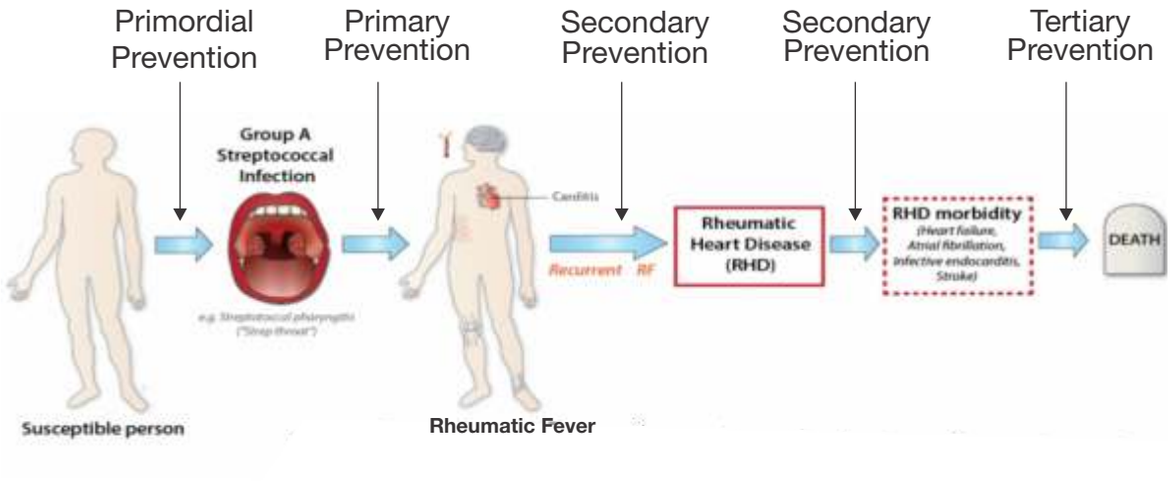
Marking the calendar to ensure timely Penicillin injection for secondary prophylaxis

6.4 Tertiary prevention

It refers to interventions in patients who already have RHD and aims at reducing symptoms and disability from associated complications and premature death from RHD. It is the least effective strategy and includes:

- Drugs to treat heart failure, abnormal heart rhythms etc.
- Heart valve surgery: valve replacement or repair
- Post surgery management: Penicillin secondary prophylaxis, blood thinner drugs etc.
- Monitoring PT and INR in patients who have undergone valve replacement

It is noteworthy that, cardiac surgery is very expensive and is not curative in nature. Management after surgery is also complicated.



Levels of prevention of RF and RHD

Key messages

- *The most promising strategy for control of RF and RHD is secondary prevention, but a combination of primary and secondary prevention is likely to help control RHD much better and all efforts must be made to achieve these*
- *Community should be educated about the significance of treating sore throat and the link between bacterial sore throat and heart disease*
- *All cases with sore throat should report to local medical facility. Bacterial sore throat must be treated with a full course of antibiotic to prevent RF*
- *Maintenance of hygiene and sanitation such as frequent hand washing should be encouraged*
- *Secondary prophylaxis must be ensured on a regular basis in those who develop RF and/or RHD*
- *RHD patients should be regularly followed at a higher centre and referred for surgery at an appropriate stage*

7. Integration With Existing Health Programmes

It is envisaged that the intervention for RF/RHD prevention and control including screening, diagnosis, referral, treatment and IEC activities, will be rolled out as a component under two existing health care programmes, namely the National Programme for Prevention and Control of Cancer, Diabetes, Cardio-Vascular Diseases and Stroke (NPCDCS) and the Rashtriya Bal Swasthya Karyakram (RBSK).

7.1 National Programme for Prevention and Control of Cancer, Diabetes, Cardio-Vascular Diseases and Stroke (NPCDCS)

In order to prevent and control major non-communicable diseases, NPCDCS was launched in 2010 with focus on strengthening infrastructure, human resource development, health promotion, early diagnosis, management and referral of major non-communicable diseases like Diabetes, Cardio-Vascular Diseases, common Cancers (Oral, Breast & Cervical Cancer) and Stroke. During the period 2010-2012, NPCDCS was implemented in 100 districts across 21 States, and during the 12th Five Year Plan (by March 2017), the programme is planned to be expanded to cover all the districts in the country.

Under the programme, NCD Clinics have been set up at the Community Health Centres (CHC) and the District Hospitals for management of non-communicable diseases, through early diagnosis, treatment and follow up. Cardiac Care Units (CCU) are being set up at the district level for follow-up of cardiac patients. Organisation of outreach camps at village and sub-centre levels has been envisaged for opportunistic screening. Health promotion strategies through behaviour change with involvement of community, civil society, community based organizations, media etc. are also mandated under the programme.

