Compliance to the secondary prophylaxis and awareness of rheumatic heart disease: A cross-sectional study in low-income province of India

Arun Prasad[1], Abhiranjan Prasad[2], Birendra K. Singh[3], Sanjeev Kumar[4]

Departments of [1]Pediatrics and [4]Cardiothoracic and Vascular Surgery, All India Institute of Medical Sciences, Patna, [2]Department of General Surgery, AN Magadh Medical College, Gaya, [3]Deputy Director, Department of Pediatric Cardiology, Indira Gandhi Institute of Cardiology, Patna, Bihar, India

ABSTRACT

Background: Rheumatic heart disease is a preventable problem and regular secondary prophylaxis and proper awareness about this disease among common people may reduce the burden of this disease in any region. **Objectives:** To find out compliance to the secondary prophylaxis of Rheumatic heart disease and awareness about this disease among common people of Bihar. **Methodology:** This was a questionnaire based cross sectional study to find out compliance to the secondary prophylaxis and awareness of Rheumatic heart disease, conducted at two tertiary care referral hospitals of Bihar. **Result:** 19/41 (46%) study participants were non-compliant to regular secondary prophylaxis. Most of the participants (34/42,81%) had poor knowledge of Rheumatic heart disease. Low socioeconomic condition was not a statistically significant risk factor for poor adherence to the secondary prophylaxis (odds ratio-5.29,95% CI- 0.55-50.08, *P*-0.11). Low level of education was not a statistically significant risk factor for poor awareness as compared to the participants with education of 10th standard or above (odds ratio 4.0, 95% CI- 0.65-24.24, *P*- 0.15). **Conclusion:** Approximately half of the participants of this study were non-compliant to the regular secondary prophylaxis of rheumatic heart disease and most of them had poor awareness of this disease. Ensuring regular secondary prophylaxis and improving awareness to Rheumatic heart disease among common people may reduce its prevalence in regions with significant burden of Rheumatic heart disease.

Keywords: Awareness, compliance, rheumatic heart disease, secondary prophylaxis

Introduction

Rheumatic heart disease (RHD) remains a major public health problem in many parts of the developing world. Although its overall prevalence has decreased in India over last 3-4 decades, it continues to be a significant health problem for this country.[1] The disease is caused by one or several episodes of acute rheumatic fever (ARF), an autoimmune inflammatory reaction developing in a susceptible individual, 2-3 weeks after a throat infection due to group A beta hemolytic streptococci. It affects children and young adults mainly. India is home to 40% of all people living with RHD. Of the estimated 33 million people with RHD, 13.2 million live in India. It causes a lot of morbidities, disabilities, and premature deaths. In the year 2015, of the 347 000 deaths due to RHD worldwide, nearly 120 000 (over a third) are estimated to have occurred in India.[2] Poverty, lack of education and sanitation, poor health infrastructure, and poor access to the healthcare system are some major contributors to the disease burden. Lack of organized RHD clinic and RHD registry system along with lack of disease awareness compounds the problem. Bihar is one

How to cite this article: Prasad A, Prasad A, Singh BK, Kumar S. Compliance to the secondary prophylaxis and awareness of rheumatic heart disease: A cross-sectional study in low-income province of India. J Family Med Prim Care 2020;9:1431-5.

