

# Epidemiology of rheumatic fever and rheumatic heart disease in a rural community in northern India\*

A. Grover,<sup>1</sup> A. Dhawan,<sup>2</sup> S.D. Iyengar,<sup>3</sup> I.S. Anand,<sup>4</sup> P.L. Wahi,<sup>4</sup> & N.K. Ganguly<sup>5</sup>

*The epidemiology of rheumatic fever and rheumatic heart disease in a rural community (total population 114 610) in northern India was studied by setting up a registry based on primary health care centres. Health workers and schoolteachers were trained to identify suspected patients in school and village surveys (121 villages). Medical specialists screened 5–15-year-olds (n = 31 200). The population was followed up for 3 years (from March 1988 to March 1991). All suspected and registered cases were investigated by serial echocardiography and Doppler ultrasonography at a tertiary care centre.*

*A total of 102 cases were confirmed to have rheumatic fever/rheumatic heart disease (prevalence, 0.09%); 66 were aged 5–15 years (prevalence, 0.21%). A total of 48 patients (24 males, 24 females; mean age, 12.11 ± 3.7 years) were diagnosed to have a possible first attack of rheumatic fever (incidence, 0.54 per 1000 per year). Arthritis was observed in 36 (75%) and carditis in 18 (37.5%) of cases. Prolapse of the anterior mitral leaflet into the left atrium occurred in 5 (22%) cases with carditis. Mitral regurgitation was observed in all 18 cases of carditis; over the period of observation it disappeared in three cases and progressed to mitral stenosis in a further three. A total of 22 patients (11 males, 11 females; mean age, 19.41 ± 8.1 years) were registered as rheumatic fever recurrences, and 32 patients (18 females, 14 males; mean age, 22.1 ± 10.1 years) had chronic rheumatic heart disease. Of those with recurrences, 9 (41%) had carditis and 11 (50%) had arthritis. No recurrences were observed among patients who complied with secondary prophylaxis with benzathine penicillin at 4-week intervals. Four patients with chronic rheumatic heart disease required mitral valvotomy and three required valve replacements. Eight patients (5 males, 3 females; mean age, 21.8 ± 8.8 years) died over the duration of the study period (3 with acute rheumatic fever, 3 from progressive heart failure, 1 from an adverse penicillin reaction, and 1 from a non-cardiac cause).*

## Introduction

In developed countries acute rheumatic fever and rheumatic heart disease were considered to be of decreasing significance until reports of recent outbreaks (1–8). In developing countries most studies of these diseases have been hospital-based and have concentrated on children (9). No study involving coverage of a whole community using revised Jones criteria (10) has appeared. Techniques such as echocardiography for confirming the diagnosis and differentiating the initial attack of rheumatic fever from recurrences have only become available since the

1980s. We therefore undertook a community-based study to investigate the following: whether the clinical profile of acute rheumatic fever in India differs from that in developed countries and whether there is a real need for revised Jones criteria for developing countries (11–14); the natural history of rheumatic fever over 3 years; and the lowest estimate of the burden imposed by rheumatic fever/rheumatic heart disease on a community in a developing country.

## Materials and methods

### Population

The study was based on three primary health centre registries in a rural community development block of Ambala district, Haryana State, northern India, covering a rural population of 114 610 (31 200 children aged 5–15 years in 121 villages (population density, 455 per km<sup>2</sup>; provisional 1991 national census data). The main occupation in the study area is agriculture. Emigration from the block has been less than 1%

\* From the Post-graduate Institute of Medical Education and Research, Chandigarh 160 012, India.

<sup>1</sup> Assistant Professor, Department of Cardiology. Requests for reprints should be sent to this author.

<sup>2</sup> Chief Resident, Department of Pediatrics.

<sup>3</sup> Chief Resident, Department of Community Medicine.

<sup>4</sup> Professor, Department of Cardiology.

<sup>5</sup> Professor, Department of Experimental Medicine.

Reprint No. 5356

over the last 3 years. All 10 medical officers and 79 multipurpose health workers in the block agreed to take part in the study.