I. Role of NPCDCS in RF/RHD Intervention

1. Provision of facilities for diagnosis of bacterial sore throat, RF and RHD at NCD clinics at CHC/Districts and echocardiography facility at Cardiac Care Units in district levels.
2. NPCDCS would ensure adequate supply of Oral and Injectable Penicillin, alternate Antibiotics, Anaphylaxis Kit for Injectable Penicillin and other essential drugs for treatment.
3. Guidelines for Safe injection practices would be incorporated into the training curriculum of Medical Officers of NCD Clinics.
4. Mechanism for referral of RHD cases for surgical management would be put in place.
5. Mechanism for follow-up of RF cases on secondary prophylaxis (Penicillin injection) to ensure treatment compliance, and for follow-up care of RHD cases would be established.
6. A mechanism for RF/RHD registration would be set up at CHC/District NCD Clinics.
7. For RF/RHD monthly reporting, a linkage would be established with RBSK reporting system.

II. Packages of Services at Different Levels of Health Care

1. Screening Camps/Subcentre/PHC

Activities

- Identifying suspected cases of Bacterial Sore throat and suspected/already diagnosed cases of RF/RHD
- Referral of suspected cases of RF/RHD to CHC/designated health facilities for further evaluation and treatment
- Dissemination of IEC material for awareness generation about importance of accessing health facility for sore throat/RF, adhering to long-term treatment of RF, etc.
- Counseling and Health promotion activities on nutrition, improving hygiene and sanitation, etc.

Role of health staff

Role of Doctors:

1. To clinically diagnose bacterial pharyngitis and RF.
2. To advise/collect appropriate sample for lab testing of suspected cases.
3. To treat or refer GAS infections & RF.
4. To identify cardiac murmur and refer suspected RHD case for cardiac evaluation to designated referral hospital.

Role of Nurse/ANM/Counselor:

1. Filling up Referral Card and maintaining record.
2. Encourage health promotion activities.
3. Counseling patients to consult doctors for sore-throat and importance of regular check-up/secondary prophylaxis (Penicillin injection) for those with diagnosed RF/RHD.

2. CHC /CHC NCD Clinic

Activities

- Diagnosis and Treatment of cases of GAS infections, RF and RHD.
- Laboratory facilities for Diagnosis (To be outsourced, if not available)
- Referral of RF/RHD cases to District Hospital/higher health facilities
- Health promotion and counseling

Role of health staff

Role of Doctor:

1. Conduct clinical examination for diagnosis of GAS infections, RF and RHD.
2. Advise appropriate lab investigations (or outsource if not available).
3. Treat GAS pharyngitis and RF.
4. Refer RHD cases to Cardiologist at a designated health facility.
5. Secondary prophylaxis to RF cases and follow-up care of RHD patients.
6. Assist in training of health personnel.
7. Overall monitoring and supervision of RF/RHD intervention including linkage with RBSK Block Manager.
8. Timely recording & reporting of formats and feedback.
9. Supply chain management of Oral and Injectable Penicillin.

Role of Nurse:

1. Conduct screening of GAS infections.
2. Assist Physician during patient examination.
3. Explain the patient and family about risk factors of RHD and health promotion activities.
4. Assist in follow up and referral of cases.
5. Fill up Referral Card. Maintain register/records at health facility.

Role of Counselor:

1. Counseling on importance of secondary prophylaxis (Penicillin injection) in RF management.
2. Assist in follow up care and referral.

Role of DEO in CHC NCD Clinic:

1. Record keeping, filling reporting formats.
2. Monthly reporting to District NCD Cells.

3. District Hospital/ District NCD Clinic/ Cardiac Care Unit

Activities

- Diagnosis and Treatment of cases of GAS infections, RF and RHD.
- Facilities for Diagnosis (To be outsourced, if not available)
- Referral of complicated cases to designated tertiary care hospitals
- Health promotion and counseling
- Cardiac Care Units (CCU) at district level may serve as designated referral facilities as they have diagnostic and medical treatment facilities.

Role of health staff

Role of Doctor (Physician/Pediatrician):

1. Diagnosis and Treatment of cases of GAS infections, RF and RHD;
2. Refer RHD cases for Surgical intervention to designated tertiary care hospitals,
3. Follow up of RF/RHD cases;
4. Secondary Prophylaxis (Penicillin injection) of RF cases;
5. Liasoning with RBSK Programme Manager.

Role of ANM/Pharmacist/Counselor:

1. Supply chain management of Oral and Injectable Penicillin.
2. Counseling on importance of secondary prophylaxis in RF.
3. Assist in treatment, follow up care and referral.

Role of DEO in District NCD Clinic:

1. Record keeping, filling reporting formats.
2. Monthly reporting to District NCD Cell.

4. Tertiary Care Hospitals/ Medical Colleges

Activities

- As a designated Tertiary Care Hospital, comprehensive package of services include facilities for diagnosis, treatment, cardiac surgery, follow-up care, recording and reporting of RF/RHD cases.
- Facilities for investigations include Culture/Sensitivity for GAS infection, ASO titre, Echocardiography for diagnosis of RHD, ECG, X-Ray etc.
- Maintaining record for RHD cases for surgery (operated and waitlisted cases) and follow-up.
- Training/ Mentoring of health personnel at and below district level.

