RECURRENT ATTACKS OF ACUTE RHEUMATISM IN SCHOOL-CHILDREN

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The recurrent attack of acute rheumatism is a paediatric and public health problem which has received increasing attention since the efficacy of specific prophylaxis has become well-recognized. One of the recommendations of the recent Report of the Rheumatic Fever Committee of the Royal College of Physicians (1957) was:

"In individuals known to have had rheumatic fever, the administration of penicillin to prevent recurrences due to infection resulting from casual exposure to beta-haemolytic streptococci should be continued without interruption for a period of five years or until leaving school, whichever is the longer."

Hitherto, data bearing on problems such as this have been derived mainly from American sources. This paper presents information relating to recurrent episodes of acute rheumatism observed in Cardiff school-children during the years 1931-50, before specific prophylaxis was practised locally on a wide scale.

The data on which the findings are based and the method of the inquiry have already been described in detail (Hitchens, 1956). The record cards of all children who attended the school rheumatism clinic (which has always been closely associated with the local Department of Paediatrics), during the 20-year period 1931-50 were scrutinized and allocated in retrospect to appropriate diagnostic categories. As far as possible, the criteria used were those originally proposed by Duckett Jones (1944), as modified for the purposes of the M.R.C. Cortisone Trials. Two categories of acute rheumatism were distinguished:

- (1) Acute rheumatism with evidence of cardiac damage; and established rheumatic heart disease.

- (2) Acute rheumatism with no definite evidence of cardiac involvement.

Originally, the main purpose of the inquiry was to define accurately in an epidemiological context the trend of morbidity from the disease as it occurred in Cardiff. At the same time, however, the opportunity was taken to abstract from the record cards additional items of information. Analyses based on those relating to recurrent episodes are now presented as follows:

- (1) Proportion of rheumatic children experiencing recurrent episodes during observation.
- (2) Type of recurrent episode related to type of initial manifestation.
- (3) Annual risk of a first recurrent attack according to length of history after onset.
- (4) Risk of a recurrent episode according to age.
- (5) Relation between recurrent episodes and permanent cardiac damage.
- (6) Trend in the frequency of recurrent episodes over the twenty-year period.
- (7) Seasonal occurrence.
- (8) Relation of recurrence rates with a socio-economic index.

As indicated elsewhere (Hitchens, 1956), the second rheumatic group distinguished in the inquiry (children without definite evidence of heart disease) presented unsatisfactory features from a statistical point of view: exact diagnostic ascertainment was both more difficult and less complete; and accurate retrospective diagnostic classification was also much more difficult. Consequently, the present analyses relate only to the first group: those children who showed evidence of heart disease at some time during the observation period. The only exception is under the seventh heading, where an analysis of

the second group is shown in order to amplify an unexpected finding.

The present analyses are based, for the most part, on the experience of all children *who entered observation* in the years 1931-50 (*i.e.* they are not confined to those whose illnesses *began* in that period). The sixth and seventh headings include also the segment of experience from 1931 onwards, contributed by children who entered observation before that year.

A limitation of the data in relation to the present purpose must be mentioned at the outset. Necessarily, analyses were based on experience while *patients were under observation*. A substantial proportion were not seen until one year or more after the onset of rheumatism, and others were lost sight of for one reason or another before reaching school-leaving age. The present results, therefore, are not necessarily representative of children with rheumatic heart disease generally. On the other hand, these circumstances are common to most cardio-rheumatism clinics, and there is no reason to believe that any statistical bias resulting detracts from the significance of certain of the findings in the context of clinical practice.

Method

For the present purpose, a "recurrent attack" is defined as one or more major manifestations of acute rheumatism occurring after a period of not less than three months following the end of the previous acute manifestation(s) of the disease.

Two types of index are employed: Recurrence Rate (Persons) based on the number of children who experienced an episode; and Recurrence Rate (Attacks) based on the number of episodes occurring. The denominator in each case is the number of person-years observation.

These rates have been employed in three distinct ways:

- (i) for total observation periods;
- (ii) for the individual calendar years of the period;
- (iii) for the individual years of life of a group of children while they were under supervision.

The method of computation and the small numerical discrepancies which result, as between one method and another, are briefly mentioned in the appendix.