of the most economically backward states of India with per capita income of Rupees 43822 (US$630) against the national average of Rupees 126,406 (US$ 1,800).[3] There has not been any recognized study of the prevalence of rheumatic heart disease in this region so far. One study has estimated an annual death of 120 patients due to rheumatic heart disease in the largest cardiac center of this province.[4] Primary prevention of this disease is done by treatment of sore throat caused by group A beta-hemolytic streptococcus. Secondary prevention involves long-term, 3-4 weekly injections of benzathine penicillin to avoid sore throat caused by Group A Beta hemolytic streptococcus. Recurrent attacks of acute rheumatic fever lead to increasing damage to the cardiac valves with each attack. Hence, strict adherence to the compliance to the secondary prophylaxis is important to reduce the overall burden and burden of severe valvular heart disease in any region. Awareness among the general public and health personnel regarding the potential association of sore throat with rheumatic heart disease is important so that a maximum number of patients with bacterial sore throat seek medical attention and they are treated appropriately. Group A streptococcal infection, known to cause ARF, accounts for 15%–30% of cases of pharyngitis in children.[5] It is also important to counsel patients and their attendants regarding the importance of adherence to the long-term secondary prophylaxis so that the patients of ARF/RHD comply with the long-term secondary prophylaxis and valvular lesions do not progress in them. WHO has recommended register-based secondary prophylaxis program as an effective preventive strategy for control of RHD.[6] In regions with significant RHD burden, there should be an organized system in existing healthcare infrastructure, such as "Rheumatic heart disease control clinic," to provide primary prevention and regular secondary prophylaxis. Although India is an endemic region for ARF and RHD, the disease is neglected in national health policy, hence due weightage should be given in national health agendas, considering its potential to cause morbidity and premature deaths.[7]

We conducted a cross-sectional study at two tertiary referral healthcare centers in Patna (in Bihar province in the eastern part of India), to find out compliance to the secondary prophylaxis in patients of rheumatic heart disease and awareness of this disease in patients and their caretakers.

Methodology

Study design

This was a questionnaire-based cross-sectional study.

Study area and Population

This study was conducted at two tertiary care hospitals, AIIMS, Patna and Indira Gandhi institute of cardiology, Patna. These two hospitals of government sector cater as referral center for cardiac cases of Bihar province.

Sample size

Considering 90% compliance with the secondary prophylaxis in the previous studies and 10% margin of error, the sample size calculated was 44.

Inclusion criteria

Patients in the age group of 5 to 45 years, diagnosed with ARF/RHD by echocardiography, who had been advised secondary prophylaxis for more than ≥1 year were included for the study. In addition, those diagnosed with ARF/RHD for less than 1 year were included in the study for knowing their awareness regarding ARF/RHD.

Exclusion criteria

Patients with valvular disease of nonrheumatic origin (e.g., congenital, senile, etc.) were excluded from the study.

Data collection

Consenting patients were included in the study. Their demographic data were recorded along with echocardiographic diagnosis. The socioeconomic condition was assessed by Kuppuswamy's scale.[8] The questionnaire used for data collection contained questions regarding adherence to the secondary prophylaxis and awareness of ARF. Responses were obtained from the patients if they were ≥16 years of age and from their caretakers if they were <16-year-old. "Good adherence" to the secondary prophylaxis has been defined for this study as when the number of expected injections/tablets taken was ≥80%, and "poor adherence" when it was <80%.[9] For studying awareness of ARF/RHD, a questionnaire used in a similar study was applied after translating it into the local language.[10] It contained the following questions with their points given for the response: sore throat can be caused by a bacterium (yes = 1 point, no or do not know = 0 point), untreated sore throat can be associated with heart disease (yes = 1 point, no or do not know = 0 point), and proper treatment of sore throat can prevent heart disease (yes = 1 point, no or do not know = 0 point). A total score of zero = very poor knowledge, 1 = poor knowledge, 2 = fair knowledge, and 3 = adequate knowledge.

Statistical analysis

Quantitative data has been described as proportions. Data was analyzed using Epi info software, version 7.2. *P* value of < 0.05 was considered statistically significant.

Results

Forty-two patients participated in the study. There were 20 (48%) males and 22 (52%) females [Table 1]. The median age was 13 years. The minimum age was 6 years and the maximum age was 45 years. The maximum number of participants (18/42, 43%) belonged to 6–10 year age group [Table 2]. Minimum age at first diagnosis of acute rheumatic fever/rheumatic heart disease was 5 years and the maximum age was 35 years. Most of the patients (35/42, 83%) belonged to low socioeconomic group. 23/42 (52%) had history of joint pain. Mitral valve involvement was found in most (41/42, 98%) of the cases. 10/42 (24%) had a combination of mitral valve and aortic valve involvement. 1/42 (2%) patient had an acute rheumatic fever while 41/42 (98%) had established rheumatic heart disease. Most of the patients (39/41, 95%) were