7.2 Rashtriya Bal Swasthya Karyakram (RBSK)

Under the National Health Mission (NHM), RBSK is the programme for child health screening and early intervention services to provide comprehensive care to the younger population (0 to 18 years) to cover 30 identified health conditions for early detection and free management. The objective of this initiative is to improve the overall quality of life of children through early detection of 4 Ds - Defects at birth, Diseases, Deficiencies, Development Delays and Disability, since the high burden of these childhood illnesses contributes significantly to child mortality, morbidity and out of pocket expenditure of the poor families.

RHD is also one of the identified health conditions for child health screening and early intervention services under RBSK.

The essential components of RBSK include screening of new-born at public health facilities and at home, regular health screening of pre-school children up to 6 years of age at Aganwadis and health check-ups of school-going children (6 - 18 years) at Government and Government aided schools, with the support of dedicated mobile health teams placed in every block in the country. District Early Intervention Centres (DEIC) have been set up as the first referral point for further investigation and management. Tertiary care centres are being roped in for management of complicated cases requiring high-end medical care.

Role of RBSK in RF/RHD Intervention

1. Mobile Health Team: The Mobile Health Teams consist of four members - two AYUSH Doctors (one male and one female), one ANM/Staff Nurse and one Pharmacist. Minimum three dedicated Mobile Health Teams in each Block are engaged to conduct screening of pre-school age children at Anganwadi centres at least twice a year besides screening of all children (age groups 6 to 18 years) studying in Government and Government aided schools at least once every year.

Role of Mobile Health Teams in RF/RHD intervention:

- Clinically diagnosing bacterial sore throat and Rheumatic Fever through examination
- Screening suspected RHD cases (abnormal heart sounds in a child 5-15 years)
- Referral of suspected GAS infections/RF/RHD, and known cases of RF/RHD to designated health facilities for management
- Filling Referral Card for referring known cases of RF and RHD and maintaining records
- Advise suspected cases of bacterial sore throat/RF to consult doctors, importance of general hygiene, nutritious food, and regular check-up at local health facility, emphasizing the significance of long-term Penicillin treatment
- Dissemination of IEC material in Govt./Govt-aided Schools and Anganwadi Centres

2. District Early Intervention Centre: Early Intervention Centres have been established at the District Hospitals, to provide referral support to children detected with health conditions during health screening. DEICs refer children who are suspected to have an illness and requiring confirmatory tests or further evaluation to the designated tertiary level public sector health facilities. The DEIC team constitutes of Paediatrician, Medical Officer, Staff Nurses and Paramedics. The DEIC manager carries out mapping of tertiary care facilities in Government institutions for ensuring referral support.

Role of District Early Intervention Centres (DEIC) under RBSK in RF/RHD intervention:

- Availability of echocardiography facility for cardiac evaluation
- Linkage with empanelled tertiary care hospitals for Surgical intervention
- Training of Medical Officer/Physician for Paediatric ECHO for RHD
- Reporting and recording of cases for follow-up
- Work in close coordination with District NCD Clinic and CCU for RF/RHD case management and monthly reporting system

Role of Medical Officer in RF/RHD Intervention

1. To have understanding of the etio-pathogenesis of RF and RHD: Identify the link between Group A beta hemolytic Streptococcal sore throat and RF/RHD. Identify individuals and groups who are most at risk for RF and RHD.
2. To be able to clinically differentiate between bacterial and viral sore throat .
3. To treat bacterial sore throat using appropriate antibiotics; ensure that the complete course of antibiotic is taken.
4. To clinically diagnose the signs and symptoms of RF and RHD: Knowledge of modified Jones criteria for diagnosing RF; diagnose RHD in a patient based on signs (including cardiac murmurs) and symptoms.
5. To refer the patients with suspected RF and RHD to a higher centre for confirmation and treatment with a specialist, and organize future reviews for RHD patients with specialists as and when advised.
6. To advise regular follow-up and ensure checkup with cardiologist and dentist at regular intervals.
7. To know the process of administering intramuscular injection of Benzathine Penicillin for secondary prophylaxis.
8. To be able to recognize and adequately treat signs and symptoms of Penicillin allergy; and know the drugs and their doses for prompt treatment of anaphylactic shock.
9. To ensure compliance with secondary prophylaxis for RHD patients .
10. To provide education about the disease to patients with RF and RHD and their families.
11. To maintain register for patients with RF and RHD in the prescribed format.
12. To ensure supply chain maintenance of antibiotics and anaphylaxis kit, and other necessary logistics.

8. Recording and Reporting of RF/RHD cases

The important points to note about recording and reporting of RF/RHD cases are as follows:

- Maintaining RHD records has been shown to improve the compliance with secondary prophylaxis, as well as create a database of RF/RHD cases. Registries are best maintained as a database in the computer wherever feasible, but paper registries are also an alternative in the health facilities, including PHC, CHC, District Hospitals and Tertiary Care Hospitals.