Results

(1) **Frequency of Recurrent Attacks.**—Table I shows a distribution of children according to the number of recurrent episodes suffered. Some 38 per cent. of boys and 32 per cent. of girls had one or more recurrences during observation. Statistically,

the sex difference is not significant and, when account is taken of period of observation, the rates are very similar for boys and girls.

TABLE I
DISTRIBUTION OF RHEUMATIC CHILDREN ENTERING OBSERVATION 1931-50 BY NUMBER OF OBSERVED RECURRENT EPISODES, AND RECURRENCE RATES, BY SEX

Recurrent Episodes	Boys		Girls	
	No.	Per cent.	No.	Per cent.
None	118	62.4	191	68.0
1	52	27.5	55	19.6
2	16	8.5	29	10.3
3 or more	3	1.6	6	2.1
Number of Children	189		281	
Number of Recurrences	93		135	
Person-Years Observation	713.0		990.0	
*Recurrence Rate	Persons	10.0	Persons	9.1
	Attacks	13.0	Attacks	13.6

* Per 100 person-years observation

Length of history at entry into observation might be expected to influence the observed recurrence rates. Table II compares rates for children coming under supervision within one year of onset (the great majority of whom were seen either at onset or shortly afterwards), with rates for those first seen after a longer interval. For boys, the figures are virtually the same, but for girls there is, in fact, a difference—those with a longer history at entry having rates some 25 to 30 per cent. lower than those seen more promptly.

TABLE II
RECURRENCE RATES ACCORDING TO LENGTH OF HISTORY AT ENTRY INTO SUPERVISION BY SEX

Sex	Boys		Girls	
	Within 1 Year of Onset	1 Year or More after Onset	Within 1 Year of Onset	1 Year or More after Onset
Observed from				
Number of Children with Recurrences	46	25	68	22
Number of Recurrences	61	32	107	28
Person-Years Observation	480.0	233.0	691.0	299.0
Recurrence Rate	Persons	9.6	Persons	9.8
	Attacks	12.7	Attacks	15.5

The calculated proportion of children who experience recurrent attacks varies, of course, according to the criteria adopted. For instance, in the present series, if a history of recurrent attacks before

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observation were accepted, then the overall proportion would become 42 per cent. Limiting consideration to those observed from onset to the time they left school, the figure was 47 per cent. (Table VIII); and for the segment of this group under continuous observation for 3 years or more, the proportion was 54 per cent., a figure which compares with 60 to 75 per cent. given by Hansen (1946) for a similar observation period.

Table III shows recurrence rates according to the manifestation of rheumatism at the onset of the disease. In both sexes, those with carditis alone had a low risk of subsequent recurrence. The group included a number of children who had entered observation with established heart disease of "silent" onset. For other manifestations in the case of boys, rates of recurrence were relatively uniform, but for girls, arthritis and arthralgia carried lower recurrence rates than chorea.

(2) **Nature of Recurrent Attack.**—In Table IV, the type of recurrent attack is related to the nature of the rheumatic manifestation at onset. Where the disease started with chorea, there was a particular likelihood that subsequent episodes would also take the form of chorea, a tendency towards a uniform rheumatic response which was less marked when arthralgia and arthritis had been the mode of onset.

(3) **Annual Risk of a First Recurrent Attack.**—Table V (overleaf) shows the annual risk of a first recurrent episode of acute rheumatism according to length of history from onset, by the conventional life-table technique. This analysis is limited to children who entered observation within one year of developing the disease. It is seen that the risk increased somewhat after the first year, remained almost uniform during the second, third and fourth years, and afterwards diminished only slightly,

TABLE III
RECURRENCE RATES ACCORDING TO NATURE OF RHEUMATISM AT ONSET, BY SEX

Initial Manifestation	Boys			Girls		
	Observation-Years	Recurrence Rate		Years	Recurrence Rate	
		Persons	Attacks		Persons	Attacks
Carditis Only (Acute or Chronic)	66·5	3·0	4·5	48·0	4·2	8·3
Arthritis, Arthralgia, "Limb Pains", with or without Carditis	433·5	10·6	13·8	528·5	7·0	9·1
Chorea, with or without Carditis	114·0	10·5	15·8	294·5	13·2	22·1
Arthritis or Arthralgia and Chorea, with or without Carditis	22·5	13·3	13·3	64·5	14·0	20·2
Other	76·5	10·5	11·8	54·5	5·5	9·2
Total	713·0	10·0	13·0	990·0	9·1	13·6