taking secondary prophylaxis from private clinics. 22/41 (53%) of the RHD patients were compliant to regular secondary prophylaxis [Figure 1]. Out of 22 compliant patients, 21 were on benzathine penicillin and 1 was on oral erythromycin. Among 19 noncompliant patients, 14 did not give any specific reason for this. Each of 5 noncompliant patients stated reason for discontinuing medication as: Wrong information given by quack that benzathine penicillin is used for treating abscess, nonavailability of injection locally, pain at injection site, unaffordability of the cost of injection, and penicillin allergy [Figure 2].

Although most of the patients belonged to low-income group, this was not a significant risk factor for noncompliance (odds ratio-5.29, 95% CI- 0.55–50.08, *P*-0.11) [Table 3].

Knowledge regarding rheumatic heart disease was poor among 34/42 (81%), very poor among 4/42 (9%), and fair among 2/42(5%) participants [Figure 3]. Only 2 (5%) patients had adequate knowledge of RHD [Table 3]. 75% (31/42) of participants were either illiterate or having an education below 10th standard, but this was not a significant risk factor for noncompliance to the secondary prophylaxis (odds ratio 4.0, 95% CI- 0.65–24.24, *P*- 0.15) [Table 4]. Out of 9 female patients in the age group of 18 years and above, 3 patients were detected first time to have rheumatic heart disease, during delivery of their child.
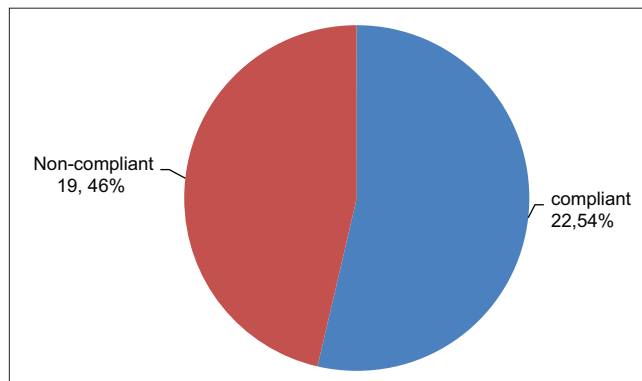
Table 1: Demography and clinical characteristics

Factors	Number (%)
Age	
≤ 18 years	33 (79)
≥ 18 years	09 (21)
Sex	
Male	20 (48)
Female	22 (52)
Socioeconomic condition	
Upper	00
Upper middle	01 (02)
Lower middle	02 (05)
Upper lower	04 (09)
Lower	35 (83)
Acute Rheumatic fever	01 (2)
Rheumatic heart disease	41 (98)
History of joint pain	
Present	23 (52)
Absent	19 (48)
Valvular involvement	
Mitral valve	41 (98)
Aortic valve	01 (02)
Mitral valve + Aortic valve	10 (24)
Procurement of secondary prophylaxis	
Self-procured	40 (97)
Availed free government supply	01 (03)
Place of taking secondary prophylaxis	
Government hospital	02 (05)
Private clinics	39 (95)

Table 2: Number of patients of ARF/RHD among different age groups (*n*=42)

Age group	Number of ARF/RHD patients (%)
6-10	18 (43)
11-15	11 (26)
16-20	07 (17)
21-25	01 (2)
26-30	02 (4)
31-35	01 (2)
36-40	03 (7)
41-45	01 (2)