### **Health education and screening**

A health education and training programme was carried out in the study area from September to December 1987. This involved the training of health workers, teachers, and school students. Health workers and three pharmacists were trained to identify suspected cases of rheumatic fever/rheumatic heart disease and to refer them to the medical officers in the health centres. A total of 698 teachers in 127 schools were also trained to recognize the symptoms and signs of these diseases and then to instruct the older pupils in classes 5–10 (12 500 children). The schools were regularly visited by the programme staff. A total of 31 200 children were personally screened by the medical officers during school medical check-ups. Any absentee on account of any illness was contacted. The health workers were trained at routine monthly meetings when 20–30 minutes were spent in discussing the problem. The teachers were trained during school visits followed by a refresher course during their routine monthly meetings. Pupils were initially given a talk on rheumatic fever by the programme staff, and this was followed by instruction during school hours by the teachers.

Posters, pamphlets and acrylic model hearts were designed, pre-tested, and then used to convey the following health education message in the local language:

— Rheumatic fever is a serious disease that inevitably damages the heart, thereby crippling the patient for life. It is potentially fatal. It usually begins in childhood between 5 years and 15 years of age and progresses thereafter. Fever, joint pain or swelling, breathlessness and fatigue, involuntary movements (chorea), are indicative of rheumatic fever. Persons having such complaints should be promptly referred for diagnosis and long-term management (regular injections) which controls the disease by limiting the heart damage.

Suspected cases from schools and villages were referred to the medical officers at the health centres for confirmation of the diagnosis. A rheumatic fever/rheumatic heart disease registry was set up at each health centre and the medical officers from the three participating primary health centres were asked to initiate secondary prophylaxis for patients whom they diagnosed to have rheumatic fever/rheumatic heart disease. The medical officers registered those cases referred to them by teachers and health workers as well as those examined by them during school screening and in health centre clinics.

Every case entered in the registry or otherwise suspected to have rheumatic fever/rheumatic heart disease was examined by one of the authors to confirm the diagnosis. A case was confirmed if any one or more of the following criteria were fulfilled: evidence of rheumatic fever with the presence of chronic valvular heart disease (chronic rheumatic heart disease, recurrence); presence of rheumatic chorea (acute rheumatic fever, first attack or recurrence depending on history); presence of acute rheumatic fever at the time of evaluation diagnosed by revised Jones criteria (10); or the presence of mitral stenosis (chronic rheumatic heart disease). Anti-streptolysin-0 titres were determined and electrocardiograms were performed at the tertiary health centre to help in establishing the diagnosis. Serum samples drawn in the field were also examined at the tertiary care rheumatic fever centre for other antibodies to confirm the diagnosis of a prior streptococcal infection. All registered cases were given a secondary prophylaxis card and monthly injections of benzathine penicillin G (sulfadiazine tablets were given to 3 patients who were allergic to penicillin) at the three health centres in the study area. The injections were administered by pharmacists or nurses, who kept a record of the secondary prophylaxis given. All registered patients were visited in their homes to complete collection of demographic data. Defaulters were recalled by post and/or a home visit by the local health worker. On registration, ambulatory cases were treated as outpatients, moderately ill patients were admitted locally, and severely ill cases were referred to the Department of Cardiology, Postgraduate Institute of Medical Education and Research (PGIMER), Chandigarh.

### **Echocardiography**

All suspected and registered cases were called to a monthly cardiology clinic run by a cardiologist (A.G.) at the community health centre to confirm the diagnosis. Defaulters were examined in their own villages. All cases were subsequently called for an echocardiogram at PGIMER, Chandigarh (interval between registration and echocardiography, 0–21 days).

Every patient was re-examined at 3-monthly intervals and repeat echocardiography was performed if considered necessary. All events in these patients were followed up and new cases were registered. Those requiring cardiac catheterization before surgery were brought to PGIMER.

For the analysis, the following definitions were used.

— Possible first episode of acute rheumatic fever ( $n = 48$ ). Those patients who fulfilled

the revised Jones criteria at the time of entry on the registry; no history of rheumatic fever; and echocardiography showing no evidence of chronic rheumatic heart disease.

- Rheumatic fever recurrences ( $n = 22$ ). Those patients who fulfilled the criteria for rheumatic fever at entry, but who had a history of either rheumatic fever or echocardiography showing evidence of previous valvular involvement.
- Chronic rheumatic heart disease ( $n = 32$ ). Clinical and echocardiographic evidence of chronic rheumatic heart disease. Two patients also had arthralgia but were not considered to have satisfied sufficient criteria to be diagnosed as exhibiting rheumatic fever recurrence.
- Compliant patient. A patient who did not miss more than one monthly prophylaxis injection per year.