TABLE IV
NATURE OF RECURRENT EPISODES ACCORDING TO NATURE OF ONSET

Onset	No. of Children with Recurrent Episodes	No. of Recurrent Episodes	Recurrent Episodes: No. of Episodes of:							
			Carditis Only		Arthralgia with or without Carditis		Chorea with or without Carditis		Arthralgia and Chorea with or without Carditis	
			No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.
Carditis Only (Acute or Established)	4	7			7	100				
Arthritis, Arthralgia, "Limb Pains", with or without Carditis	83	108	17	16	59	55	28	26	4	3
Chorea, with or without Carditis	51	83	9	11	12	14	61	74	1	1
Arthritis, Arthralgia, and Chorea, with or without Carditis	12	16	1	6	4	25	9	56	2	13
Other (all with Carditis)	11	14	5	36	8	57	1	7		
Total	161	228	32	14	90	40	99	43	7	3

remaining substantial even in the seventh year after onset.

TABLE V

RISK OF A FIRST RECURRENT ATTACK OF ACUTE RHEUMATISM BY DURATION OF HISTORY (BASED ON THE EXPERIENCE OF CHILDREN* ENTERING SUPERVISION WITHIN ONE YEAR OF ONSET)

No. of Years after Onset	Persons		Percentage Risk of First Recurrent Attack
	Exposed to Risk	With First Recurrent Attack	
0-	254.0	25	9.8
1-	204.0	31	15.2
2-	147.5	22	14.9
3-	107.0	18	16.8
4-	71.5	9	12.6
5-	48.0	5	10.4
6-	28.0	3	10.7
7-	14.5	—	—
8-	9.0	1	11.1
9+	8.0	—	—

* The three instances of a first recurrent attack before supervision in this group are not included

It might be argued that the data may be biased because a considerable proportion of children lapsed from observation before reaching school-leaving age. However, an analysis confined to those who were observed from onset up to the time they left school (Table VI) shows an almost identical experience for this segment of patients taken separately. It seems unlikely, therefore, that selective factors seriously impaired the validity of this finding.

TABLE VI

RISK OF A FIRST RECURRENT ATTACK OF ACUTE RHEUMATISM BY DURATION OF HISTORY (BASED ON THE EXPERIENCE OF CHILDREN ENTERING SUPERVISION WITHIN ONE YEAR OF ONSET AND FOLLOWED UNTIL SCHOOL-LEAVING AGE)

No. of Years after Onset	Persons		Percentage Risk of First Recurrent Attack
	Exposed to Risk	With First Recurrent Attack	
0-	178.5	16	9.0
1-	150.5	27	17.9
2-	110.5	16	14.5
3-	82.5	13	15.8
4-	58.0	7	12.1
5-	39.0	4	10.3
6-	24.0	1	4.2
7-	14.5	—	—
8-	9.0	1	11.1
9+	8.0	—	—

Three other analyses (not shown) were also made:

(i) The annual risk of a *second* recurrent attack following the *first*, showed a precisely similar pattern.

(ii) Dividing the patients into two age groups

at the onset of illness—under 10 years, and 10 years of age and over—there was no material difference either in the extent of the annual risk or in the general pattern of the experience.

(iii) Considering separately those patients whose rheumatism first manifested with chorea, the annual risk of a first recurrent attack was somewhat higher than for other rheumatic children, but again it remained relatively uniform after the first year.

Surveys in the United States have differed on the risk of a recurrence according to length of history. For instance, Wilson and Lubschez (1944) and Stollerman (1954) show a considerably greater risk in the first 2 or 3 years after an acute episode than subsequently. The work of Bland and Jones (1951), on the other hand, suggests a high risk for a longer period. However, most surveys have shown that recurrence rates are not negligible even after substantial periods of freedom from active rheumatism, and Mortimer and Rammelkamp (1956), after reviewing the literature, conclude that "... it is mandatory to continue prophylaxis as long as the patient is in school or serving in the armed forces".