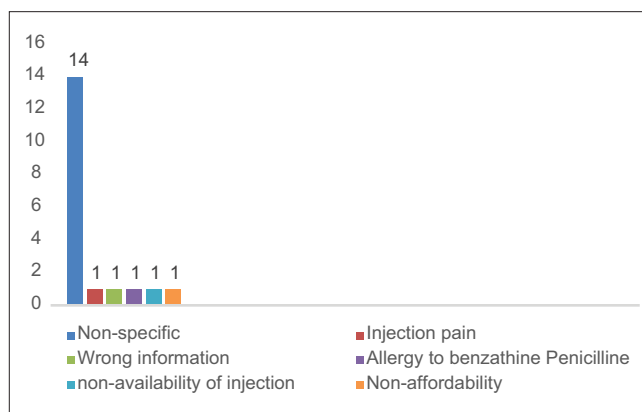**Figure 1:** Compliance to the secondary prophylaxis in patients of ARF/RHD (*n*=41)

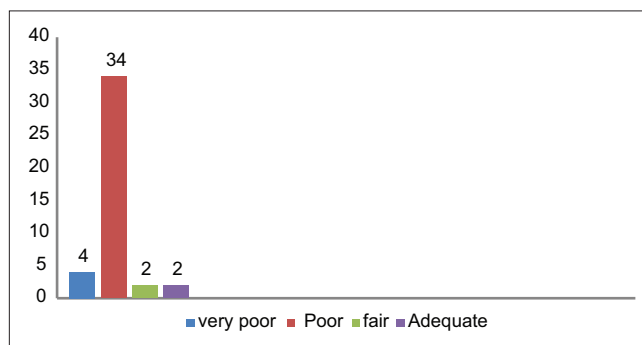**Figure 2:** Various reasons for noncompliance to the secondary prophylaxis

Figure 3: Awareness of ARF/RHD among patients and their relatives (*n* = 42)

Discussion

Regular secondary prophylaxis and awareness of RHD are some of the recognized factors which can reduce the burden of this disease, in any region. Noncompliance to the secondary prophylaxis is a significant risk factor for the recurrences of acute rheumatic fever.[11] A good adherence to the regular secondary prophylaxis would prevent recurrences of ARF in any patient who had suffered from ARF previously.[12] This might prevent the development of valvular disease at all or halt the progression of the already developed valvular lesion. Poor adherence to secondary prophylaxis for rheumatic fever has been observed due to poor knowledge.[13] According to Eissa *et al.*, "knowledge and understanding of the rheumatic fever are important factors in treatment uptake."[14] High adherence (90%) with rheumatic fever prophylaxis in India, observed by Tullu *et al.*, was credited to the training of health workers, schoolteachers, and pupils who were able to recognize the signs of rheumatic fever and refer suspected persons to a health center.[15] The compliance rate to the secondary prophylaxis in our study was 53%. This was comparable to a study conducted in five centers in Jamica[13] which recorded a compliance rate of 48.7%. But, this was much below the compliance rate in a similar study conducted in rural areas of northern India which recorded a higher compliance rate of more than 90%.[16] One of the striking findings related to secondary prophylaxis in our patients was that most of the RHD patients (95%) were taking it from private clinics. This reflects the lack of an organized system to control RHD and nonavailability of benzathine penicillin in government hospitals of this region. As RHD is a significant health problem in this country; the government health care system should have the mechanism to provide free of cost regular secondary prophylaxis. As benzathine penicillin is a cheaper medicine, supplying medicines free of cost for secondary prophylaxis will not involve much of the cost to the government agencies. Many noncompliant patients did not give any specific reason to discontinue secondary prophylaxis. This could be due to ignorance of the disease, which could be dealt with counseling the patients and their relatives, regarding the importance of secondary prophylaxis. Al-Sekait *et al.* have also identified ignorance and lack of awareness as a cause of the persistence of acute rheumatic fever.[17] One of the findings of our study is wrong information given to the patient by a quack that the benzathine penicillin is used for treating skin infections only. It indicates that the healthcare workers also need to be made aware regarding the nature of this disease and the

importance of secondary prophylaxis so that they encourage the patients to be adherent with the treatment and secondary prevention. Fear of pain at injection site, nonavailability of injection benzathine penicillin, and financial constraints are some of the important factors associated with poor adherence with the secondary prophylaxis.[18,19] The low-income group was not a statistically significant risk factor for poor adherence to the secondary prophylaxis.