## Results

A total of 380 suspected cases from all age groups were referred to the medical officers by health workers, teachers, and outpatient clinics for registration. Of these, 125 were registered. We re-examined 376 of the original referrals (4 could not be traced) but the medical officer could find insufficient evidence to diagnose rheumatic fever/rheumatic heart disease in any of the 251 suspected cases denied registration in the first instance. Of the 125 cases that were registered initially, 102 were found to be suffering from rheumatic fever or rheumatic heart disease after a detailed clinical examination and further investigations. All these 125 cases and 67 further cases (from the suspected but not registered cases) underwent echocardiography (2-D, M-mode, and Doppler ultrasonography; ATL mark 8 electrocardiograph).<sup>a</sup> For 12 cases (10%) diagnosis could only be confirmed after echocardiography, while for 23 (18.4%) of the registered cases the cardiologist did not agree with the diagnosis made by the medical officers and secondary prophylaxis was stopped. Of these 23 patients, 11 had joint pains and fever but no evidence of prior streptococcal infection; seven had innocent systolic murmurs, mistaken for rheumatic heart disease; and five had congenital heart disease (1 patient had corrected transposition of the great arteries with Ebstein's anomaly of the left atrioventricular valve; 1 had an atrial septal defect; and 3 patients had ventricular septal defects).

<sup>a</sup> Advanced Technical Laboratories, Boethel, WA, USA.

## Profile of the first attack of rheumatic fever

A total of 48 patients (24 males, 24 females; age range, 5–18 years; mean age,  $12.11 \pm 3.7$  years) were diagnosed to have a possible first attack of rheumatic fever (13, 16, and 19 patients per year over the 3 years of the study). The clinical profile of these patients is summarized in Table 1.

Arthritis was observed in 36 (75%) of the 48 patients who presented a first attack. One or more major joints were involved in all but one patient, who had arthritis of the proximal phalangeal joints. Arthritis, as the isolated major criterion, was present in 19 (39.5%) patients; and 14 (29.2%) had associated carditis. One patient with arthritis had associated subcutaneous nodules (Table 1). Two patients with arthritis had chorea; both of these patients had no previous history of rheumatic fever, and cardiac examination did not reveal any sequel of previous rheumatic fever. Carditis as the only major manifestation occurred in 18 (37.5%) patients, two of whom had pericardial effusion and pericarditis. The New York Heart Association (NYHA) functional class of the patients is shown in Table 2. Erythema marginatum was seen in only one patient.

## Profile of recurrent rheumatic fever

Arthritis involving one or other major joints was seen in 11 (50%) of 22 patients. Carditis occurred in 9 (41%) patients. Six (27.2%) patients had arthritis with carditis and one patient had a subcutaneous nodule and arthritis. For four (18%) patients, arthritis was not accompanied by any other major criteria (Table 2).

Arthralgia was a presenting feature in 15 (12%) of the 125 registered patients. Definite diagnosis of rheumatic fever could be established for only six of these 15 patients, and of these six, two had chorea, three had echocardiographic evidence of chronic rheumatic heart disease, and one had carditis as indicated by echocardiography. For six further patients

Table 1: Clinical profile of patients with a first attack of rheumatic fever or a recurrence

	No. of patients with:				
	Arthritis	Carditis	Chorea	Subcutaneous nodules	Erythema marginatum
First attack ( $n=48$ )	36	18	4	2	1
Recurrence ( $n=22$ )	11	9	4	2	0
Total	47	27	8	4	1

Table 2: **Functional status (New York Heart Association (NYHA) class) of patients with acute rheumatic fever and recurrence**

	No. in NYHA class:			
	I	II	III	IV
First attack (n=48)	22	17	6	2
Recurrence (n=22)	8	9	4	2
Total	30	26	10	4

with arthralgia, diagnosis of rheumatic fever was considered doubtful and they were excluded from the study for the purpose of calculating incidence and prevalence values. These patients were categorized as having "post-streptococcal arthralgia", since they exhibited antibodies that suggested previous streptococcal infection, and were followed up. Finally, the three remaining patients with arthralgia were excluded, since on clinical laboratory examination their symptoms did not suggest rheumatic fever.