- The **"Register for RF/RHD line listing"** should include only those cases of bacterial sore throat/ RF/ RHD whose diagnosis has been confirmed. The following information should be included in all RHD Registers:
  - Patient identification number
  - Date of entry in the register
  - Personal information
  - Full diagnosis including the severity of the disease
  - Medicines prescribed with their doses
  - Secondary prophylaxis details
  - Follow-up details and Recall dates (i.e. dates for next review with physician or next echocardiogram)
- Medical officers at PHC, CHC or District level are expected to keep a record of all patients who are diagnosed to have RF or RHD. This would also help in tracking patients for follow-up, for ensuring compliance in secondary prophylaxis.
- **"Patient Record Form or Patient Card"** is to be filled in duplicate by trained health staff. One copy is to be retained at facility and another to be given to the patient.
- Every health facility maintaining records of RF/RHD cases should send monthly reports of the cases to the higher facility in NPCDCS, using the **"Monthly Reporting Format for RF/RHD" .** The details of the reports should include the following:
  - Details of cases registered at the Health Facilities
  - Details of Penicillin injections administered in the Health Facility
  - Logistic/Stock details of Penicillin tablets/injections, Consumables, etc.
- The **"Patient Referral Slip "** is to be filled for referring the patient to a higher facility for investigation or treatment. It is to be carried, by the patient for referral and follow up purposes.

The various formats for reporting and recording cases at various levels are annexed – (Annex 1 to Annex 4)

Annexures

Annexure 1

PATIENT CARD

RF/RHD Intervention

National Programme for Prevention & Control of Cancer, Diabetes, CVD & Stroke(NPCDCS)

(Note: To be filled up in duplicate by trained NCD Clinic staff; One copy to be given to person attending NCD clinic)

Registration Number:_____ Date:_____

Address/ Village:_____ _____

PHC: _____Block:_____District:_____

Name : _____Age: _____ Sex:_____

RBSK referral number:_____ Date of referral_____

Presumptive diagnosis by RBSK Mobile Health Team_____

_____

Past History *(Please tick as appropriate)*	**Treatment received for** *(Please tick as appropriate)*
Bacterial sore throat ☐	Bacterial sore throat ☐
Rheumatic Fever ☐	Rheumatic Fever ☐

Symptoms:

_____

Physical Examination findings:

_____

Investigation Details:

Laboratory/ Other Investigations	Result of Investigation
1.	
2.	
3.	
4.	
5.	

Provisional Diagnosis:

Final Diagnosis after investigations:

Treatment Details:

_____

Referral to (Name of District Hospital/ Medical College):

Purpose:

Mode of Referral: [Govt.ambulance/private vehicle/any other (specify)]

Date of Next Visit_____

Penicillin Chart

Date of visit	Skin test for Penicillin Sensitivity Testing (yes/no)	Outcome of Sensitivity test	Penicillin inj. Given (Yes/No)	Change in treatment plan (if yes, mention briefly)	Signature of Doctor/Other staff

Instructions for Patients:

- Penicillin injection should be given under supervision of medical personnel only.
- Ensure Penicillin skin sensitivity test has been done before taking injection.
- Patient should be under observation for at least 30 minutes after administration of injection.
- Do not discontinue or change dosage of this injection without consulting your doctor.
- Any complications must be reported to doctor immediately.

महत्वपूर्ण निर्देश:

- इस इंजेक्शन को किसी डॉक्टर या अस्पताल कर्मचारी की देखरेख मे ही लिया जाना चाहिए.
- इंजेक्शन लगवाने से पहले हमेशा संवेदनशीलता की जांच करवानी चाहिए.
- बिना डॉक्टर को पूछे आपको इंजेक्शन ना बंद करना है ना कम/ज्यादा करना है.
- किसी प्रकार की परेशानी होने पर तुरंत डॉक्टर को सूचित करें.

In case of need, contact: .....

आवश्यकता पड़ने पर, संपर्क करें: .....

RF/RHD Line Listing Register for Health Facility (CHC/DH)

RF/RHD Intervention

National Programme for Prevention & Control of Cancer, Diabetes, CVD & Stroke (NPCDCS)

(Include only those bacterial sore throat/ RF/ RHD cases which are confirmed at CHC/DH Level)

PAGE 1										PAGE 2							
										FINAL DIAGNOSIS			TREATMENT DETAILS		Outcome		
Register No.	Date	Name	Age	Sex	Address & Contact No.	RBSK register number	Referred by	Investigation Prescribed	Investigation Results	Bacterial Sore Throat	RF	RHD	Penicillin (oral/Inj)	Other	(Treatment completed/ Lost to follow up/ Referred/ Died)	Out Referral Details (date/ place)	Remarks

RF/RHD Follow-up Register at Health Facility (CHC/DH)

RF/RHD Intervention

National Programme for Prevention and Control of Cancer, Diabetes, CVD & Stroke (NPCDCS)

(Include only those bacterial sore throat/ RF/ RHD cases which are confirmed at CHC/DH Level)

Register No.	Date	Name	Age	Sex	Address & Contact No.	Date on which Inj. Penicillin given	Due Date for Penicillin injection	Complications, if any	Remarks	Signature

RF/RHD Monthly Reporting Format*

National Programme for Prevention and Control of Cancer, Diabetes, CVD & Stroke (NPCDCS)

State:	Month:	Name of Health Facility:
District:	Year:	Type of Health Facility:

1.Number of Cases (Bacterial Sore throat/ RF/RHD cases registered):