General public awareness activities are vital for a successful RHD control program.[20] 81% (34/42) of our participants had poor awareness of rheumatic heart disease. 75% (31/42) of the participants had a low level of education (either illiterate or having an education below 10th standard). But the low level of education was not a statistically significant risk factor as compared to the participants with the education of 10th standard or above. This indicates generalized lack of awareness of RHD in this region, irrespective of their educational status. Awareness activities have been found to improve awareness of RHD in Nepal by 40% (from 8% to 48%).[21] 9/3 (33%) adult female patients were detected to have underlying heart disease first time during pregnancy. This is more likely that they might have developed the valvular lesions before conceiving the child, which could be diagnosed first time during childbirth due to significant dyspnea. Nemani *et al.* also reported 10/273 of their patients were diagnosed the first time with RHD during pregnancy.[19] This signifies the need of careful antenatal clinical examination of the cardiovascular system with screening echocardiography if possible. The obstetricians may be trained and acquainted to screen valvular heart disease during the antenatal examination of pregnant females by ultrasound so that such lesions are detected early and any serious complication is avoided with prior preparation.

As this is a hospital-based study, it does not provide a true reflection of factors associated with RHD in the community but overall the findings of this study may resemble with the situation of RHD in other low-income provinces.

Conclusion

Rheumatic heart disease remains a significant health problem in developing countries. Awareness regarding this disease among common people and regular secondary prophylaxis are vital for the prevention and control of this disease. Approximately, half of the total number of participants in our study were noncompliant to the regular secondary prophylaxis. A large number of patients had poor knowledge about this disease; hence, in the regions with significant disease burden, there is a need of spreading awareness regarding this disease among common people so that more people seek medical attention for sore throat and they adhere to the regular secondary prophylaxis if diagnosed with ARF/RHD. Government agencies should invest money in preventing this neglected disease.

Table 3: Low-income group as risk factor for noncompliance to the secondary prophylaxis (*n*=41)

Income group	compliant	Noncompliant	Odds ratio	*P*
Low income	17	18	Odds ratio 5.29 (95% CI 0.55-50.08)	0.11
Above low income	5	1		

Table 4: Low level of education as risk factor for poor awareness of RHD (*n*=42)

Level of education	Fair/adequate knowledge of RHD	Poor knowledge of RHD	Odds ratio	*P*
Less than 10th standard	3	28	Odds ratio 3.50 (95% CI 0.58 to 20.81)	0.15
10th standard and above	3	8		

Abbreviations

ARF: Acute Rheumatic Fever
RHD: Rheumatic Heart Disease
WHO: World Health Organization

Declarations

Ethics approval and consent to participate

The study complies with the "National ethical guidelines for biomedical health and research ethics guidelines, 2107" of Indian Council of Medical research. This research was conducted in consultation with Ethics committee of All India Institute of Medical Sciences Patna. This research was exempted from ethical review as per provisions contained in Para 2 (Sl.no.1) of table 4.2 of these guidelines. Verbal consent was taken from each participant before including them in study as per above mentioned national guidelines (Para 5.7, Point no. 4).

Consent for publication

Not applicable

Availability of Data and Material

Demographic and clinical data were obtained from records of All India Institute of Medical Sciences, Patna and Indira Gandhi Institute of Cardiology, Patna.

Authors contributions

AP and BKS were involved in data collection, SK drafted the manuscript, and *P* Abhiranjan was involved in data analysis. All authors reviewed and approved the final draft.

Conflicts of interest

There are no conflicts of interest.

References

1. Watkins DA, Johnson CO, Colquhoun SM, Karthikeyan G, Beaton A, Bukhman G, *et al.* Global, regional and national burden of rheumatic heart disease, 1990-2015. N Eng J Med 2017;377:713-22.

2. Karthikeyan G. Rheumatic heart disease in India: Declining, but not fast enough. Natl Med J India 2017;30:247-8.

3. List of Indian states and union territories by GDP per capita. Wikipedia. Available from: https://en.wikipedia.org/wiki/List_of_Indian_states_and_union_territories_by_GDP_per_capita. [Last accesesd 2019 Dec].