### Sequelae of rheumatic fever

A total of 7 (38%) of 18 patients with a first attack of rheumatic fever and carditis developed chronic valvular lesions. Echocardiography performed at the first attack did not reveal any evidence of chronic valvular disease; the mean period for the development of this complication in these seven patients (3 with mitral stenosis, 3 with dominant mitral regurgitation and mild narrowing of the mitral valve, and 1 also with aortic regurgitation) was 9 months (range, 1–3 years). The lesions were diagnosed by prospective serial echocardiography. Three of the patients were male, while four were female.

Retrospective analysis could be carried out on 58 of 70 patients (48 with acute rheumatic fever and 22 with recurrences). For these patients, the average interval between occurrence of rheumatic fever (presumably the first attack) and the occurrence of rheumatic heart disease was 12.1 years.

### Profile of chronic rheumatic heart disease

There were 32 patients who had chronic rheumatic heart disease at registration. Their demographic details were similar to those of patients who had a first attack of rheumatic fever (Table 3). The pattern of valvular involvement detected was as follows: mitral stenosis (11 patients); mitral stenosis and mitral regurgitation (9); mitral stenosis and aortic

regurgitation (2); mitral regurgitation (6); and mitral and aortic regurgitation (4).

### Treatment

All patients received secondary prophylaxis in the form of benzathine penicillin G injections once every 4 weeks; three patients received oral sulfadiazine since they were allergic to penicillin. Compliance was good since, on average, patients missed only one injection per year. No patients had a recurrence of rheumatic fever while on penicillin prophylaxis; there was one death due to penicillin anaphylaxis.

A total of 7 of the 32 patients with chronic rheumatic heart disease underwent surgery; four required mitral valvotomy and three, mitral valve replacement. Another three patients required surgical intervention, but were unable to afford it.

### Mortality

A total of eight patients (5 males, 3 females) died (average age, 21.8 years) over the study period. For six patients, death was directly due to altered cardiac haemodynamics, three died during acute rheumatic fever, and three because of progressive heart failure caused by untreated valvular lesions. One child died of penicillin anaphylaxis and one death was unrelated to heart disease.

Table 3: **Demographic features of the patients with acute rheumatic fever, rheumatic fever recurrences, and chronic rheumatic heart disease**

	Rheumatic fever (n = 48)	Recurrence (n = 22)	Chronic RHD <sup>a</sup> (n = 32)
Age range (years)	6–17 (12) <sup>b</sup>	7–36 (19)	9–40 (22)
No. of males	24	11	14
No. of females	24	11	18
Socioeconomic status:			
Very poor	6	2	4
Poor	16	10	15
Middle	26	10	13
No. of rooms in house <sup>c</sup>	2	2	2
Average number of siblings <sup>c</sup>	4	4	4
Patient shares room with how many others <sup>c</sup>	3	3	3

<sup>a</sup> RHD = rheumatic heart disease.

<sup>b</sup> Figures in parentheses are the mean.

<sup>c</sup> These data indicate overcrowding, according to criteria drawn up by the Indian Council of Medical Research.

## Discussion

### Prevalence and incidence

The prevalence of rheumatic fever and rheumatic heart disease worldwide has been reported to vary from 0.55 per 1000 to 11 per 1000 (15–24). In our target population (5–15-year age group) which was screened ( $n = 31\ 200$ ) the prevalence was 2.1 per 1000 and the incidence, 0.54 per 1000. For the whole population in the rural development block, which was the subject of passive surveillance by the programme staff, health workers, and medical officers, the prevalence of rheumatic fever was 0.9 per 1000. Echocardiography, the first report of its use in a field study, in addition to confirming the diagnosis of 10% of patients, also enabled us to exclude 18% of patients who were probably overdiagnosed. This removes any bias and attaches more accuracy to our data. In previous studies (19–23), some cases must have been overdiagnosed, since clinically it is sometimes impossible to determine whether a systolic murmur is of rheumatic or non-rheumatic origin. Similarly, use of echocardiography and Doppler ultrasonography helped us to identify the 11 cases with no audible signs of mitral regurgitation. Veasy et al. have shown that echocardiography is a valuable adjunct in detecting clinically inaudible murmurs (2). From the point of view of their epidemiology and the administration of secondary prophylaxis, rheumatic fever and rheumatic heart disease cannot be separated. The 48 first-attack cases of acute rheumatic fever—equivalent to an attack rate of 0.54 per 1000 per year in the susceptible population in the 3 years of the study up to March 1991—indicate the magnitude of the problem and the scope for prevention. Over the period April 1991 to April 1992 no new case of chronic rheumatic heart disease has been added to the registry, while cases of acute rheumatic fever are being entered at the same rate as previously. These findings are a rough indication of the completeness of the passive surveillance and the lack of primary prevention.

