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Prevention and Control of Rheumatic Fever in India – A Blue Print for Introduction of a Pragmatic Program with Limited Resources

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ABSTRACT

"Eliminate rheumatic fever (RF) and minimize the burden of rheumatic heart disease by 2025" is the goal of World Heart Federation (WHF). The most important step to achieve the goal of WHF is the implementation of the prevention and control of RF in India. The program can be implemented with minimal fund allocation from government making use of the existing manpower in the government and private health sector and schools with the concurrence of National Health Mission, Ministry of Health and Family Welfare, Ministry of Public Education and under the guidance of Cardiological Society of India, National Rheumatic Heart Consortium, Rheumatic Heart Club India, Association of Physicians of India, Indian Academy of Pediatrics, and Association of Otolaryngologists of India. By the successful implementation of this program, the children of 5–15 years in India can be protected from RF. India eradicated smallpox in 1980 and Polio 2012. With this program, we can start our efforts to eliminate RF by 2025.

Keywords: Rheumatic heart disease, Primary prophylaxis, Secondary prophylaxis, AHA Recommendations

INTRODUCTION

Cardiovascular disease is the most common cause of death of mankind both in developed and under developed nations in the world by the middle of the last century rheumatic heart disease (RHD) which is the long-term sequelae of rheumatic fever (RF) that has been successfully eradicated in developed countries like US and Europe.[1] However, in underdeveloped and developing countries, RF continues to be the common cause of heart disease in children and young adults.[1] Globally, 33 million people suffer from RHD which kills 27500 people annually. Around 0.5 million new cases are detected every year. A total of 2.4 million children of 5–15 years are affected by RF in a year. Till today, there is no prevention and control program for RF in India.[2] The National Program for non communicable diseases (NCDSs) and Rashtriya Bal Swasthya Karyakram attempted to address this program with no palpable results. Therefore, this article highlights the features of the prevention and control program of RF which is planned keeping in mind the poor resources and logistics in India.

ETIOLOGY AND CLINICAL CHARACTERISTICS OF RF

Acute RF (ARF) is a delayed autoimmune response to untreated Group A *Streptococcus* (GAS) pharyngitis. GAS is a bacteria causing both skin and throat infection and the latter is positively

linked to ARF. GAS pharyngitis is commonly seen in school going children of 5–15 years world-wide.[3] There is only 0.3–3% chance of developing ARF in sporadic and epidemic GAS pharyngitis. The chance of development of RF following GAS pharyngitis is considered as natural selection and the pathogenesis is not well understood as there is no successful animal model for RF.

Apart from the agent and host factors, the environmental conditions which influence the development of ARF are overcrowding, low economic status, and inadequate health-care facilities.[4]

The first episode of ARF can be prevented by treating GAS pharyngitis with oral penicillin V for 10 days [Table 1] or by giving an injection of long acting benzathine penicillin G (BPG). ARF involves heart, joints, brain, and skin; however, only the heart involvement leads to the long-lasting problem of RHD.

RF AND SECONDARY PREVENTION

Recurrence of RF can be prevented by effective secondary prophylaxis which includes either oral penicillin twice daily or long acting BPG injection every 3rd week for a period of up to 18 years or up to 25 years of age depending on the time of onset of illness. One of the hurdles of secondary prophylaxis is penicillin allergy and anaphylaxis (1/10000) which may occur rarely in patients undergoing treatment with penicillin. In such instances, penicillin needs to be substituted with erythromycin [Tables 2 and 3].

CLINICAL FEATURES OF RHD

RHD is a natural sequelae of RF. Around 50% of children with ARF may present with carditis.[5] Mitral or aortic valves are commonly involved in carditis and lead to the incompetence of the valve in the majority of instances. Patients with carditis and valve involvement have got a very high chance to develop RHD in the future. Mitral and aortic valves are generally affected in RHD in the form of progressive valve incompetence or stenosis late in adulthood or a combination of the two. RHD can lead to various complications such as elevation of pulmonary artery pressure, rhythm disturbance, embolism, stroke, valve infection, heart failure, and sudden death. When the patient with RHD develops symptoms and physical inability to carry out routine activities, they may need either continuous medication, surgical repair, balloon surgery, or valve replacement. Patients with RHD need prolonged or probably life-long secondary prophylaxis also.

