SEASONAL INCIDENCE OF RHEUMATIC FEVER IN THIS COUNTRY

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The study of the seasonal fluctuations of infectious diseases in this country reveals the existence of two characteristic types:

1. *The Solstice Type*.—This type, dominated by the prevailing temperature, includes certain respiratory and alimentary infections which we associate respectively with the winter and summer solstices.

2. *The Equinox Type*.—Measles and whooping-cough usually show a conspicuous increase at the vernal equinox, while the autumnal equinox is associated with an increase of throat infections: diphtheria, scarlet fever, and rheumatic fever.

Though this classification has severe limitations, it has the merit of simplicity. Further—and this is the reason for its presence here—it emphasizes a contrast between the conditions prevailing at the two equinoxes. It is much easier to appreciate the nature of this contrast than to state directly what is the characteristic feature of the autumnal equinox. First, in respect to negative evidence, there is no significant difference between the temperature and the relative humidity at the two equinoxes. What, then, is the nature of this contrast?

Dynamic Change

The answer to this little riddle is to be found in dynamics rather than statics. The seasonal variation of temperature is determined by the obliquity of the ecliptic, which effects a periodic variation of the angle of elevation of the sun's rays. At any one place this angle is, of course, equal at both equinoxes. However, during the weeks in immediate relation to the equinoxes the angle is changing very quickly. Thus the angle increases rapidly in the "spring" and decreases in like manner in the "autumn." It is this rapidity of change, in opposite directions, which supplies the fundamental difference between the equinoxes. We have not only a contrast, but a significant reciprocal relationship, between the two periods of the year when climatic accelerations and decelerations are at their height.

The Rate of Change of Temperature

Graphs 1 and 2 illustrate our point. Graph 1 portrays the average seasonal variation of temperature at Greenwich. Graph 2, deduced from the former, represents the rate of change of temperature and shows clearly the contrast between the equinoxes. Despite many secondary climatic factors, the changes of temperature are still dominated by the theoretical solar climate. The most important deviation, from our standpoint, is the lag in the earth's response to changes in the sun's elevation. Thus the most rapid changes of temperature are post-equinoctial phenomena.

Rate of Change of Relative Humidity

We are aware of an approximate inverse relation between the changes of temperature and relative humidity in this country (Graphs 1 and 3). We can therefore anticipate a close inverse association between their respective accelerations (see Graphs 2 and 4). Let us summarize

Graphs showing the Seasonal Incidence of Rheumatic Fever and its Association with Climatic Factors

GRAPHS 1-5.—Seasonal Incidence of Rheumatic Fever.

Graphs 1 and 3 illustrate, respectively, the seasonal variations of temperature and relative humidity at Greenwich.

Graphs 2 and 4, deduced from Graphs 1 and 3, show the rates of change of temperature and relative humidity at Greenwich. Graphs 2 and 4 are merely an expression of the steepness of the more familiar Graphs 1 and 3.

Graph 5 illustrates the seasonal incidence of rheumatic fever in London.

these views in the simplest possible form relevant to our subject. We may say that, in London, September and October are characterized by a deceleration of temperature and an acceleration of relative humidity.

Seasonal Incidence of Rheumatic Fever

Graph 5 is based on the onset of symptoms in nearly 1,500 first attacks of rheumatic fever (St. Bartholomew's Hospital, 1882-1904). This graph shows a striking resemblance to the preceding graphs (2 and 4). Study of these graphs suggests a promise of close correlations. This promise is realized:

Rate of change of Temperature } and { Seasonal variation of Rheumatic Fever } $r = -0.86$
 Rate of change of Relative Humidity } and { Seasonal variation of Rheumatic Fever } $r = +0.85$

(In the text I have refrained from including the mathematical probable error, as this may lead to a false idea of accuracy. The rate of change of temperature for each month has been derived graphically from the rate of change between individual months. This leads to an error in draughtsmanship. Thus the total error is probably in the neighbourhood of ± 10 per cent.)

There can be no doubt that in this country there is a significant correlation between the seasonal variations of rheumatic fever and the rates of change of temperature and relative humidity. Is there any causative relationship between these climatic accelerations and the onset of rheumatic fever?

Climate and Rheumatic Fever

In this country there are two well-established associations between climate and the incidence of rheumatic fever:

1. Sir Arthur Newsholme (1935) has clearly demonstrated that the incidence of rheumatic fever is highest in hot dry years.

2. Damp cold has been implicated by numerous workers (Poynton and Schlesinger, 1937).

At first glance these associations appear to be mutually antagonistic. Fortunately this paradox is apparent rather than real. It will be appreciated that the maximum seasonal incidence of rheumatic fever does not occur in the hottest and driest months; neither does it occur in the damp cold of winter. It is to be found between the two, when the hot dry conditions of summer are changing most rapidly to the damp cold of winter.