### Age/sex of cases

When the data were stratified by sex there were no differences in patients with acute (24 males, 24 females) or recurrent rheumatic fever (11 males, 11 females), although there was a statistically insignificant predominance of female patients with chronic rheumatic heart disease (18 females, 14 males). Mathur et al. have reported a higher prevalence of rheumatic fever/rheumatic heart disease among females (7.2 per 1000) compared with males (5.28 per 1000) (18). In India several studies have found

a higher frequency among males (25–27), while only a few Indian but several Western studies have reported a higher incidence among females (19, 28–30). It appears that in India the incidence of rheumatic fever/rheumatic heart disease, by sex, is not different from that in developed countries. The observed discrepancy for females could arise because in India hospitals are used more frequently by men. The present study, which was community-based, was not affected by this factor.

The mean age of patients with acute rheumatic fever was less than that of those with recurrence. The oldest patient who presented with recurrence was 36 years of age; thus, we believe that long-term prophylaxis needs to be recommended for all the patients.

### Arthritis/arthralgia

In India, the frequency of arthritis in many series of patients with rheumatic fever has been reported as less than 50% (31–33). The frequency of arthritis in our patients (75% for the first attack of rheumatic fever) is among the highest reported for India and is consistent with reports by Sanayal (34) and by Aggarwal & Aggarwal (35). Arthritis can be so mild that the patient may not seek medical help. The distinction between arthritis and arthralgia is not always clear; moreover, in arthritis the swelling subsides without any specific treatment. The value of obtaining a careful history and of detailed examination of patients needs to be emphasized.

Roy et al. have suggested that arthralgia could be used as a major criterion to diagnose rheumatic fever in India (12). A high incidence of arthralgia (46%) in patients with rheumatic fever has also been reported by Padmavati & Gupta, who recommended that arthralgia be included as a major criterion (14). Our experience supports the opposite view. Mild arthritis, which is likely not to be diagnosed, is not an uncommon manifestation, and arthralgia, if present in the absence of arthritis, can be evaluated in the majority of cases with the help of other features. For example, of the 15 patients with arthralgia in our study, we were able to categorize 9 (60%), who were either included or excluded from the registry based on other findings (taking arthralgia as a minor criterion); three had arthralgia as the only manifestation, and were eliminated, while the diagnosis of three other patients was problematic. These six patients had post-streptococcal arthralgia upon normal cardiac examination (if arthralgia had been a major criterion the diagnosis would have been acute rheumatic fever), and although their data were excluded from the study, they continued to receive secondary prophylaxis and are being given serial echocardiograms.

The incidence of carditis associated with rheumatic fever (65–98%) varies from country to country (14, 34, 36–38). In our study, we found carditis in 37.5% of patients with an initial attack of rheumatic fever and in 41% of those with recurrence. This is similar to the 34% reported by Sanyal for initial attacks in north India (34). In the literature the striking observation about carditis is its average incidence of 46% for the initial attack, whereas in recurrent attacks levels as high as 81% have been reported (34, 39). In our study, the reason for the only slightly higher incidence of carditis in the group with recurrence could be that the condition was identified in 25% of cases during the first attack by echocardiography. Furthermore, it has been reported that clinical manifestations during recurrence tend to mimic those present in the preceding attack (40).

An unusual feature in our study was the occurrence of chorea with arthritis in two patients, which suggests re-infection. The infrequent occurrence of subcutaneous nodules and erythema marginatum has been reported in developing countries (15, 27), and in developed countries these features of rheumatic fever are also declining (41).

Five patients in the initial attack group, who otherwise satisfied Jones criteria, exhibited prolapse of the anterior mitral leaflet into the left atrium with grade 2 to grade 3 regurgitation on echocardiography. On follow-up, prolapse remained in one patient and regurgitation disappeared, whereas in another two patients mild mitral stenosis with a Doppler gradient across the mitral valve was observed 1 year later. A similar etiology for mitral valve prolapse has been reported previously (42). None of our patients underwent surgery during the acute phase, and we propose that prolapse of the mitral valve may have been the result of an initial insult to the mitral valve, followed by the development of fibrosis and a chronic valvular lesion later.