BURDEN OF RHD IN INDIA

RHD is the most common cause of heart disease in children and young adults. One-third of the death caused by heart disease in India is due to RHD. RHD is the most common cause of mitral valve stenosis below the age of 20. In India, 1.5–2/1000 people in all age group are suffering from RHD as per the Indian Council of Medical Research (ICMR) study. This translates into a national burden of 2–2.5 million patients of RHD. The ICMR initiated community control and prevention of RF/RHD through hospital-based passive surveillance and implementation of secondary prophylaxis under Jai Vigyan Mission Mode Project from 2000 to 2010.[6]

SCHEDULE OF THE IMPLEMENTATION OF THE PROGRAM

The program can be planned to take off as early as this year. There will be periodic evaluation every 6 months to assess the progress and find out the lacunae in the implementation of the program. The final evaluation of the program can be done after completing 5 years at the end of December to decide in which all states the program needs to be continued. For the execution of the program, a state program officer (SPO) preferably a senior professor of cardiology should be given the responsibility and district co-ordinators preferably assistant professor of cardiology from a medical college who will periodically evaluate the progress of the project and assist the SPO in his activities. To reduce workforce and expenses, the office proceedings should be kept paper less. The parents are requested to get the relevant certificate from their personal/family pediatricians and physicians at three occasions only. Cardiac evaluation and certificates are to be brought:

(a) At the time of entry to school
(b) At the time of entry to fifth standard
(c) During the time of school leaving – 10th or plus two.

The pro forma for the medical examination at the time of school entry in the first standard should be given, along with the application form for school admission to the parents by the school authorities. The school dairy given to the students must have a health page and all the details of the diseases occurring every year should be written in it by the class teacher. The health card given to each student at the time of school leaving/plus two should be provided by the educational department.

ELIMINATION OF RF RECOMMENDATIONS

Cardiac assessment plan and its follow up

Evaluation at the time of admission to first standard

Students of 5–15 years are the main subset of community affected by RF. Therefore, students of this age group can be examined at three levels to detect RF and silent RHD.

At the time of school entry along with birth certificate, a medical examination certificate by a pediatrician should also

Table 1: Primary prevention of rheumatic fever (Treatment of GAS pharyngitis).

Agent	Dose	Mode	Duration
	Penicillins		
Penicillin V (phenoxymethyl penicillin)	Children: 250 mg 2–3 times daily for <27 kg (60 lb); Children >27 kg (60 lb), adolescents, and adults: 500 mg 2–3 times daily OR 50 mg/kg once daily (maximum 1 g)	Oral	10 days
Amoxicillin	OR 600,000 U for patients <27kg (60 lb); 12,00,000 U for patients >27kg (60 lb)	Oral	10 days
Benzathine penicillin G		Intramuscular	Once
	For individuals allergic to penicillin		
Narrow-spectrum cephalosporins*	Variable OR		
Cefalexin, cefadroxil	20 mg/kg per day divided in 3 doses (maximum I.8.g/d) OR	Oral	10 days
Clindamycin	12 mg/kg once daily (maximum 500 mg) OR	Oral	10 days
Azithromycin	15 mg/kg per day divided into BID (maximum 250 mg BID)	Oral	5 days
Clarithromycin		Oral	10 days

The following are not acceptable: Sulfonamides, trimethoprim, tetracyclines, and flouroquinolones.*To be avoided in those with immediate (type I) hypersensitivity to a penicillin, GAS: Group A Streptococci, BID: Twice a day

Table 2: Secondary prophylaxis of ARF.

Drug	Dose	Route	Frequency
BPG To be given after a sensitivity test. Contraindicated if penicillin allergy	Body weight >27 Kg: 12 lakh units Body weight <27 Kg: 6 lakh units	Deep IM injection	Every 21 days Every 14 days
Phenoxymethyl penicillin (penicillin V) Contraindicated if penicillin allergy	250 mg	Oral	Two times a day
Erythromycin ethyl succinate *Contraindicated in liver disease*	250 mg	Oral	Two times a day

BPG: Benzathine penicillin G, ARF: Acute rheumatic fever

Table 3: Duration of secondary prophylaxis WHO recommendations.

Category	Duration of secondary prophylaxis
RF 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 episode, or until age 25 years (whichever is longer)
Moderate or severe RHD and following cardiac surgery	Up to 40 years of age (or lifelong)

WHO: World Health Organization, RF: Rheumatic fever, RHD: Rheumatic heart disease

be made mandatory by changing necessary government rules with the help of the ministry of public education.