If we regard hot dry and cold damp conditions as two extremes, then the rate of change between the two will be accentuated by an increase of one or both of these factors. It would therefore appear that, while hot dry conditions predispose to the onset of rheumatic fever, it is the rate of change to damp cold which acts as the precipitating climatic factor.

Conclusion

In view of the presence of significant correlations and a happy reconciliation with current ideas on climate, I submit that one of the factors controlling the seasonal incidence of rheumatic fever in this country is the reciprocal acceleration of temperature and relative humidity.

I wish to express my indebtedness to Professor P. C. Cloake of Birmingham, without whose inspiration and kindly encouragement this investigation would not have been undertaken.

REFERENCES

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Newsholme, Sir Arthur (1935). *Fifty Years in Public Health*, London.
Poynton, F. J., and Schlesinger, B. (1937). *Recent Advances in the Study of Rheumatism*, London.

At the annual general meeting of the Society for Relief of Widows and Orphans of Medical Men, with Mr. V. Warren Low, president, in the chair, the report for 1937 and the financial statement were presented and adopted. During 1937 sixty-one widows and seven orphans were in receipt of grants and the total amount distributed was £4,702. Owing to the increase of the number of widows in receipt of grants there were not sufficient funds available to make them the usual Christmas present, but each orphan received a present of £5. The receipts for the year amounted to £5,390, including £367 18s. 11d. from subscriptions and donations. The total membership of the society is 285, which is a very small proportion of the medical men eligible for membership. Relief is only granted to necessitous widows and orphans of deceased members. Membership is open to any registered medical man who at the time of his election is residing within a twenty-mile radius of Charing Cross. Each widow receives a grant of between £60 and £75 per annum, and the orphans £50 per annum. Any widow with an income of £125 or under is eligible to receive a grant. The directors are anxious to bring the great advantages of membership of the society to the notice of medical men. The invested capital, which amounts to over £140,000, may not be used as income; only the interest is available for this purpose. This year the society celebrates the one hundred and fiftieth anniversary of its foundation. Full particulars may be obtained from the secretary at the office of the society, 11, Chandos Street, Cavendish Square, W.1.

Clinical Memoranda

Treatment of Schizophrenia

Since Sakel (1935) introduced his method for the treatment of schizophrenia by the induction of hypoglycaemic "shocks" a wave of optimism has spread among psychiatrists of almost every country in the world, and insulin therapy in its different sphere is rivalling in popularity the malarial treatment of general paralysis.

The Vienna technique has been practised at the Hatton Mental Hospital since June, 1937, and fifty-nine cases of schizophrenia have completed a course of treatment comprising fifty or more shocks, unless cure was established with a smaller number. In order to get the results of treatment in their proper perspective we have inquired closely into the results obtained in cases of schizophrenia during the years 1931 to 1935 inclusive, with T.A.B. vaccine, with somnifaine prolonged narcosis, and finally with no special treatment beyond ordinary nursing care and the psychotherapy of friendly interest. We have collected the after-histories of these schizophrenics up to the present, but here we are only concerned with the results achieved during their first year after admission.

Table showing Immediate Results in Treatment of Schizophrenia

	No. of Cases	Cases Discharged		Average Stay in Hospital	Average Age	Relapses in One Year	Final %
		No.	%				
Symptoms 0-½ year :							
Treatment—				Mths.	Years		
Insulin	18	18	100.0	4.5	22.8	2	88.8
T.A.B.	49	40	81.6	7.3	23.7	3	76.9
Somnifaine	6	3	50.0	4.7	25.2	1	33.3
None	26	22	84.6	8.8	23.7	2	76.9
Symptoms ½-1 year :							
Treatment—							
Insulin	12	9	75.0	5.3	21.9	0	75.0
T.A.B.	16	13	81.2	9.9*	23.6	3	62.5
None	9	6	66.7	8.5	24.6	0	66.7
Symptoms 1-2 years :							
Treatment—							
Insulin	10	5	50.0	4.5	24.2	1	40.0
T.A.B.	22	12	54.5	8.9	23.9	6	27.3
None	9	6	66.7	8.1	24.2	0	66.7
Symptoms over 2 years :							
Treatment—							
Insulin	10	3	30.0	3.0	25.1	0	30.0
T.A.B.	17	6	35.3	15.0	25.8	1	29.4
None	4	3	75.0	4.0	25.0	1	50.0
Second Attacks :							
Treatment—							
Insulin	9	4	44.4	3.5	25.1	0	44.4
T.A.B.	16	7	43.7	7.3	24.7	3	25.0
Somnifaine	6	4	66.7	7.2	23.0	2	33.3
None	32	15	46.9	5.7	25.5	7	25.0

* Excluding one case in hospital for 4½ years. If this case is included the average stay in hospital becomes 13.1 months. Of all cases in this table the immediate discharges are : for insulin 66.1%, for T.A.B. vaccine 65%, for no treatment 65%, and for somnifaine narcosis 58.3%.