No recurrence occurred among patients who received regular penicillin prophylaxis, while recurrence occurred in one patient who stopped taking sulfadiazine.

### **Mortality load on the community**

Carditis leading to congestive heart failure is the commonest cause of death in patients with congestive heart failure. Recurrence of carditis, usually in the absence of prophylaxis, leads to further deterioration in cardiac status. In developed countries mortality during the first episode of rheumatic fever is zero; if cardiac function deteriorates, surgery (such as mitral valve replacement or reconstruction) can be performed (43)—a situation that does not apply in developing countries. In our study there were three deaths

related to acute rheumatic fever, one during the first episode and two during recurrences.

Out of the 102 definite cases of rheumatic fever in our study, seven (7%) died because of the illness within 3–32 months of being entered in the registry, at a relatively young age. The mortality rate is five times the crude death rate for this age group in the general population. Three patients died from progressive valvular lesions; they could not afford the cost of valve replacement, which in a state hospital is about US\$ 3000. This sum, in a developing country where the average annual per capita income is US\$ 270, is prohibitive. A penicillin injection costs about US\$ 0.30 and can be given free at a government dispensary. At present we are carrying out a cost-benefit analysis. A total of US\$ 7000 was spent on health education material and providing penicillin to the study population of 114 610 for 3 years; the rationale of providing secondary prophylaxis is therefore clear.

---

### **Acknowledgements**

This study was partly supported by WHO. We thank Dr R. Kumar, Assistant Professor of Community Medicine, for his guidance; Dr V. Gupta and all other medical officers of Raipurani for helping with the data collection; and Mr P. Singh, social worker, for his assistance.

---

### **Résumé**

#### **Epidémiologie du rhumatisme articulaire aigu et de ses manifestations cardiaques dans une communauté rurale du nord de l'Inde**

Une étude épidémiologique du rhumatisme articulaire aigu et de ses manifestations cardiaques a été entreprise sur l'ensemble de la population d'une communauté rurale du nord de l'Inde comptant 114 610 habitants.

Un registre a été établi à partir des données recueillies dans les centres de soins de santé primaires. On a appris aux agents de santé et aux instituteurs à reconnaître les patients atteints de rhumatisme articulaire aigu et de ses manifestations cardiaques grâce à un système de surveillance active dans les écoles et de surveillance passive dans 121 villages. Douze spécialistes médicaux ont examiné 31 200 enfants âgés de 5 à 15 ans. La population a été suivie pendant trois ans, de mars 1988 à mars 1991. Des séries d'examen par échocardiographie et échographie Doppler ont été pratiqués dans un centre de soins tertiaires sur tous les cas suspects enregistrés.

Au total, le rhumatisme articulaire aigu et/ou ses manifestations cardiaques ont été confirmés chez 102 patients (prévalence, 0,09%) dont 66 étaient âgés de 5 à 15 ans (prévalence, 0,21%). La possibilité d'une première attaque de rhumatisme articulaire aigu a été diagnostiquée dans 48 de ces cas (24 de sexe masculin, 24 de sexe féminin; âge moyen:  $12,11 \pm 3,7$  ans), ce qui donne une incidence de 0,54 pour 1000 par an dans la population à risque. Une arthrite a été notée chez 36 (75%) des patients souffrant d'une première attaque de rhumatisme articulaire aigu et une cardite chez 18 d'entre eux (37,5%). Un prolapsus de la valvule mitrale antérieure dans le ventricule gauche a été observé chez cinq des patients atteints de cardite (22%). Une régurgitation mitrale a été notée dans les 18 cas de cardite. Au cours de la période d'observation, elle a disparu dans trois cas, elle s'est aggravée en sténose mitrale chez trois patients et en régurgitation mitrale chronique accompagnée d'une légère sténose mitrale dans trois autres cas; chez un patient, l'anomalie a fini par toucher également le système valvulaire aortique.