Evaluation at the time of admission to fifth standard

Heath checkup and health certificate should be made mandatory at the time of admission to the fifth standard also. The advantage of cardiac evaluation at this level helps to detect heart disease coming after the pre-primary school period.

Evaluation before school leaving/plus two

The 10th standard/plus two students should be asked to bring a health evaluation certificate by a cardiologist when they come after their final class examination. This evaluation should include Doppler echocardiographic evaluation also to detect silent RHD.[7] The diagnosis of RF remains clinical. Valvulitis is sine qua non-of acute carditis in RF and no investigation is better than echocardiography in its assessment. Echocardiography along with Doppler

assessment gives excellent details of the structural and functional abnormalities in ARF.

Health card

At the time of school leaving along with the SSLC certificate/ plus two certificates, a health card should also be given to each student. In this health card, all the details of the diseases of the individual student during the time of their school life should be entered and the current status of the condition should also be mentioned.

Heart disease registry

A registry of students with heart disease, especially RF and RHD, should be made at the district and state level. From this registry, the total number of students with heart disease will be available to each state government for further follow-up.

Referral system

The students with heart disease identified from the school can be referred to the local hospital and from there to the nearest medical college for future management.

Health education

In the prevention and control program of RF in India, the less expensive strategy is to make use of parents, students, and teachers for spreading the message of prevention and treatment of RF through health education book, notice, badges, videos, and bill boards containing the goal of RF prevention and the details of GAS pharyngitis and RF. A summary of the clinical features of GAS pharyngitis and RF can be read in the school assembly once or twice every year.

Teachers

The Health Education program for the teachers of each district is to be conducted once in a year in the district headquarters. Attending the health education program should be made mandatory once during the service period of all teachers. During this health education program all the information regarding the causative bacteria GAS, features of GAS pharyngitis and the signs and symptoms of RF should be taught to them.

Students

There is no information about RF and RHD in the science textbooks of school students. A minimum information regarding both RF and RHD should be included in the school text books. Students can be educated on the symptoms and signs of GAS pharyngitis, RF, and by reading the details in school assembly once or twice a year.

Parents

Parents of the students can be utilized for the prevention and control of RF and RHD. Parents-teachers association can take the initiative of conducting health education classes for students and parents.

Teacher students

Teachers-students of Anganwadi, Nursery, TTC, and B.Ed should have sufficient knowledge about RF. A short account of the GAS pharyngitis and RF should be included in the text books of these courses.

MINIMIZING THE BURDEN OF RHD

- All the RF patients should be registered in the National RF/RHD Registry
- Secondary prophylaxis as per the recommendation of World Health Organization should be given to all the RF patients[8]
- Drugs for secondary prophylaxis such as oral penicillin and long-acting benzathine penicillin should be freely available for the use of the RF patients
- Safe injection room in every districts to give BPG injection
- Annual clinical and echo evaluation of RF patients during the family get together to pick up patients with RHD and also patients requiring surgery or BMV
- There is an indication of declining trends especially after 2000 mirroring with improving economic growth of the country[9]
- Rigorous evaluations and comprehensive analyses of interventions are necessary for guiding effective strategies and informing public health policies to prevent and reduce the burden of these diseases in diverse populations[10]
- "Hridayasparsham" meetings to be conducted every year in each districts to pick up RF in school dropouts and people keeping away from mainstream
- World/National RF day celebration for public education and advocacy.

LIMITATIONS OF THE PROGRAM

In a nation like India, all the children of 5–15 years may not go to school. Another problem will be that of school drop outs. To evaluate cardiac status of these subset of children, special medical camps should be conducted for them.

RF is occasionally identified for the 1st time while evaluating during medical camps in remote tribal areas, in colonies of underprivileged communities. The details of the RF patients thus detected should be entered in the National RF and RHD registry for further follow-up.

CONCLUSION

As the most important stakeholder is the school going children of 5–15 years prevention and control of RF in India has been the program designed to be implemented with the co-operation of students, parents, and teachers and also with special attention to school dropouts and students keeping away from the mainstream. As the vaccine against RF continues to be a dream even now after more than 50 years of research, the program is mainly focusing on cardiac evaluation of students, surveillance, advocacy, and health education of all concerned.

Ethical approval

The Institutional Review Board approval is not required.

Declaration of patient consent

Patient's consent is not required as there are no patients in this study.

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Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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