4. Prasad A, Kumar S, Singh BK, Kumari N. Mortality due to rheumatic heart disease in developing world: A preventable problem. J Clin Exp Cardiolog 2017;8:503.

5. Schroeder BM. Diagnosis and management of group A streptococcal pharyngitis. Am Fam Physician 2003;67:883-4.

6. World Health Organization. Rheumatic Fever and Rheumatic Heart Disease: Report of a WHO Expert Consultation. Geneva (CHE); 2004.

7. Noubiap JJ, Agbor VN, Bigna JJ, Kaze AD, Nyaga UF, Mayosi BM. Prevalence and progression of rheumatic heart disease: A global systematic review and meta-analysis of population-based echocardiographic studies. Sci Rep 2019;9:17022.

8. Shaikh Z, Pathak R. Revised Kuppuswamy and B G Prasad socio-economic scales. Int J Community Med Public Health 2017;4:997-9.

9. Gasse B, Baroux N, Rouchon B, Meunier JM, Frémicourt ID, D'Ortenzio E. Determinants of poor adherence to secondary antibiotic prophylaxis for rheumatic fever recurrence on Lifou, New Caledonia: A retrospective cohort study. BMC Public Health 2013;13:131.

10. Nkoke C, Luchuo EB, Jingi AM, Makoge C, Hamadou B, Dzudie A. Rheumatic heart disease awareness in the South West region of Cameroon: A hospital based survey in a Sub-Saharan African setting. PLoS One 2018;13:e0203864.

11. Bassili A. Profile of secondary prophylaxis among children with rheumatic heart disease in Alexandria, Egypt. EMHJ 2000;6:437-46.

12. de Dassel JL, de Klerk N, Carapetis JR, Ralph AP. How many doses make a difference? An analysis of secondary prevention of rheumatic fever and rheumatic heart disease. J Am Heart Assoc 2018;7:e010223.

13. Thompson SB, Brown CH, Edwards AM, Lindo J. Low adherence to secondary prophylaxis among clients diagnosed with rheumatic fever, Jamaica. Pathog Glob Health 2014;108:229-34.

14. Eissa S, Lee R, Binns P, Garstone G, McDonald M. Assessment of a register-based rheumatic heart disease secondary prevention program in an Australian Aboriginal community. Aust NZ J Public Health 2005;29:525.

15. Tullu MS, Gandhi A, Ghildiyal RG. Benzathine penicillin prophylaxis in children with rheumatic fever (RF)/rheumatic heart disease (RHD): A study of compliance. Al Ameen J Med Sci 2010;3:140-5.

16. Kumar R, Thakur JS, Aggarwal A, Ganguly NK. Compliance of secondary prophylaxis for controlling rheumatic fever and rheumatic heart disease in a rural area of northern India. Indian Heart J 1997;49:282-8.

17. Al-Sekait MA, Al-Swilem ARA, Tahir M. Rheumatic heart disease in schoolchildren from Al-Medina Al-Mounawarrah district, Saudi Arabia. Ann Saudi Med 199010:590-2.

18. Mohammed K, Demissie WR, Bariso M. Adherence of rheumatic heart disease patients to secondary prophylaxis and main reasons for poor adherence at Jimma Medical Center. EJCM 2019;7:22-7.

19. Nemani L, Maddury J, Barik R, Arigondam AK. A cross sectional study to look at the determinants of poor adherence to secondary prophylaxis for rheumatic heart disease at the tertiary care center in South India. J Clin Prev Cardiol 2018;7:5-10.

20. Bach JF, Chalons S, Forier E, Elana G, Jouanelle G, Kayemba S, *et al.* 10-year educational programme aimed at rheumatic fever in two French Caribbean islands. Lancet 1996;347:644-8.

21. Regmi P, Sanjel K. Effectiveness of awareness raising interventions on knowledge about rheumatic heart disease and change in care seeking behavior for throat infection in Lalitpur, Nepal. Nepalese Heart J 2019;16:15-8.