(4) Risk of a Recurrent Episode according to Age.—Table VII shows recurrence rates (attacks) for each single year of life, based on the experience of all children attending the clinic at these particular ages, who had been first seen within one year of onset. The findings are consistent with the view of a relatively low risk of recurrence up to age 7, and of a substantially greater risk which remained uniform from age 7 to age 15.

TABLE VII

RECURRENCE RATES (ATTACKS) IN SINGLE YEARS OF LIFE, BASED ON CHILDREN ENTERING SUPERVISION WITHIN ONE YEAR OF ONSET

Age (yrs)	Person-Years Observation	Recurrence Rates (Attacks)
3-	8.0	—
4-	18.0	—
5-	33.5	6.0
6-	60.0	5.0
7-	93.5	15.0
8-	119.0	16.0
9-	142.5	18.2
10-	164.5	17.0
11-	187.0	12.3
12-	163.0	14.7
13-	105.0	20.0
14-	45.0	15.6
15-	17.5	11.4
16+	8.5	—

It is seen that recurrence rates were low at ages under 7, and that rates at age 7 to age 15 were in general about three times as high and had no consistent trend within the age range. Experience

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at age 15 and over was too small to form the basis of reliable rates.

More detailed analysis (not reproduced here) showed that there was no consistent relationship between age at onset and the recurrence rate at any subsequent age. For instance, children whose rheumatism started at age 6, had a recurrence rate during their thirteenth year of life similar to that of children whose rheumatism had started at age 12. There was no indication either that rheumatism tends "to burn itself out", or that rheumatism starting at a very early age has a greater tendency to recur.

(5) Significance of Recurrent Episodes in relation to Cardiac Damage.—It must be recalled that the present series of patients was assembled on the criterion that each had shown unequivocal evidence of cardiac damage at some time during supervision.

88 per cent. of the patients showed signs either of acute carditis or of established heart disease at the time of entry into supervision. By the time supervision had ended, in some patients the clinical signs of cardiac damage had become equivocal or had disappeared altogether. It is a surprising fact that, when the whole series is divided into two groups (those who had experienced recurrent episodes and those who had not), the proportion in whom signs of cardiac damage remained is precisely the same for each—77 per cent.

Probably, however, selective factors have combined to conceal a difference. For instance, the

group with no recurrences included a larger proportion of children who had been supervised at the clinic for a relatively short period, and the average observation period was substantially shorter.

A more accurate picture of the relation between recurrences and permanent cardiac damage is probably afforded by the figures set out in Table VIII, confined to those patients supervised from the onset of the disease until they had left school, although on relatively small numbers the difference shown is barely significant at the customary level.

It is seen that signs of cardiac abnormality remained in 74 per cent. of those who had experienced recurrences, compared with only 61 per cent. of those who had not.

TABLE VIII

CARDIAC ABNORMALITY AT THE END OF SUPERVISION IN RELATION TO RECURRENT ATTACKS BASED ON CHILDREN OBSERVED FROM WITHIN ONE YEAR OF ONSET UNTIL SCHOOL-LEAVING AGE

Recurrent Attacks	Cardiac Abnormality		Normal or No Unequivocal Sign of Cardiac Disease	
	No.	Per cent.	No.	Per cent.
None	59	60.8	38	39.2
One or More	64	74.4	22	25.6

(6) Trend in Recurrent Attacks, 1931-50.—Table IX shows annual recurrence rates for each year of

TABLE IX

ANNUAL RECURRENCE RATES AND AVERAGE ANNUAL RECURRENCE RATES FOR QUINQUENNIA 1931-50

Calendar Year	Person-Years Observation	Recurrence Rates			
		Persons		Attacks	
		Annual	Average for Quinquennium	Annual	Average for Quinquennium
1931	42.0	9.5	15.7	9.5	17.6
32	71.0	21.1		26.8	
33	100.5	13.9		14.9	
34	121.5	21.4		23.0	
35	137.5	12.4		13.8	
1936	135.0	17.7	14.2	17.7	14.2
37	139.5	10.8		10.8	
38	120.0	12.5		12.5	
39	100.5	16.9		16.9	
40	82.5	13.3		13.3	
1941	70.5	8.5	10.6	8.5	10.9
42	63.5	12.6		12.6	
43	60.0	10.0		11.7	
44	59.5	11.8		11.8	
45	60.5	9.9		9.9	
1946	60.0	13.3	11.2	15.0	11.9
47	57.0	12.3		12.3	
48	60.0	13.3		13.3	
49	58.0	6.9		8.6	
50	58.0	10.2		10.3	

