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The community control of rheumatic fever and rheumatic heart disease: report of a WHO international cooperative project

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The feasibility and effectiveness of a programme for the community control of rheumatic fever and rheumatic heart disease were studied in a cooperative multicentre project initiated and coordinated by the World Health Organization. The programme was carried out in seven centres in various developing countries of Africa, America, and Asia according to a common protocol, and is under way in a further eight countries in Latin America. Pilot community programmes were shown to be practicable and effective in reducing the burden of rheumatic heart disease in developing countries and their extension to cover entire populations should be encouraged.

The World Health Organization project for the community control of rheumatic fever and rheumatic heart disease started in 1972 in six centres and was coordinated by WHO headquarters. One more centre joined the study in 1974, and the WHO Regional Office for the Americas organized a cooperative study following the same protocol in a number of Latin American countries in 1975–76. The present report aims to present an overall view of the headquarters project, by summing up the data and the experience gained.

The basic operating protocol designed in 1972 (*1*)[a] and revised in 1975[b] defined the following main objectives:

(i) Surveillance of known cases of rheumatic fever and rheumatic heart disease in the community, and prevention of relapses by prophylactic administration of penicillin.

(ii) Demonstration of the feasibility of community control of rheumatic heart disease in pilot programmes, in order to encourage the extension of such programmes to wider populations.

(iii) Acquisition of information on:

— incidence and prevalence of the disease
— natural history of the disease
— load of the disease on the community
— cost of prophylaxis programmes
— patient response, including missed appointments, drop-outs, and effect of migration into and out of the study area.

Both the successes and the failures of the project will be discussed on the basis of the information contained in the record forms that have been received in WHO headquarters.

STUDY METHODS

Interested and motivated investigators in various centres in developing countries were asked to adopt a protocol designed by WHO to promote the community control of rheumatic fever. The protocol suggested the establishment of rheumatic fever registries, each covering a limited community, the registration of all known rheumatic fever patients, screening of high-risk populations (if appropriate) for rheumatic heart disease, encouragement of cooperation between

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[a] *WHO programme on rheumatic fever prevention: report of a consultation held in Cairo, 19–22 February 1972.* WHO unpublished document, CVD/72.2, 1972.

[b] *The community control of rheumatic fever and rheumatic heart disease: report of a WHO meeting, Prague, 3–5 November 1975.* WHO unpublished document, CVD/76.1, 1976.

Table 1. Number of record forms received

Examination	Centre							All centres
	A	B	C	D	E	F	G	
Initial	638	62	488	699	229	162	691	2969
Follow-up	1204	–	2142	44	710	46	1353	5499
Total	1842	62	2630	743	939	208	2044	8468

hospitals, policlinics, school health services, laboratories, and individual physicians in the promotion of rheumatic fever prevention and control, education of the physicians in the area with special reference to the prevention of rheumatic fever, and health education of the general public. Greatest emphasis was laid on regular penicillin prophylaxis in order to prevent recurrences of rheumatic fever and the appearance or deterioration of rheumatic heart disease. Criteria for diagnosis and registration, and guidelines for carrying out the penicillin prophylaxis were given in the protocol.

Investigators were asked to enter all information on standard record forms, which were to be sent to WHO headquarters at regular intervals. Each registered subject was to be re-examined once a year and a follow-up record form also sent to Geneva.

RESULTS

The present report deals with the results from the seven centres whose project was coordinated at WHO headquarters in Geneva. The results from the Latin American centres, whose action was coordinated by the WHO Regional Office for the Americas, will be reported later.

Assessment of the functioning of the programme

The project was carried out in the following centres: Cairo, Cyprus, Kingston, Lagos, New Delhi, Tehran, and Ulan Bator. During the project, nearly 3000 patients with rheumatic fever and rheumatic heart disease were registered. Approximately 5500 follow-up record forms were received in Geneva, corresponding to almost the same number of patient-observation years (Table 1). Although this is a considerable amount of information, a total of 10 102 follow-up record forms could have been expected if every registered patient had been re-examined once a year. Thus only 54% of the expected record forms were received in Geneva, indicating that the information on follow-up examinations was incomplete. The number of record forms received should not be equated with the number of follow-up examinations performed, since some patients were followed up without a record

