Controlling rheumatic heart disease in developing countries

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The streptococcal infection that leads to rheumatic heart disease, which accounts for one third to half of the cardiac admissions in developing countries, appears to spread especially rapidly in overcrowded living conditions. Rheumatic fever can be prevented by antibiotic treatment for streptococcal sore throat in children (primary prophylaxis), and its progression towards rheumatic heart disease can also be stopped by antibiotic therapy (secondary prophylaxis). At present, the most cost-effective control strategy appears to be secondary prophylaxis.

Rheumatic heart disease is one of the most common causes of cardiovascular morbidity and mortality in developing countries. Prevalence rates, according to community and school surveys, range from 1 to 22 per 1000 children (1). It is estimated that there may be 30 million children with chronic rheumatic heart disease in the developing countries and 1.5 million in the industrialized countries (2). Many of the deaths which occur in developing countries could be prevented by implementing the available preventive strategies in community-level primary health care programmes.

Epidemiology and control

Epidemiological studies in the first half of this century showed that the disease starts with an apparently innocuous sore throat caused by group A beta-haemolytic streptococci (3). Acute rheumatic fever develops 2–3 weeks later. More than 50% of the episodes of acute rheumatic fever include carditis, which often progresses gradually to chronic rheumatic heart disease. Recurrences of rheumatic fever are quite common and cause further damage to the heart valves. The disease runs a more severe course in developing countries, because appropriate medical care is often not available during the acute attack of rheumatic fever, and, owing to ignorance, patients do not take adequate bed rest. Over a period of a few years, cardiac decompensation develops and 70% of the cases end in premature death. The average age at death is 35 years.

Trials during the 1950s showed that adequate antibiotic therapy (“primary prophylaxis”)
for streptococcal sore throat could prevent rheumatic fever, and the development of rheumatic heart disease or its further progression in patients with rheumatic heart disease could also be prevented by providing long-term antibiotic treatment ("secondary prophylaxis"), which prevents streptococcal infections and recurrence of acute rheumatic fever (4). Primary and secondary penicillin prophylaxis became part of medical practice in the industrialized countries and is believed to be the cause of a dramatic decline in the incidence of rheumatic fever in these countries since the Second World War.

Data gathered in Denmark from 1862 to 1962 showed that the fall in the incidence of rheumatic fever was temporally related to the rise in the standard of living (5). Case–control studies also indicate that there is a high risk of disease where socioeconomic conditions are poor. Overcrowding appears to be the decisive environmental factor in the spread of infection. Therefore, a decline in incidence can be expected in the developing countries when there is a rise in living standards. But according to current predictions most of the developing countries are unlikely to raise their standard of living sufficiently in the foreseeable future to reduce the incidence of this disease significantly.

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Prevention of streptococcal infection by immunization could be a simple and effective solution, but the complex pathogenesis of the disease is still too poorly understood to make the development of a streptococcal vaccine likely in the near future. At present the programme based on either primary or secondary antibiotic prophylaxis is the only available short-term means of controlling rheumatic heart disease in the developing countries.

**Primary prophylaxis**

The use of primary prophylaxis in developing countries poses several problems. Pharyngitis is quite common in children, and differentiation of streptococcal pharyngitis from non-streptococcal pharyngitis (which is usually viral) cannot be done by clinical examination alone. Culturing of streptococci from the throat is needed to confirm the diagnosis. A simple and rapid test has been developed but it still needs to be field-tested for use in peripheral health centres where culture facilities are not available (6).

In one study, the incidence of streptococcal pharyngitis was found to be 8 episodes per week per 1000 children in the 5–15-year age group. Only 0.3% of the episodes in endemic situations and 3% during epidemics developed into acute rheumatic fever. Mild cases of sore throat (about a third) did not show up in clinics (7), and one third of the rheumatic fever cases result from subclinical streptococcal infection. Application of primary prophylaxis, therefore, can only be expected to achieve a modest reduction in the incidence of rheumatic fever. Rheumatic fever incidence has been calculated to range from 20 to 100 cases per 100,000 population in the developing countries (8).