the period, together with average rates for quinquennia. There was an apparent decline in frequency over the years, the average annual rates for 1946-50 being some 30 per cent. below those for the first quinquennium. Most of the decline took place between 1936-40, and 1941-45, the average rates for the latter quinquennium, indeed, being the lowest of all.

The present data does not, however, furnish conclusive evidence of a *true* decline. In the earlier years, patients more frequently lapsed from supervision and the possible effect of this on the calculated rates, and on the trend, is problematical. Moreover, as Wilson and Lubschez (1944) have suggested, a change in the type of case coming under supervision may influence the annual recurrence rate, though there was no evidence in the present series that such a change had occurred.

If, however, the observed rates do reflect a real trend in frequency, then it may be asked whether the fall was related to changing circumstances as the years went by, or whether the period in which acute rheumatism first developed determined the subsequent risk of a recurrent episode.

Table X analyses recurrence rates in quinquennia according to period of onset. The figures relate only to those patients for whom a precise date on onset was recorded. In no single quinquennium was there any substantial tendency for the patients with earlier onset to experience higher rates of recurrence. If the trend were a real one, then Table X would suggest that recurrence rates were influenced by changing conditions and not deter-

mined by the circumstances attending the onset of the disease.

It is noteworthy that the observed decline was much less marked than the fall in inception rates of acute rheumatism in Cardiff school-children (Hitchens, 1956). Over the same period, the inception rate was reduced to one-third.

(7) **Seasonal Occurrence.**—There seems no obvious *a priori* reason why the seasonal frequency of recurrent episodes of rheumatism should differ from that characterizing the onset of the disease. Yet, in the present series, a difference was found. The figures are set out in Table XI (opposite). Again, the analysis was necessarily confined to children for whom the relevant information was available.

Statistically, there is a significant difference between the monthly distribution of onset and that of recurrence in children with heart disease. Recurrent episodes were most frequent in January, March, and November; rather more than 40 per cent. of the recurrences were experienced in the first quarter of the year, and only 28 per cent. in the fourth quarter. By contrast, for initial attacks, October and December were worse months than January; 36 per cent. of cases had an onset in the fourth quarter of the year, compared with only 23 per cent. in the first quarter.

It is always difficult to assess the epidemiological significance (if any) of seasonal irregularities of this kind, and no explanation can be offered for the differences found. It may be pointed out, however, that a similar analysis of the second group of rheumatic cases attending the Cardiff clinic (those

TABLE X

RECURRENCE RATES IN QUINQUENNIA ACCORDING TO PERIOD OF ONSET OF DISEASE, BASED ON PATIENTS WITH A KNOWN DATE OF ONSET

Period of Onset	Quinquennium of Recurrences							
	1931-5		1936-40		1941-5		1946-50	
	Recurrence Rate		Recurrence Rate		Recurrence Rate		Recurrence Rate	
	Persons	Attacks	Persons	Attacks	Persons	Attacks	Persons	Attacks
Before 1931	17.9 (28)	19.4 (30)	16.0 (6)	16.0 (6)				
1931-35	16.3 (43)	18.3 (48)	14.7 (50)	14.7 (50)	6.3 (3)	6.3 (3)	0.0 (0)	0.0 (0)
1936-40			15.7 (21)	15.7 (21)	12.0 (19)	12.0 (19)	2.6 (1)	2.6 (1)
1941-45					10.0 (9)	11.1 (10)	12.8 (20)	13.5 (21)
1946-50							14.6 (12)	15.9 (13)

Figures in parentheses are the number of patients and recurrent episodes on which the rates are based.