Table 2. Distribution of patients by age[a]

Age group (years)	Centre							All centres
	A	B	C	D	E	F	G	
⩽ 5	7	7	15	7	2	10	5	53
6–8	51	13	45	14	8	17	64	212
9–11	147	19	76	57	15	16	142	472
12–14	202	6	107	84	38	24	274	735
15–17	145	3	80	65	44	9	170	516
18–20	53	2	51	92	34	15	22	269
⩾ 21	28	11	112	374	87	70	14	696
Unknown	5	1	2	6	1	1	0	16
Total	638	62	488	699	229	162	691	2969

[a] Median age class is underlined.

Table 3. Number of follow-up records by calendar year

Year	Centre						All centres
	A	C	D	E	F	G	
1969–71	1	191	–	–	1	1	194
1972	36	204	1	0	40	–	281
1973	317	300	11	66	5	–	699
1974	146	389	–	108	–	101	744
1975	341	362	–	104	–	268	1075
1976	238	346	–	159	–	433	1176
1977	125	350	32	140	–	247	894
1978	–	–	–	133	–	151	284
1979	–	–	–	–	–	152	152
Total	1204	2142	44	710	46	1353	5499

form being sent to Geneva, but, in general, the performance of the registries, as regards data collection, was less satisfactory than expected.

From the age distribution of the registered patients, presented in Table 2, some conclusions can be drawn on the functioning of the centres. In centres A and G, the percentage of adults registered (subjects aged 18 and above) equalled 13% and 5%, respectively, while in centres C, D, and E the proportion of adults amounted to 50%, 53%, and 67% of all subjects, respectively. It is thus obvious that some of the centres focused most of their attention on paediatric patients and school populations, while in other centres more attention was directed to adults suffering from rheumatic heart disease. Although it is difficult to draw any firm conclusions from the data available, it is unlikely that coverage of the whole community was achieved in any of the centres.

The number of follow-up record forms received in WHO in each year (Table 3) also shows certain irregularities. During the first few years, there was a steady increase in the number of follow-up records, as

Table 4. Number of patients with active rheumatic fever at initial registration (percentage in brackets)

Presence of active rheumatic fever	Centre							All centres
	A	B	C	D	E	F	G	
Without carditis								
Definite	0 (0.0)	10 (16.1)	74 (15.2)	121 (17.3)	59 (25.8)	54 (33.3)	71 (10.3)	389 (13.0)
Suspected	0 (0.0)	3 (4.8)	20 (4.1)	13 (1.9)	1 (0.4)	4 (2.5)	9 (1.3)	50 (1.7)
With carditis								
Definite	0 (0.0)	32 (51.6)	34 (7.0)	329 (47.1)	49 (21.4)	61 (37.7)	54 (7.8)	559 (18.7)
Suspected	0 (0.0)	6 (9.7)	11 (2.3)	148 (21.2)	14 (6.1)	20 (12.3)	28 (4.1)	227 (7.6)
None	630 (98.7)	6 (9.7)	331 (67.8)	76 (10.9)	24 (10.5)	23 (14.2)	529 (76.6)	1619 (54.8)
Unknown	8 (1.3)	5 (8.1)	18 (3.7)	12 (1.7)	82 (35.8)	0 (0.0)	0 (0.0)	125 (4.2)
Total	638	62	488	699	229	162	691	2969

Table 5. Number of patients with different types of valvular heart disease and congestive heart failure

Disease classification	Congestive heart failure				
	Definite	Suspected	None	Unknown	Total
Mitral stenosis only	87	6	246	35	374
Mitral insufficiency only	91	32	773	20	916
Aortic insufficiency and/or aortic stenosis only	20	1	58	21	100
Mitral stenosis and mitral insufficiency	82	9	364	16	471
Mitral stenosis and/or mitral insufficiency and aortic stenosis and/or aortic insufficiency	72	15	282	21	390
No mitral or aortic involvement	11	19	582	106	718
Total	363	82	2305	219	2969

expected, because of the accumulation of registrations, but after 1976, the number decreased. This was most probably due to a decline in interest in the study.

Despite these weaknesses, the cooperative project has produced valuable information, which will be described in the following sections.