Vingt-deux cas de récurrence de rhumatisme articulaire aigu (11 hommes et 11 femmes, âge moyen:  $19,41 \pm 8,1$  ans) ont été enregistrés au moment de l'admission, tandis que 32 patients (18 femmes et 14 hommes, âge moyen:  $22,1 \pm 10,1$  ans) présentaient des manifestations cardiaques chroniques. Neuf patients (41%) hospitalisés à la suite d'une nouvelle crise de rhumatisme articulaire aigu souffraient également de cardite et un pourcentage presque identique (50%) étaient atteints d'arthrite. Aucune rechute n'a été observée chez les patients qui ont suivi un traitement prophylactique secondaire de quatre semaines à la benzathine pénicilline. Quatre patients souffrant de rhumatisme cardiaque chronique ont dû subir une valvotomie mitrale, et il a fallu procéder au remplacement des valvules chez trois autres. Huits patients (cinq de sexe masculin et trois de sexe féminin, âge moyen:  $21,8 \pm 8,8$  ans) sont morts au cours de l'étude (trois lors d'une attaque de rhumatisme articulaire aigu, trois en raison d'une insuffisance cardiaque progressive, un des suites d'une réaction à la pénicilline; la cause du décès du huitième n'était pas d'origine cardiaque).

Dans la région rurale couverte par cette étude, le profil clinique de la première attaque de rhumatisme articulaire aigu ne diffère pas de celui qui a été décrit dans des pays développés. L'arthralgie en l'absence d'arthrite n'a pas posé de problèmes de diagnostic importants et ne mérite donc pas d'être considérée comme un critère majeur. L'évolution des cardites en rhumatisme

cardiaque chronique est rapide et s'observe chez des patients jeunes. Le rhumatisme articulaire aigu constitue toujours un grave problème de santé dans le nord de l'Inde où il entraîne une morbidité et une mortalité importantes chez les jeunes.

## References

1. **Congeni, B. et al.** Outbreak of acute rheumatic fever in north-east Ohio. *Journal of pediatrics*, **111**: 176–179 (1987).
2. **Veasy, L.G. et al.** Resurgence of acute rheumatic fever in the intermountain area of the United States. *New England journal of medicine*, **316**: 421–427 (1987).
3. **Hoseir, D.M. et al.** Resurgence of acute rheumatic fever. *American journal of diseases of children*, **141**: 730–733 (1987).
4. **Wald, E.R. et al.** Acute rheumatic fever in north-western Pennsylvania and the tristate area. *Pediatrics*, **80**: 371–374 (1987).
5. **Papademas, T. et al.** Acute rheumatic fever at a Navy training area—San Diego, California. *Morbidity and mortality weekly report*, **37**: 101–104 (1987).
6. **Sampson, G.L. et al.** Acute rheumatic fever among trainees—Fort Leonard Wood, Missouri, 1987–88. *Morbidity and mortality weekly report*, **37**: 519–522 (1988).
7. **Burns, D.L. & Ginsburg, C.M.** Recrudescence of acute rheumatic fever in Dallas, Texas. *Pediatric research*, **21**: 256A (1987).
8. **Jackson, M.A. et al.** Mucoid group A streptococcal disease in Kansas City, Missouri. *Pediatric research*, **23**: 372A (1988).
9. **Agarwal, B.L.** In: Agarwal, B.L., ed. *Rheumatic fever and rheumatic heart disease in developing countries*. Delhi, Arnold, 1988, pp. 13–15.
10. **Committee on Prevention of Rheumatic Fever, American Heart Association.** Jones criteria (revised) for guidance in the diagnosis of rheumatic fever. *Circulation*, **69**: 203A–209A (1984).
11. **Lue, H.C. et al.** Outcome of children with rheumatic fever not diagnosed by revised (1965) Jones criteria. *Japanese heart journal*, **17**: 560–567 (1976).
12. **Roy, S.B.** The diagnosis of rheumatic fever. *Journal of the Indian Medical Association*, **35**: 344–346 (1960).
13. **Cherian, G.** Acute rheumatic fever — the Jones criteria. A review and a case for polyarthralgia. *Journal of the Association of Physicians of India*, **27**: 453–457 (1979).
14. **Padmavati, S. & Gupta, V.** Reappraisal of the Jones criteria: the Indian experience. *New Zealand medical journal*, **101**: 391–392 (1980).
15. **Padmavati, S.** Epidemiology of cardiovascular diseases in India: rheumatic heart disease. *Circulation*, **25**: 703–710 (1962).
16. **Aggarwal, V.K. & Aggarwal, R.K.** A survey of prevalence of heart disease in schoolchildren in Allahabad. *Journal of the Association of Physicians of India*, **17**: 695–702 (1969).