The wisdom of widespread throat culturing has been questioned in the developed countries on epidemiological and economic grounds, and treatment of suspected cases of streptococcal sore throat with penicillin without culture has been recommended as the most cost-effective strategy for acute rheumatic fever prevention (9). Information on the
effectiveness of primary prevention strategy is not available from developing countries. In Hawaii, the incidence of rheumatic fever in the schools where a primary prevention programme was introduced did not differ from the incidence in schools not covered by the programme (10).

The efficiency of the primary prevention strategy can be improved by increasing the clinic attendance of sore throat cases or by using this strategy during seasonal peaks of streptococcal infection. There is a great need to educate parents and teachers about the importance of treatment of sore throat among school-aged children. Not all patients who attend the clinic get proper treatment, so medical practitioners need to be reminded that eradication of streptococci is the aim of the treatment, and appropriate drugs in sufficient quantities should be given for a sufficient length of time to achieve this.

**Secondary prophylaxis**

Secondary prophylaxis demands surveillance of rheumatic fever cases and regular antibiotic injections. Several hospital-based follow-up programmes in developing countries report poor compliance with secondary prophylaxis (11–13). It was observed that those mildly affected by the disease, with little or no disability, drop out of the programme. Secondly, patients report to hospitals in very late stages of the disease, when secondary prophylaxis cannot be of much benefit to them (14). Community-based programmes for case detection are more likely to register patients early and, by providing prophylaxis close to the patients’ residence, can improve compliance.

A WHO-sponsored international project tested the feasibility of secondary prophylaxis in seven developing countries from 1972 to 1976 and launched a control programme in 16 developing countries in 1986 (15). WHO also tested this strategy in eight countries of South America from 1976 to 1981. These projects adopted a community-based approach. Surveillance of cases was carried out in the community and registries were set up to ensure proper follow-up.

The feasibility project was considered to be only partially successful, as 48% of the patients were lost to follow-up (mainly because they moved out of the area). The compliance rate for secondary prophylaxis among those followed up improved from 38.3% in the first year to 79.8% in the last year of the project. In a community-based programme in a rural community of North India, health workers, schoolteachers and pupils were trained to recognize the signs of rheumatic fever and refer suspected cases to a health centre. A registry was set up at the health centre to monitor compliance. Defaulters were reminded by letter or by the health workers of the area. A compliance rate of 85–90% was achieved in a two-year period. (16). Similar approaches can be used to improve the effectiveness of the programme in other developing countries.

**Cost-effectiveness**

Rheumatic fever and rheumatic heart disease have a considerable adverse economic impact in developing countries. They account for one third to half of the cardiac admissions in the hospitals (17). Surgical treatment to repair or replace the damaged heart valves is either not available or very expensive. Most of the
patients need hospital admission repeatedly. A study in Chile found that 4.4 medical consultations per 1000 inhabitants and 54.5 hospital admissions per 100,000 inhabitants per year were due to rheumatic heart disease (7).

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The secondary prophylaxis strategy was found to be cost-effective in a WHO pilot study. Only 3.14 injections of benzathine penicillin prevented one hospital day of admission (18). The cost of penicillin was considerably outweighed by the gain in hospital days saved. Other benefits to the patients were achieved at no cost. This shows that a rheumatic heart disease control programme carried out within the available primary health care institutions will not only prevent premature deaths but also reduce the cost of caring for chronic cases in developing countries.

Health programmes compete with each other for limited resources in the developing countries. The frequency and severity of this disease are less than those of many other acute communicable diseases, severe malnutrition, and some of the parasitic diseases which cause crippling morbidity in the developing world. In Ghana, rheumatic heart disease came 33rd in a list of 48 diseases ranked according to the number of days of life lost because of the disease (19). Similar analyses can be undertaken in other countries to determine the relative costs and benefits of preventive programmes.

References

Short-course treatment regimens for tuberculosis

The last twenty years have seen substantial improvements in tuberculosis treatment, with the development of highly efficacious treatment regimens. As a result of large-scale programmes of carefully controlled clinical trials, the duration of treatment has been progressively reduced from 18–24 months to 9 months, and now 6 months.

However, in order for these intensive, short-course regimens to be effective, antituberculosis drugs must be available to patients. This requires an efficient and effective system of drug procurement and distribution, as well as the availability of health workers to ensure that patients continue to receive these drugs until cured.