Diseases	During the Reporting Month									Cumulative cases since April (current year)									
	Number of cases referred by RBSK team	New Cases Diagnosed			Cases under Treatment			Cases Referred to higher Health Facility for		Number of cases referred by RBSK team	New Cases Diagnosed			Cases under Treatment			Cases Referred to higher Health Facility for		
		Male(M)	Female (F)	Total	New	Old	Total	Investigation	Treatment		Male (M)	Female (F)	Total	New	Old	Total	Investigation	Treatment	
Bacterial sore throat																			
Rheumatic Fever																			
Rheumatic Heart Disease																			

2. Penicillin Injection Administration details:

Parameter		During the Reporting Month			Cumulative since April (same Year)		
		Male	Female	Total	Male	Female	Total
Number of patients currently on Penicillin injections	Bacterial sore throat						
	RF/RHD						
Number of patients received all due doses of Penicillin Inj. (based on follow up card)							
Number of patients developed allergic reaction to Penicillin Inj. Skin Sensitivity test							

3. Logistic Details (Drug Stock Position)

Parameter	Oral Penicillin	Injectable Penicillin	Amoxycillin	Erythromycin	Cephalosporins (name)	Other	Remarks
Stock on 1st day of the month in the Health Facility							
Stock received during the month							
Consumption during the month							
Stock on the last day of the month							

Signature:.....

Name & Designation :.....

Date:.....

* Note: To be submitted every month along with other NPCDCS formats

Annexure 4

PATIENT REFERRAL SLIP-I
(To be filled by RBSK team/Health Worker)
Rheumatic Fever/ Rheumatic Heart Disease Intervention
NPCDCS/RBSK

Registration No.....
Date:.....

State	District	Block/PHC	Sub-centre

Name:	**Address :**
Age / Sex:	
Contact No.:	

Brief History of illness (if any)

Suspected & Referred for: *(please tick as appropriate)*

1. Bacterial Sore throat ☐
2. Rheumatic Fever ☐
3. Rheumatic Heart Disease ☐

Referred to: .....
(Name of NCD Clinic/Medical College/Empaneled facility/Any other)

Referred by:.....

Mobile No.....

Signature

Name & Designation.....

PATIENT REFERRAL SLIP-II
(To be filled by Medical Officer)
Rheumatic Fever/ Rheumatic Heart Disease Intervention
NPCDCS/RBSK

Registration No.....
Date:.....

State	District	Block/PHC	Sub-centre

Name:	**Address :**
Age / Sex:	
Contact No.:	

Brief History of illness (if any)

Suspected for: *(please tick as appropriate)*

1. Bacterial Sore throat ☐
2. Rheumatic Fever ☐
3. Rheumatic Heart Disease ☐

Referred for: *(please tick as appropriate)*

1. Disease Management ☐

2. Investigation

a. C Reactive Protein ☐ b. Anti Streptolysin O titre ☐

c. Throat Swab Culture ☐ d. Echocardiography ☐

e. Others (please specify) ☐

Referred to: .....
(Name of NCD Clinic/Medical College/Empaneled facility/Any other)

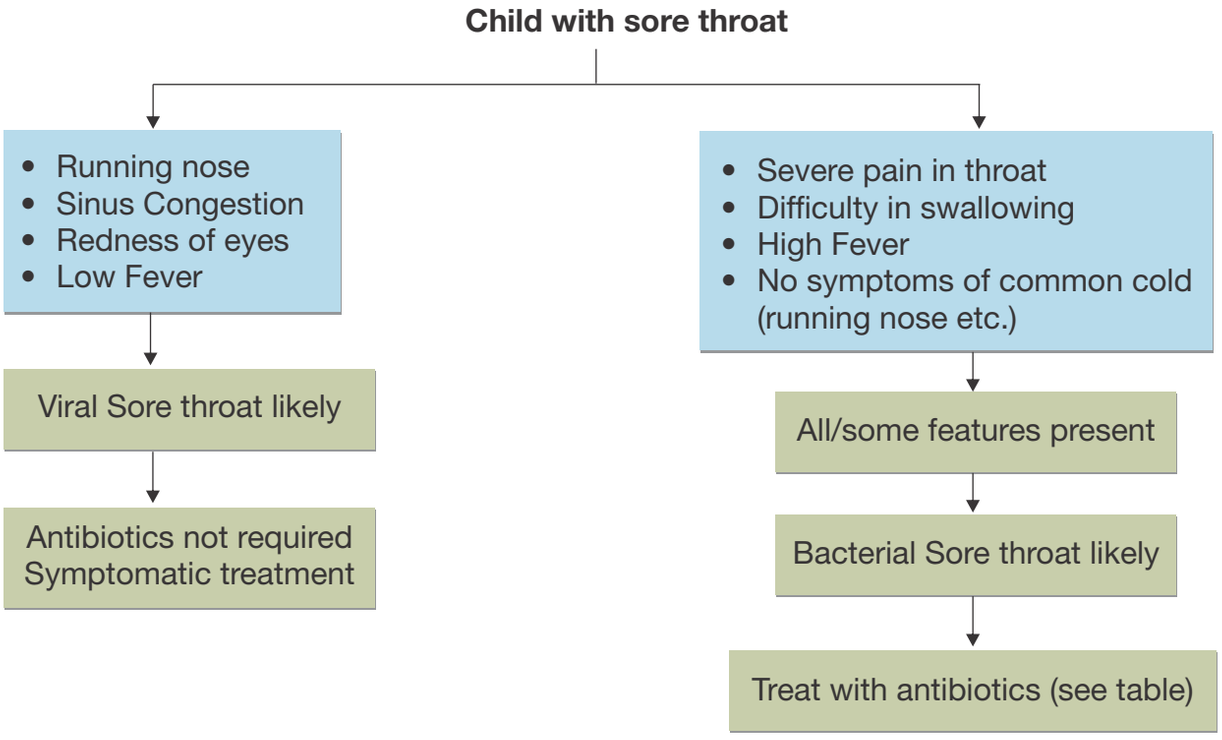
Referred by:.....