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TABLE XI

SEASONAL DISTRIBUTION OF MONTH OF ONSET AND OF RECURRENT ATTACKS, BASED ON ALL PATIENTS FOR WHOM DATES WERE PRECISELY RECORDED*

Type of Case	Month of Onset												Month of Recurrence											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
<i>With Carditis:</i>																								
Number ..	29	16	19	24	20	17	13	14	19	38	23	40	41	19	28	12	10	21	13	10	16	17	25	21
Number Corrected to 31-day Month ..	29	18	19	25	20	18	13	14	20	38	24	40	41	21	28	12	10	22	13	10	16	17	26	21
Per cent. Average Monthly Number ..	125	78	82	108	86	78	56	60	86	164	103	172	208	106	142	61	51	111	66	51	81	86	132	106
<i>Without Evidence of Carditis:</i>																								
Number ..	40	31	24	27	24	25	20	22	27	34	20	46	33	22	29	20	11	15	17	18	20	13	19	20
Number Corrected to 31-day Month ..	40	34	24	28	24	26	20	22	28	34	21	46	33	24	29	21	11	15	17	18	21	13	20	20
Per cent. Average Monthly Number ..	138	118	83	97	83	90	69	76	97	118	73	159	163	119	144	104	54	74	84	89	104	64	98	98

* The monthly distributions of onset and of recurrence for patients with carditis differ significantly. $\chi^2=24.35$; $n^1=11$; $0.02>p>0.01$. January, March, October, and December together account for two-thirds of the value of χ^2 . The distributions for patients without carditis are not significantly different. $\chi^2=14.92$; $n^1=11$; $0.20>p>0.10$.

without heart disease), which is also shown in Table XI, has some points of similarity. Again, recurrences were heavy in the first quarter of the year (36 per cent.) and relatively infrequent in the fourth quarter (22 per cent.), and the episodes were most numerous in January. Corresponding figures for onset in this group were 28 per cent. in the first quarter and 29 per cent. in the fourth quarter, December being the month of highest incidence.

(8) *Relation with Social Status.*—Here, in particular, there may be some bias, arising perhaps from a higher degree of ascertainment among the less well-to-do. Table XII does, however, suggest that

children living in the least favourable physical environment may have been subject to the greatest risk of recurrence.

In the absence of a more precise index, children were divided according to school of attendance (excluding grammar schools and special schools), classified subjectively on a four-point social scale. Those attending older working-class type schools had rates somewhat in excess of the other groups; there is also a social gradient for recurrence rates (attacks), though not a substantial one for recurrence rates (persons).

Comment

The main interest of the present findings centres in the risk of a recurrent episode according to length of history and age. During the period considered, specific prophylaxis was not a routine procedure, and the figures consequently represent the "natural" tendency of acute rheumatism to recur in this particular clinic population. The results are approximately comparable with those of two of the American surveys mentioned earlier: one by Wilson and Lubschez (1944) and the other by Bland and Jones (1951). In the first of these, based on 3,957 patient-years experience, there was a high recurrence rate from age 4 to age 13, rates about half to one-third lower from age 14 to age 16, and still lower rates thereafter. The risk of a recurrence was greatest in

TABLE XII

RECURRENCE RATES ACCORDING TO TYPE OF SCHOOL ATTENDED

Type of School Serving:	Person-Years Observation	Recurrence Rate	
		Persons	Attacks
(1) Old Working-Class Area ..	772.0	11.3	16.1
(2) New Council Estate ..	283.0	8.7	13.1
(3) Mixed Working and Middle-Class Area ..	443.0	7.7	11.8
(4) Mainly Middle-Class Area ..	131.0	7.6	8.4

the first year after an acute episode, lower in the second year, and subsequently lower thereafter. The second American survey showed that recurrent episodes occurred annually in one patient in five for the first 5 years after onset, in one in ten for the second 5 years, in one in twenty for the third 5 years, and thereafter much less frequently.

As regards age, the present findings differ only slightly from those of Wilson and Lubschez in that rates were relatively low up to age 7, and that there was no marked decline from age 13 to age 15. They agree in showing a high sustained rate from age 7 to age 13. As regards risk of recurrent attack according to length of history, the results would seem to agree more closely with the second survey. The chance of a first recurrent attack remained substantial even in the seventh year after onset.