Morbidity patterns

The overall ratio of males to females in the registered population is approximately 4:5, confirming that rheumatic heart disease is slightly more common in women. The ratio holds true for all centres except centre G, indicating that some selection in favour of boys may have occurred there.

Table 4 shows the frequency of active rheumatic fever on initial registration. In all centres, 54.8% of the subjects had chronic rheumatic heart disease, while 41.0% were diagnosed at the time of registration as having rheumatic fever. Of these, 64% had definite or suspected carditis. It should be pointed out that in several centres the majority of the subjects were registered initially outside an active phase of rheumatic fever, a fact that once again reflects operational differences among the various centres.

The types of valvular heart disease found in registered subjects are indicated in Table 5. The summary findings from all centres show that, as expected, the commonest type of valvular heart disease was mitral insufficiency, followed by mitral disease (combined mitral stenosis and insufficiency), aorto-mitral valve disease, and isolated mitral stenosis. The least frequent condition was isolated aortic valve disease.

Congestive heart failure (definite and suspected) was registered in 19% of all cases, usually accompanying valvular heart disease. While the distribution of types of valvular heart disease was similar in all centres, there were considerable differences in the frequency of congestive heart failure. Although the definition of congestive heart failure was given in the protocol, it is likely that these intercentre differences reflect different diagnostic criteria rather than actual differences in the occurrence of congestive heart failure.

A cross-tabulation of congestive heart failure and New York Heart Association (NYHA) functional class is given in Table 6; this allows cross-checking of the validity of the diagnosis. In some centres, definite congestive heart failure was often described in patients who were classified as NYHA class I or II. These two

Table 6. Number of patients with congestive heart failure according to NYHA functional class

Functional class	Congestive heart failure			
	Definite	Suspected	None	Unknown
I	18	20	1163	107
II	183	50	721	30
III	133	9	103	4
IV	21	0	7	3
Not applicable or blank	8	3	311	75
Total	363	82	2305	219

Table 7. Other conditions diagnosed in registered patients

Condition	ICD code	Centre						All centres
		B	C	D	E	F	G	
Infective and parasitic diseases	000–136	1	8	132	1	56	3	201
Diseases of the blood	280–289	1	12	–	–	–	–	13
Mental disorders	290–315	–	1	–	–	–	1	2
Diseases of the nervous system	320–389	–	5	1	–	–	2	8
Chronic rheumatic heart disease	393–398	1	7	–	–	–	16	24
Acute endocarditis	421	1	2	–	7	–	1	11
Pulmonary heart disease	426	–	3	–	–	–	45	48
Symptomatic heart disease	427	–	3	–	–	–	2	5
Cerebral embolism	434	–	–	–	1	–	–	1
Diseases of the respiratory system	460–519	–	17	258	1	–	6	282
Diseases of the digestive system	520–577	–	13	115	–	–	–	128
Diseases of the genitourinary system	580–629	–	2	–	2	–	1	5
Delivery	650	–	5	–	–	–	–	5
Complications of pregnancy	630–678	–	1	–	2	–	3	6
Diseases of the skin	680–709	–	1	–	–	–	–	1
Arthritis	710–718	–	1	–	–	–	46	47
Congenital anomalies of the heart	746	–	1	–	1	–	–	2
Symptoms referable to cardiovascular system	782	–	2	–	–	–	–	2
Medical and surgical aftercare	Y30–Y39	–	–	–	16	–	27	43
Others	Y60	–	8	4	6	1	48	67

conditions are, by definition, incompatible, suggesting that the diagnosis of heart failure, or the NYHA functional classification, or both, need to be examined carefully in epidemiological studies.

Table 7 summarizes the occurrence of other disease conditions in subjects with rheumatic fever or rheumatic heart disease. In 8% of patients, infective and parasitic diseases were diagnosed; diseases of the respiratory system were found in 9.4% of cases, and diseases of the digestive system in 4.2% of cases. Other groups of diseases were much less frequent. However, most of the associated pathology was reported from one centre only, and other conditions obviously received little attention in the majority of centres.