Signature

Mobile No.....

Name & Designation.....

Annexure 5 : Algorithm for Sore Throat

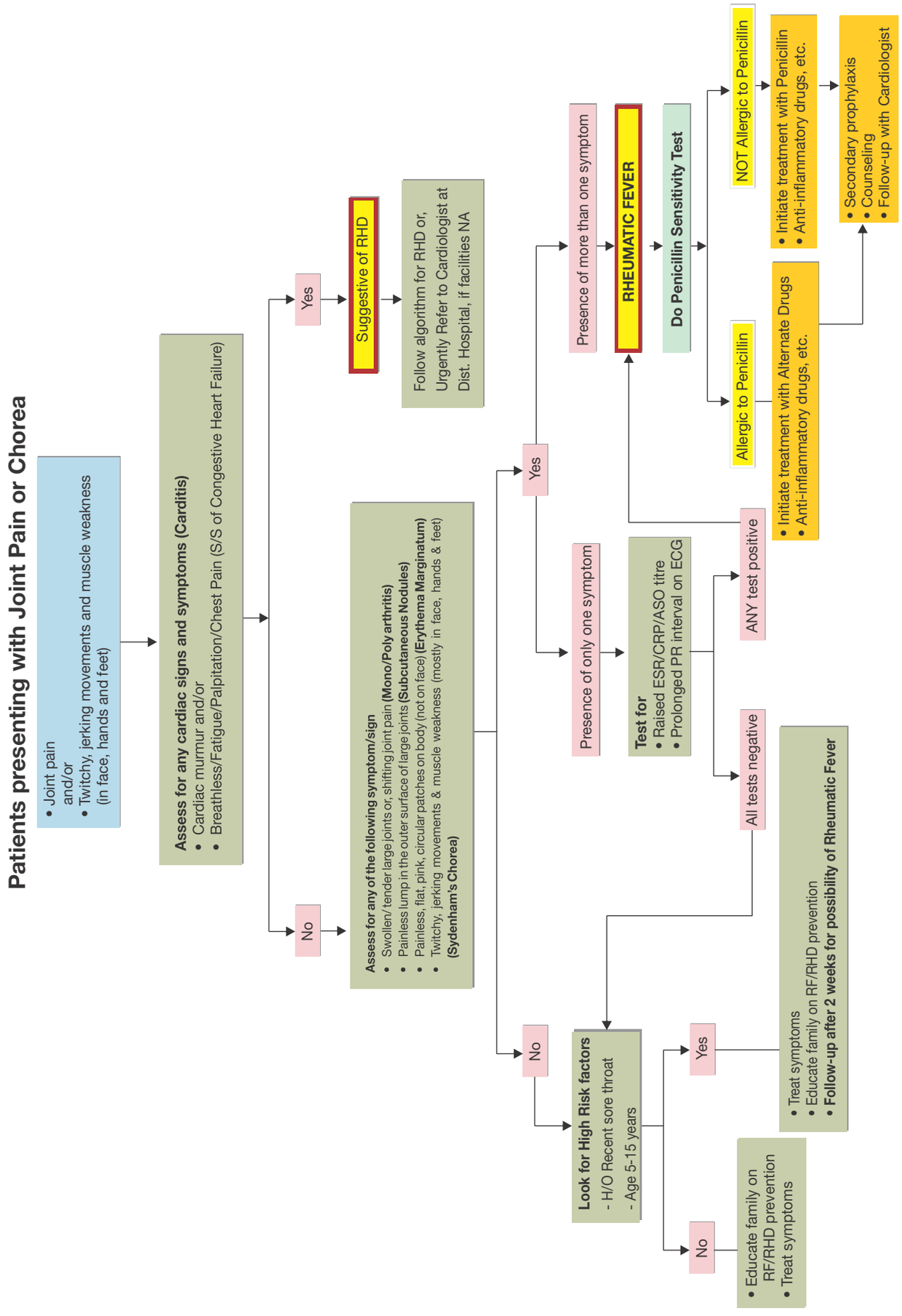


Educate patient and families regarding :
- Further episodes of sore throat
- Symptoms of Rheumatic Fever
- Symptoms of Rheumatic Heart Disease