Recently, both the Royal College of Physicians of London (1957) and the American Heart Association (1957) have reiterated that, if specific prophylaxis is contemplated, it should be continued throughout the years of childhood after an attack of rheumatic fever. Retrospectively, the experience of the Cardiff Clinic in the 20 years from 1931-50 shows that no less rigorous a preventive programme would have been fully effective. Furthermore, the seasonal trend in the frequency of recurrent attacks, although quite marked, would not have justified omitting prophylaxis during the summer months.

Summary

The experience of recurrent attacks of acute rheumatism in a group of Cardiff children with rheumatic heart disease, who attended the School Rheumatism Clinic from 1931-50, is described. The main findings were as follows:

- (1) Recurrent episodes were observed in about one-third of the whole group; in 47 per cent. of those under supervision from onset to school-leaving age; and in 54 per cent. of those who were observed continuously for 3 years or more after onset. In girls, recurrences were most frequent when the illness started with chorea.
- (2) When chorea was an initial manifestation, there was a particular likelihood that chorea would also be a feature of recurrent attacks.
- (3) The risk of a first recurrent attack of rheumatism remained substantial even in the seventh year after onset. The risk diminished only slightly after the first 4 years.

- (4) Recurrence rates were relatively low up to age 7, but remained at a high level from age 7 to age 15.
- (5) Among children observed from onset to the time of leaving school, cardiac abnormality remained at the end of the supervision period in 74 per cent. of those who experienced recurrences and in 61 per cent. of those who did not.
- (6) There was an apparent decline in the frequency of recurrent attacks over the 20-year period.
- (7) There was a marked seasonal trend in frequency, but the number of recurrent attacks in the summer months was not negligible. The seasonal pattern of recurrent episodes differed from that of initial attacks in a manner which could not be explained.
- (8) There was some suggestion of a social gradient in recurrence rates.

The implication of some of these findings in relation to prophylaxis is mentioned.

Acknowledgments are due to Professor A. G. Watkins for permission to use the clinical data relating to these patients, most of whom were under his care at one time or another; to Dr. W. Powell Phillips, City Medical Officer of Health, for access to the records; and to Dr. C. W. Anderson, Deputy Medical Officer. I am indebted also to Dr. E. Lewis-Fanning for helpful suggestions and statistical criticism, and to Professor F. Grundy.

REFERENCES

- American Heart Association (1957). "Report of the Committee on Prevention of Rheumatic Fever and Bacterial Endocarditis." *Circulation*, 15, 154.
- Bland, E. F., and Jones, T. D. (1951). *Ibid.*, 4, 836.
- Hansen, A. E. (1946). *J. Pediatr.*, 28, 296.
- Hitchens, R. A. N. (1956). *Ann. rheum. Dis.*, 15, 160.
- Jones, T. Duckett (1944). *J. Amer. med. Ass.*, 126, 481.
- Mortimer, E. A., and Rammelkamp, C. H. (1956). *Circulation*, 14, 1144.
- Royal College of Physicians (1957). "Further Report of the Rheumatic Fever Committee." R.C.P., London.
- Stollerman, G. H. (1954). *Amer. J. Med.*, 17, 757.
- Wilson, M. G., and Lubschez, R. (1944). *J. Amer. med. Ass.*, 126, 477.

Rechutes du rhumatisme articulaire aigu chez des écoliers

RÉSUMÉ

On a étudié les rechutes du rhumatisme articulaire aigu chez un groupe d'enfants de Cardiff atteints de la maladie de Bouillaud et observés à la Clinique Rhumatologique Scolaire entre 1931 et 1950. Voici les résultats principaux:

- (1) Des rechutes ont été observées dans à peu près un tiers du groupe entier; chez 47% de ceux suivis dès le début de la maladie jusqu'à la fin de l'âge scolaire; et chez 54% de ceux suivis pendant 3 ans après le début. Chez les filles, les rechutes étaient plus fréquentes lorsque la maladie avait commencé par la chorée.

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(2) La chorée de la première attaque tendait à se reproduire au cours des rechutes.

(3) La probabilité de la première rechute ne diminuait que faiblement quatre ans après la première attaque et demeure assez importante après sept ans.

(4) La proportion des rechutes est relativement basse jusqu'à l'âge de 7 ans et augmente considérablement entre 7 et 15 ans.