17. **Zaheer, M. et al.** A survey among school-going children at Aligarh. *Indian heart journal*, **25**: 289 (1973).
18. **Mathur, K.S. et al.** Rheumatic heart disease and rheumatic fever in a village community of Bichpuri Block, Agra. *Journal of the Association of Physicians of India*, **19**: 151–156 (1971).
19. **Berry, J.N.** Prevalence survey for chronic rheumatic heart disease and rheumatic fever in northern India. *British heart journal*, **34**: 143–149 (1972).
20. **Shrestha, N.K. & Padmavati, S.** Prevalence of rheumatic heart disease in Delhi schoolchildren. *Indian journal of medical research*, **69**: 821–833 (1979).
21. **Nair, D.V. et al.** Epidemiological survey of rheumatic heart disease in schoolchildren in Alleppey. *Indian journal of medical research*, **32**: 65–71 (1980).
22. **Devi, C.** Rheumatic fever and rheumatic heart disease in Simla Hills: epidemiological aspects. *Indian journal of medical research*, **51**: 407–713 (1963).
23. **Shah, P.M. & Udani, P.M.** Medical examination of rural schoolchildren in Palghat Taluk. *Indian pediatrics*, **5**: 343–361 (1963).
24. **Morton, W.E. et al.** Rheumatic heart disease epidemiology. *Journal of the American Medical Association*, **199**: 879–882 (1967).
25. **Malhotra, R.P. & Gupta, S.P.** Rheumatic heart disease in Punjab. *Indian heart journal*, **15**: 107–113 (1963).
26. **Samani, O.T. & Changdalia, B.** Rheumatic heart disease in Bombay. *Indian heart journal*, **17**: 263–269 (1965).
27. **Vakil, R.J.** Heart disease in India. *American heart journal*, **48**: 439–448 (1954).
28. **Wood, P.** An appreciation of mitral stenosis. *British medical journal*, **1**: 1051 (1954).
29. **Dubost, U. et al.** Instrument dilation using the transatrial approach in the treatment of mitral stenosis—a survey of 1000 cases. *Journal of thoracic and cardiovascular surgery*, **44**: 392–397 (1962).
30. **Friedberg, C.K.** *Diseases of the heart*, 3rd ed. Philadelphia, W.B. Saunders, 1966, p. 1030.
31. **Roy, S.B.** The diagnosis of rheumatic fever. *Journal of the Indian Medical Association*, **35**: 344–346 (1960).
32. **Benakappa, D.G. et al.** Review of 100 cases of rheumatic fever. *Indian pediatrics*, **15**: 376–384 (1978).
33. **Ghosh, S. & Mangat, R.** Acute rheumatic fever and rheumatic heart disease in childhood. *Indian pediatrics*, **1**: 226–230 (1964).
34. **Sanyal, S.K. et al.** The initial attack of acute rheumatic fever during childhood in north India: a prospective study of the clinical profile. *Circulation*, **49**: 7–12 (1974).
35. **Aggarwal, B. & Aggarwal, R.** Rheumatic fever: clinical profile of the initial attack in India. *Bulletin of the World Health Organization*, **64**: 573–578 (1986).
36. **Lahiri, K. et al.** Clinical profile of rheumatic fever: a study of 168 cases. *Journal of tropical pediatrics*, **31**: 213–215 (1985).
37. **Gharib, R.** Acute rheumatic fever in Shiraz, Iran. *American journal of diseases of children*, **118**: 694–699 (1969).
38. **Okoroma, E.O. et al.** Rheumatic fever in Nigerian children: a prospective study of 66 patients. *American journal of diseases of children*, **18**: 548–551 (1981).
39. **Mahmood, J. & Abbas, K.A.** Clinical profile of acute rheumatic fever in children. *Journal of tropical pediatrics*, **35**: 10–13 (1989).
40. **Feinstein, A.R. & Spagnuolo, M.** Mimetic features of rheumatic fever recurrences. *New England journal of medicine*, **262**: 533–540 (1968).
41. **Barnert, A.L. et al.** Acute rheumatic fever in adults. *Journal of the American Medical Association*, **232**: 925–928 (1975).
42. **Lembo, J.N. et al.** Mitral valve prolapse in patients with prior rheumatic fever. *Circulation*, **77**: 830–836 (1988).
43. **Marcus, R.H. et al.** Functional anatomy of severe mitral regurgitation in active rheumatic carditis. *American journal of cardiology*, **63**: 577–584 (1989).