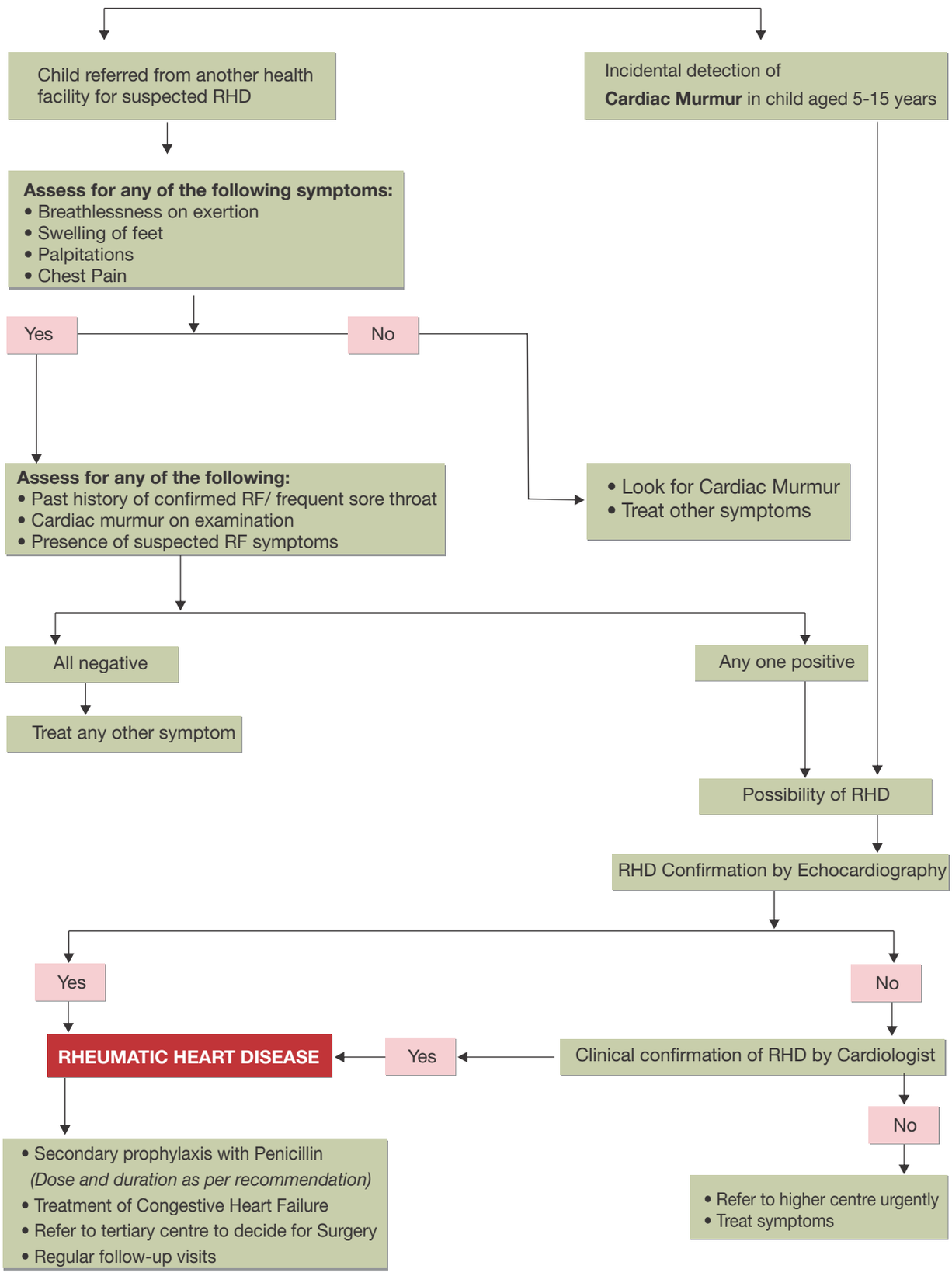
Details of antibiotics for treatment of Streptococcal Sore Throat [11, 13]

Drug	Dose	Frequency and duration
Penicillin V (Phenoxymethyl Penicillin) (oral) *To be given one hour before or two hours after meals.* *Contraindicated if Penicillin allergy present*	Children: 250 mg Adults: 500 mg	Three times a day for 10 days Two times a day for 10 days
Benzathine Penicillin G (deep IM injection) *To be given after sensitivity test.* *Contraindicated if Penicillin allergy present*	For those >27 Kg: 12 lakh unit For those ≤27 Kg: 6 lakh unit	Single Dose Single Dose
Amoxicillin (oral) *Contraindicated if Penicillin allergy present*	Children: 25 mg/kg/dose Adults: 500 mg	Two times a day for 10 days Two times a day for 10 days
Cefadroxyl (oral)	Children: 15 mg/kg/dose Adults: 500 mg	Two times a day for 10 days Two times a day for 10 days
Cephalexin (oral)	Children: 10-15 mg/kg/dose Adults: 500 mg	Three times a day for 10 days Two times a day for 10 days
Erythromycin ethyl succinate (oral)	Children: 20 mg/kg/dose (maximum dose: 800 mg) Adults: 800 mg	Two times a day for 10 days Two times a day for 10 days