(5) Parmi les enfants suivis dès le début de la maladie jusqu'au moment de quitter l'école, la lésion cardiaque fut retrouvée à la fin de la période d'observation chez 74% de ceux qui eurent des rechutes et chez 61% de ceux qui n'en eurent pas.

(6) Il y avait une diminution apparente de la fréquence des rechutes sur une période de 20 ans.

(7) La fréquence des rechutes tendait à varier fortement selon la saison, mais le nombre d'attaques en été n'était pas négligeable. Le type saisonnier des rechutes différait de celui des attaques initiales d'une manière inexplicable.

(8) Le facteur social semblait jouer un rôle dans la fréquence des rechutes.

On fait mention des implications de quelques-uns de ces résultats dans la question de prophylaxie.

Accesos recurrentes del reumatismo poliarticular agudo en niños de escuela

SUMARIO

Se estudiaron los accesos recurrentes del reumatismo poliarticular agudo con lesión cardíaca en un grupo de niños de Cardiff observados en la Clínica Reumatológica

Escolar entre los años de 1931 y 1950. Los resultados principales fueron los siguientes:

(1) Accesos recurrentes fueron observados en cerca de una tercera parte del grupo entero; en un 47% de los niños observados desde el comienzo de la enfermedad hasta el cumplir la edad escolar; y en un 57% de los observados durante 3 años al menos desde el comienzo. En las muchachas, las recaídas fueron más frecuentes cuando la enfermedad había empezado por la corea.

(2) La corea del acceso inicial tendía a manifestarse en las recaídas.

(3) La probabilidad de la primera recaída baja un poco cuatro años después del primer acceso, pero aún queda bastante importante siete años después.

(4) La proporción de las recaídas es relativamente baja hasta la edad de 7 años, pero sube considerablemente entre los 7 y los 15 años.

(5) Entre los niños observados desde el comienzo de la enfermedad hasta el fin de la edad escolar, la lesión cardíaca fue encontrada al cabo del período de observación en un 74% de los que manifestaron recaídas y en un 61% de los que no los tuvieron.

(6) Hubo una baja aparente de la frecuencia de las recaídas en un período de 20 años.

(7) La frecuencia de las recaídas tendía a variar fuertemente según el tiempo del año, pero el número de accesos en verano no fue despreciable. El tipo tempestivo de las recaídas difería del de los accesos iniciales de una manera inexplicable.

(8) El factor social pareció desempeñar un papel en la frecuencia de los accesos recurrentes.

Se mencionan las implicaciones de algunos de estos resultados respecto a la profilaxis.

APPENDIX

It has been stated in the text that a substantial proportion of children were lost to supervision for one reason or another before leaving school. Among 272 children seen within one year of onset, 68 per cent. were followed until the time they left school, 8 per cent. were still attending the clinic when the inquiry ended, and 24 per cent. lapsed. Among the remainder who entered supervision at a later stage of their illness, the corresponding figures were 36, 2, and 62 per cent.—i.e. there was a much higher lapse rate. The mean observation periods for the two groups were 4.3 and 2.7 years respectively.

The distribution of all children entering supervision during the 20 years by duration of observation period was as shown in the Table.

The method of computing person-years observation was the usual one, based on the assumption that entries and withdrawals were uniformly distributed over the year. For instance, in relation to

Years	No. of Children	Years	No. of Children
0 (no supervision)	6	5-	41
0-	91	6-	40
1-	65	7-	20
2-	58	8-	15
3-	61	9-	10
4-	54	10+	9

total observation period, the number of completed years of supervision for each patient had been coded, and to these on each withdrawal was added a further 6 months' exposure to risk. For computing person-years observation in calendar years, 6 months' exposure to risk was allowed both in the year of entry and in the year of withdrawal. The numerical differences as between one context and another do not exceed 5 per cent. That they were as great as this probably means that the assumption for this group of patients was only approximately true. There is also a further source of discrepancy: when rates relate to total observation period, a child

who experienced two recurrent attacks appears only once in the Recurrence Rate (Persons); when rates relate to calendar years, however, he may appear in the rate for each of the years when the recurrent attack took place.

The six children seen on one occasion only have been allowed no experience throughout the investigation.

Throughout the paper, differences have been considered significant at the 5 per cent. level.