The median age of onset of rheumatic fever in the whole population was 10 years for males and 11 years for females. It is important to stress that in 3% of cases, the disease had started in children aged 4 and younger. The median age of onset varied according to the centre, and was between 7 and 9 years in four of them. The overall picture is confused by the findings in centre D where 26% of all cases were reported as having started rheumatic fever at age 21 or later. This finding might be due to some misunderstanding of the protocol. In general, however, Table 8 confirms that in developing countries rheumatic fever starts early in life and, in one-third of all cases, had started before the end of the 8th year.

In 70.3% of all subjects with active rheumatic fever, it was stated that a streptococcal infection had preceded the bout of rheumatic fever. It is interesting to note that regular penicillin prophylaxis was mentioned in the history of some 25% of all subjects with active rheumatic fever. The others had either received no prophylaxis at all (35%), or were receiving penicillin only occasionally.

Level of coverage

As mentioned, a considerable proportion of follow-up records is missing. However, certain conclusions can be drawn from the reports of the absence of subjects at the follow-up examination. Of the patients who did not attend the follow-up examination, 46.6% had moved out of the area, 3.4% had died, and 20.4% were removed from the registry for some other reason, e.g., refusing to cooperate. In 13.1% of cases, the patient could not be traced, and in 16.5% the reason was recorded as unknown. The number of subjects

Table 8. Distribution of patients according to age at onset of rheumatic fever

Age at onset (years)	Centre							All centres
	A	B	C	D	E	F	G	
<1				1			1	2
1	1						1	2
2	2		2	2			1	7
3	11	2	4	1	1	2	2	23
4	21	1	6	3	10	2	11	54
5	22	3	13	5	13	9	23	88
6	83	2	20	8	12	12	26	163
7	50	4	19	11	15	6	37	142
8	46		28	12	16	3	37	142
9	43	2	17	29	13	4	54	162
10	54	2	17	31	14	12	40	170
11	36	2	16	34	9	8	39	144
12	41	2	20	33	15	9	23	143
13	22		26	25	12	7	26	118
14	18	1	12	24	13	6	9	83
15	7		14	35	13	6	4	79
16	3	1	6	30	8	3	3	54
17	1	1	8	22	4	3	2	41
18	1		4	23	9	3		40
19	2		2	23	4	7	1	39
20	1	1	5	25	5	4		41
21	1		1	8	3	4		17
>22	2	4	11	126	8	21		172
Total	468	28	251	511	197	131	340	1926

not traced is, in fact, many times greater than that recorded. However, a considerable proportion of patients moved from the area, underlining the need for wider, preferably nationwide, rheumatic fever control programmes.

The primary aim of the WHO project was to ensure that rheumatic fever patients received penicillin regularly, in order to prevent recurrence of the disease. Table 9 shows the level of prophylaxis achieved, on the basis of the number of penicillin injections given during the first six follow-up years. Penicillin prophylaxis was given 10 or more times per year to 38.3% of

Table 9. Percentage of patients given different levels of prophylaxis in the first six years of follow-up

No. of penicillin injections per year	Follow-up year						Total no. of patients
	1	2	3	4	5	6	
0–5	36.7	24.9	17.2	13.1	10.8	18.4	1125
6–9	24.9	20.4	16.1	7.4	10.2	5.5	992
10–11	12.9	14.2	15.8	12.4	12.4	19.7	919
12	25.4	40.6	50.8	67.4	66.5	56.5	2463

all patients at the beginning of the project; this proportion steadily increased until the end of the fifth year of follow-up. Thus, there was a trend towards improving the regularity of prophylactic injections, at least in those subjects for whom follow-up records are available. However, in view of the many missing record forms, this information cannot be regarded as complete.

An analysis of the reasons for not giving penicillin showed that non-compliance by the patient was most often quoted (in 28.6% of all registered patients) and that the physician claimed to have deliberately stopped prophylaxis in only a few cases (3.5%).

Effects of prophylaxis

During the follow-up periods, each corresponding to approximately one year, one confirmed streptococcal infection was reported in 6.3% of all subjects, and two or more definite streptococcal infections occurred in 3.7% of subjects. A total of 6.3% of subjects had one recurring bout of active rheumatic fever, while 0.6% had two or more bouts. These data are presented in Table 10.