Annexure 6 : Algorithm for Rheumatic Fever



Annexure 7 : Algorithm for Rheumatic Heart Disease



Annexure 8 : Secondary Prophylaxis Regimen for RF/RHD

1. Drugs, Dosage and Interval of Secondary Prophylaxis with antibiotics for established RF/RHD cases

Drug	Dose	Interval of doses
Benzathine Penicillin G (deep IM injection) *To be given after sensitivity test. Contraindicated if Penicillin allergy present*	If body weight >27 Kg: 12 lakh unit If body weight ≤27 Kg: 6 lakh unit	Every 21 days Every 14 days
Penicillin V (oral) *To be given one hour before or two hours after meals. Contraindicated if Penicillin allergy present*	250 mg	Two times a day
Erythromycin ethyl succinate (oral) *Contraindicated in liver disease*	250 mg	Two times a day

2. Duration of Secondary Prophylaxis for established RF/RHD cases

Category	Duration of Secondary Prophylaxis
Rheumatic Fever with no proven carditis	Minimum of 5 years after last RF episode, or Until age 18 years (*whichever is longer)*
Mild carditis (or healed carditis)	Minimum 10 years after last RF, or Until age 25 years (*whichever is longer)*
Moderate or severe RHD and following Cardiac Surgery	Lifelong (or up to 40 years of age)

References

1. Carapetis, J. R., Steer, A. C., Mulholland, E. K. & Weber, M. The global burden of group A streptococcal diseases. Lancet Infect. Dis.2005; 5: 685-694.
2. World Health Organization. Rheumatic fever and rheumatic heart disease: Report of a WHO expert consultation. Geneva, 29 Oct–1 Nov 2001. World Health Organ Tech Rep Ser 2004; 923: 1-122.
3. Saxena A. Epidemiology of rheumatic heart disease in India and challenges to its prevention and control. J Preventive Cardiology 2012;2: 256-261.
4. Community control of rheumatic fever and rheumatic heart disease. Report of ICMR task force study. New Delhi: Indian Council of Medical Research; 1994.
5. Shrivastava S. Rheumatic heart disease: Is it declining in India? Indian Heart J 2007; 59: 9–10.
6. Misra M, Mittal M, Singh R, Verma A, Rai R, Chandra G, et al. Prevalence of rheumatic heart disease in school-going children of eastern Uttar Pradesh. Indian Heart J 2007; 59: 42–3.
7. Jose VJ, Gomathi M. Declining prevalence of rheumatic heart disease in rural schoolchildren in India: 2001–2002. Indian Heart J 2003; 55: 158-60.
8. Periwal KL, Gupta BK, Panwar RB, Khatri PC, Raja S, Gupta R. Prevalence of rheumatic heart disease in school children in Bikaner: An echocardiographic study. J Assoc Physicians India 2006; 54: 279-82.
9. Prevalence of rheumatic fever and rheumatic heart disease in school children: Multicenter study. Annual Report. New Delhi: Indian Council of Medical Research; 1977:108.
10. Jai Vigyan Mission mode project on community control of RHD. Non-communicable diseases. Indian Council Med Res Annu Rep 2007-08; pp 63-4.
11. World Health Organization. Rheumatic fever and rheumatic heart disease: report of a WHO expert consultation, Geneva, 29 October–1 November 2001. WHO technical report series 923; 2004; Available from: www.who.int/entity/cardiovascular_diseases/resources/ trs923/en/.
12. Gewitz MH, Baltimore RS, Tani LY, Sable CA, Shulman ST, Carapetis J, Remenyi B, Taubert KA, Bolger AF, Beerman L, Mayosi BM, Beaton A, Pandian NG, Kaplan EL; American Heart Association Committee on Rheumatic Fever, Endocarditis, and Kawasaki Disease of the Council on Cardiovascular Disease in the Young. Revision of the Jones Criteria for the diagnosis of acute rheumatic fever in the era of Doppler echocardiography: a scientific statement from the American Heart Association. Circulation. 2015 May 19;131(20):1806-18.
13. Gerber, M., Baltimore, RS, Eaton, CB, et al, Prevention of rheumatic fever and diagnosis and treatment of acute streptococcal pharyngitis: a scientific statement from the American Heart Association Rheumatic Fever, Endocarditis, and Kawasaki Disease Committee of the Council on Cardiovascular Disease in the Young,the Interdisciplinary Council on Functional Genomics and translational Biology, and the Interdisciplinary Council on quality of Care and Outcomes Research: Endorsed by the American Academy of Pediatrics. Circulation, 2009. 119: 1541-1551.
14. Wyber R, Taubert K, Marko S, Kaplan E L. Benzathine Penicillin G for the Management of RHD. Global Heart 2013;8:227-34.

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2. WiRED International:
   http://www.wiredinternational.org and
   http://www.wiredhealthresources.net

3. RHD Action Alliance: http://www.rhdaction.org

PREVENTION AND CONTROL OF RHEUMATIC FEVER AND RHEUMATIC HEART DISEASE