Tables 11 and 12 present data on the effects of various levels of prophylaxis. The study population has been divided into four groups according to the level of prophylaxis received. Subjects who received 12 or more injections of penicillin, i.e., those who were given at least one injection each month, are considered to have been on full prophylaxis during that year. Patients who received 10–11 injections are considered to have been on regular prophylaxis, 6–9 injections per year are labelled irregular, and 5 or fewer injections are considered as occasional prophylaxis. In each case the time unit is the observation year, i.e., the period of approximately 12 months preceding the follow-up examination.

Table 11 demonstrates clearly the inverse relationship between level of prophylaxis and the proportion of subjects with streptococcal infections, this being approximately three times greater in the group who had occasional prophylaxis than in those who were on the full regimen.

Moreover, the proportion of subjects who had one or more bouts of confirmed active rheumatic fever was ten times greater in those at the lowest level of prophylaxis than in those receiving full prophylaxis.

There are also clear-cut differences in hospital admissions at the different levels of prophylaxis (Table 12). At the lowest level of prophylaxis, 17.5% of the subjects were admitted to hospital once during the observation year, while among those on full pro-

Table 10. Frequency of streptococcal infections, bouts of active rheumatic fever, and hospitalization during one-year follow-up periods

	Percentage occurrence[a]
Streptococcal infections	
1 definite	6.3
2 or more definite	3.7
Suspected	11.0
None	64.5
Unknown	10.0
Blank	4.5
Bouts of active rheumatic fever	
1 definite	6.3
2 or more definite	0.6
Suspected	2.4
None	77.4
Unknown	8.7
Blank	4.6
No. of hospitalizations	
0	80.6
1	10.8
2	1.3
3	0.2
4	0.2
5	0.1
Blank	6.8

[a] Total no. of record forms = 5499

Table 11. Percentage of patients with recurrence of streptococcal infection or active rheumatic fever according to level of prophylaxis

	No. of penicillin injections per year			
	0–5	6–9	10–11	12
Streptococcal infections				
1 definite	12.1	11.6	8.5	4.3
2 or more definite	5.6	5.4	7.1	2.5
Suspected	24.9	20.3	12.5	7.6
None	57.5	62.7	71.9	85.5
Bouts of active rheumatic fever				
1 definite	23.0	13.6	5.8	2.1
2 or more definite	2.2	1.0	0.9	0.2
Suspected	6.6	4.4	2.7	1.3
None	68.2	81.0	40.7	96.4

Table 12. Hospital admissions and days spent in hospital according to level of prophylaxis

	No. of penicillin injections per year			
	0–5	6–9	10–11	12
Mean number of hospital admissions per 100 subjects	20.8	23.8	14.8	10.7
Number of days spent in hospital per year per 100 subjects for:				
active rheumatic fever	331.3	418.2	179.1	62.9
heart failure	44.9	66.7	13.1	39.4
other causes	89.9	124.3	90.9	91.4
Proportion admitted to hospital per year				
not admitted to hospital	81.1	80.4	88.4	92.4
admitted once	17.5	16.7	9.5	5.8
admitted 2 or more times	1.6	3.5	2.2	1.8

phylaxis only 5.8% were admitted once during the same period. The differences in multiple hospital admissions are less clear-cut, but the numbers are rather small. There is a clear correlation between the rate of hospital admissions per 100 subjects registered per year and the level of prophylaxis, this rate being twice as high in subjects on poor prophylaxis than in those on the full regimen. The number of days spent in hospital by the different groups confirms this picture, showing a five to six times lower figure in those on full prophylaxis than in subjects on irregular or poor prophylaxis. However, this finding applies only to hospital admissions for rheumatic fever; as may have been expected, the number of days spent in hospital for heart failure or for other causes does not show any relationship with the level of penicillin prophylaxis.

It should be emphasized that prophylaxis is useful even if not given in a completely regular fashion, but its efficacy declines as fewer penicillin injections are given. This finding does not excuse health services from aiming at full levels of prophylaxis in all subjects with rheumatic fever and rheumatic heart disease, but it does indicate that, if this cannot be attained for practical reasons, it is still better to carry out some prophylaxis than none at all.

Load of rheumatic fever on health services and gains from prophylaxis

Tables 11 and 12 present a measure of the load placed by rheumatic fever patients on the health services, especially by those who were not receiving an appropriate level of penicillin.

The total number of hospital admissions during the observation period amounted to 870 resulting in some 20 000 days spent in hospital. Although these numbers are small compared with the total number of subject–observation years in the study, they place an appreciable load on the health services of the communities, since their resources are extremely limited.

The following questions should be asked:

(*a*) How much greater would this load have been had the rheumatic fever project not taken place, i.e., how great is the actual gain from secondary prophylaxis?

(*b*) How much greater could the gain from the project have been if full prophylaxis had been given to all registered subjects, i.e., what is the potential gain from the project?

Benefits from health care projects are extremely difficult to assess. Nevertheless, certain indicators can be used to illustrate the differences between various alternatives. In the present analysis, the number of days spent in hospital for rheumatic fever will be used as an indicator of both the actual and the potential benefits of the project.

As shown in Annex 1, the actual gain, G_a, amounts to 9386 hospital days, assuming that without the present project the subjects would have received little or no prophylaxis. The potential gain, G_p, is a further 6544 hospital days, if all subjects for whom follow-up record forms were available, had received full preventive treatment.

However, the number of follow-up record forms received was only approximately half of those expected on the basis of the number of initial registrations. It seems unlikely that patients for whom no follow-up record is available were in fact receiving full prophylaxis; thus it is a safe assumption that the total possible gain amounts to approximately 30 000 hospital days.

In the light of these figures some consideration should be given to the efficiency of the project. The coefficient of efficiency (E) is defined as the ratio of the actual gain to the total possible gain, giving $E = 0.31$. If the potential gain (G_p) had also been realized, this value would be $E_1 = 0.52$. By definition, had all registered subjects been on full prophylaxis, the resulting coefficient would have been $E = 1.0$.

It should be emphasized that the number of hospital days is only one of several possible indicators of programme effect, and that the main factors considered should be related to deterioration of the disease, incapacity, invalidity, and early death. This information, however, is not readily available from

the data of the present study, and the number of hospital days is a quantitative measure applicable to a number of analyses, including cost/benefit analyses. Thus, for instance, it can be shown that only 3.14 injections of penicillin were given for each hospital day gained. Since penicillin is relatively inexpensive, especially if purchased wholesale for public health programmes, its cost is considerably outweighed by the gain in hospital days averted. All other benefits, i.e., the real health benefits for the patients, are thus achieved at no cost at all.

DISCUSSION

The multi-centre cooperative rheumatic fever control project coordinated by WHO and described here, has both positive and negative aspects. It has shown that control projects, as outlined in the WHO protocol, *are* feasible in developing countries, but that the operation of such programmes is fraught with difficulties. The regular surveillance of identified and registered rheumatic patients has been only partially achieved; nevertheless, even with a follow-up rate of around 50% and with only half of those receiving regular prophylaxis, the gains achieved are considerable. Although the direct health benefits could not be measured quantitatively, the reduction in health care expenditure is so considerable that the direct health benefits may be assumed to be very great indeed. These benefits are related to the level of prophylaxis, so that while full prophylaxis is obviously desirable, imperfect prophylaxis is better than none at all. Although this was quite evident from earlier literature, it needs to be re-emphasized in the light of the situation in developing countries. Thus, the difficulties associated with establishing a full rheumatic fever control programme should not deter authorities from building up similar programmes with lower coefficients of efficiency, since they will also yield considerable benefits.

The most important question is how to extend the rheumatic fever prevention programmes to cover the entire population. The enthusiasm of a single committed person will rarely, if ever, succeed in extending a programme beyond the pilot stage. Populationwide or nationwide programmes need to be integrated into the clinical and public health practices of whole countries (*2*, *3*).

The final conclusion derived from the WHO cooperative project is that rheumatic fever control programmes in developing countries are not only needed, but are feasible, and of great potential benefit.

Annex 1

CALCULATION OF GAIN AND EFFICIENCY

The load placed on health services by rheumatic fever patients can be represented by the number of days per year they spend in hospital. The table below shows the effect on this load of partial and full penicillin prophylaxis.

Level of prophylaxis	Sum of hospital days	No. of observation years	Hospital days/ year
Full	1550	2463	0.6293
Regular	1646	919	1.7911
Irregular, occasional or none	7876	2117	3.7203
Total	11 072	5499	2.0135

If the subjects[a] who, in the project, were on full or regular prophylaxis (2463 + 919) had been hospitalized at the rate of those on irregular, occasional, or no prophylaxis, they would have spent

$$(2463 + 919) \times 3.7203 = 12\,582 \text{ days in hospital.}$$

Actually, they spent in hospital only

$$1550 + 1646 = 3196 \text{ days, so the } \textit{actual gain} \text{ is:}$$

$$G_a = 12\,582 - 3196 = 9386 \text{ days.}$$

If the subjects who were on irregular, occasional or no prophylaxis (2117) had been hospitalized at the rate of those on full prophylaxis, the estimated sum of hospital days for this group would have been:

$$2117 \times 0.6293 = 1332 \text{ days.}$$

As they in fact spent 7876 days in hospital, the *potential gain* is:

$$G_p = 7876 - 1332 = 6544 \text{ days.}$$

If there had been no drop-outs from the study, the benefit would be even greater. It may be assumed that

[a] "subjects" in this context means "subject-observation years".

the drop-outs (4685) were on irregular or no prophylaxis and that, accordingly, their hospitalization rate was 3.7203. The presumed number of hospital days of the drop-outs amounts to:

$4685 \times 3.7203 = 17\,430$ days.

On the other hand, if they had been on full prophylaxis, they would have spent only $4685 \times 0.6293 = 2948$ days in hospital. Thus, the *hypothetical additional gain* is:

$G_h = 17\,430 - 2948 = 14\,482$ hospital days.

The *total possible gain* is the sum of the three figures:

$$G_{tp} = G_a + G_p + G_h = 9386 + 6544 + 14\,482 = 30\,412.$$

The *coefficient of efficiency*, i.e., the ratio of the actual gain to the total possible gain is, in the present project:

$E = 0.3086.$

If all those who were followed up had been on full prophylaxis, the expected coefficient of efficiency would be:

$$E_1 = \frac{9386 + 6544}{30\,412} = 0.5238.$$

RÉSUMÉ

LUTTE COMMUNAUTAIRE CONTRE LE RHUMATISME ARTICULAIRE AIGU ET LA CARDIOPATHIE RHUMATISMALE

Un protocole pour la lutte communautaire contre le rhumatisme articulaire aigu et la cardiopathie rhumatismale a été mis au point par l'OMS et appliqué dans des centres à Chypre, en Egypte, en Inde, en Iran, à la Jamaïque, en Mongolie et au Nigéria, avec la coordination de l'OMS.

Le programme consiste à détecter les cas, les enregistrer et les suivre à long terme, le principal objectif étant d'administrer régulièrement de la pénicilline à toutes les personnes enregistrées, en vue de prévenir les rechutes de rhumatisme articulaire aigu et l'aggravation de la cardiopathie rhumatismale.

Près de 3000 malades atteints de rhumatisme articulaire aigu et de cardiopathie rhumatismale ont été enregistrés dans ce projet collectif. Chez 3%, la maladie avait commencé dans l'enfance dès l'âge de 4 ans ou plus tôt. Chez 70%, on a enregistré une infection streptococcique précédant la crise de rhumatisme articulaire aigu. Une prophylaxie régulière par la pénicilline était mentionnée dans l'anamnèse de 25% seulement de l'ensemble des sujets atteints de rhumatisme articulaire aigu au moment de l'enregistrement. Bien que la surveillance des malades enregistrés ait été moins complète qu'on ne l'aurait désiré, on a noté un bénéfice net dans le cas de la prophylaxie régulière, par comparaison avec les malades qui, pour une raison quelconque, ne recevaient qu'une prophylaxie incomplète ou n'en recevaient aucune. Le profit réel, sous l'angle de l'hospitalisation évitée, se montait à près de 10 000 journées d'hospitalisation. Si tous les malades enregistrés avaient été soumis à un traitement prophylactique régulier, ce gain aurait pu atteindre 30 000 journées d'hospitalisation.

Il est conclu que les programmes de lutte contre le rhumatisme articulaire aigu dans les pays en développement sont nécessaires, faisables, et d'un grand avantage potentiel.

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