ARTHRITIS IN POPULATIONS

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I am going to say a few words about rheumatic diseases as they appear when studied in populations instead of patients. This address should have been delivered by Dr J. S. Lawrence, Director of the Empire Rheumatism Council’s Field Unit, but he is at the moment engaged in a field survey in Jamaica.

There are two ways of studying rheumatic diseases in populations. The first is to take a population sample and then to ask every individual in the sample whether he has had pains in the limbs and back during a stated period (in this particular study for the past five years), and to examine clinically the people who answer “yes” to this question. When we sampled the population of the town of Leigh in Lancashire, the aches and pains were classified according to their presumed cause, and the commonest was osteoarthritis, which has a maximal prevalence late in life and is perhaps one of the major causes of aches and pains. Then there is rheumatoid arthritis, or a peripheral inflammatory polyarthritis. It is twice as common in women as in men, with its peak incidence somewhere in the forties and fifties. Then we have the backaches and the pains in the arms and legs associated with disc disorders, with a peak incidence, especially in men, much earlier in life, tailing off in old age. Finally come the pains of undetermined nature, that is, the episodes of pain and stiffness for which you really cannot even make a guess as to diagnosis. These occur in the earlier decades and give way to more defined diseases in the later decades, and this of course suggests that many of these episodes may be early and undiagnosable manifestations of more serious diseases. I am not including the less common and yet well-defined conditions, such as gout, ankylosing spondylitis, Reiter’s disease and a whole host of uncommon arthropathies such as systemic lupus or periarteritis nodosa. All those conditions have a prevalence of one per thousand or less in the population, and individually they are insignificant, although in the mass they form quite a significant proportion of rheumatic complaints. Probably every practice contains one example of most
of these conditions, which are important because their correct diagnosis is necessary for correct and in many instances specific treatment. By screening populations by complaints you get very much the same results as you get by studying the disease in practice, either in general practice or in hospital practice.

Another way of looking at populations is by taking random samples and studying them for objective criteria of changes, anatomical or other, in the joints, or by looking for biochemical or serological characteristics in everybody whether they have symptoms or not. This involves studying everybody with x rays and taking a blood sample for biochemical analysing and testing for substances like the rheumatoid factor. Here you get rather different results. A radiological determination of the prevalence in the population of osteoarthrosis (figure 1) shows two important things: that osteoarthrosis in the hands is very much more common than osteoarthrosis in the hips, and that there is a sex difference; women have more osteoarthrosis in the hands than the hips, and men more in the hips than the hands. Of course hip disease causes much the more important clinical problem. Another change which takes place in the bones and also in the other connective tissues is a thinning as the years go by, which radiography reveals as osteoporosis (figure 2). Here we have another important sex difference, for women’s bones and other connective tissues begin to thin at the menopause, so that by old age some 60 per cent of women have quite a definite
osteoporosis, whereas this comes on very much later and to a much less extent in the men.

![Graph of osteoporosis in hands by age and sex in Leigh and Wensleydale random population sample](image)

Figure 2. Osteoporosis in hands by age and sex in Leigh and Wensleydale random population sample

X-ray films of individual joints from a sample of persons in the 55-64 age group shows the extraordinary difference in the behaviour of different joints; for example, the distal interphalangeal joints are very commonly affected by osteoarthritic change, whereas in the wrists this is very rare in women and not very common in men, in whom it is nearly always due to fractures and other traumatic conditions, or secondary in both sexes to inflammatory arthritis. The spine is much affected in both the discs and the apophyseal joints. Osteoarthrosis of the knees is very common, as it is in the great toe, whereas in the lateral toes it is very uncommon. There is a tremendous amount of asymptomatic osteoarthrosis and the proportion that is symptomatic varies a bit from joint to joint, so that we always have to ask ourselves why an individual with demonstrable osteoarthrosis had pain and disability. There are several reasons. Occasionally, pain is due to the severity of the disease and the stage of the disease itself, but not uncommonly it is due to the concurrent onset of another disease like rheumatoid arthritis or to some other condition. Moreover, the whole question of whether joint changes produce symptoms is very much determined by the individual's "complaint threshold". All of us have aches and pains every day of our lives. When we have anatomical changes in the joints we have them more often and they are perhaps a little more severe, but whether we
actually accept these as part of life or go to our colleagues for consultation depends on our complaint threshold; this is not only affected by our psychological make-up but by intercurrent troubles in life. Perhaps one of the most important things to determine is whether in fact the patient comes because his disease has become more severe or because his complaint threshold has changed.

*Rheumatoid disease*

As an objective index of rheumatoid disease in a population I have taken the concentration of rheumatoid macroglobulin in the serum, as determined by the sheep cell agglutination test (figure 3). A titre in the agglutination test of 1 in 32 is considered to be positive, and at this level an association with arthritis begins but this characteristic is not an "all or none" one. Some amount of the factor occurs in about a third of the population and it occurs equally in both sexes. Yet ever since rheumatoid arthritis was recognized it was supposed

![Figure 3. Prevalence of positive sheep cell agglutination tests in Leigh random population sample by age and sex](Reproduced from J. Ball & J. S. Lawrence, *Ann. rheum. Dis.*, 20, 235, 1961)
to be three times as common in women as in men. There are various reasons for this. A lot of polyarticular arthritis in women is not really rheumatoid but something else, and another reason is that rheumatoid disease affects not only the joints but also many other tissues and is associated with all sorts of other conditions like pulmonary fibrosis, which may be much more common in men. So here there is a very different picture from the clinical one. Clinically, rheumatoid disease is commonest in middle adult life, the incidence falling off in the elderly, but the incidence of rheumatoid factor shows a steady rise with the maximum peak at ages over 65—up to 15 per cent of the population in males and 10 per cent in females in this particular industrial community. And it is probable that rheumatoid disease does in fact become more common with advancing age, but that it is associated with rather different clinical pictures in the elderly. The old person with rheumatoid disease just goes off and becomes tired and not so well, and doesn’t present the classical articular picture.

If we take individuals from the population sample, classified by agglutinating titres as probands and study their blood relatives, we find that the proportion of positive tests in the blood relatives increases very strikingly from 3 per cent to 12 per cent according to the titre of the probands. So it does look as if there is striking familial aggregation of rheumatoid disease, a four-fold increase; this is not observed in the spouses, so it seems to be hereditary. If, on the other hand, we take samples from different populations, all in the same age group, and classify them as rural or urban, there appears a striking and consistent difference between the country and the town, the rheumatoid factor being twice as common in the latter, so there are obviously some unknown environmental factors involved in the production of this disease.

**Gout**

We studied serum uric acid levels in the population of the rural area of Wensleydale, which is largely a marginal hill farming area, and found a rather pretty distribution of levels with a normal distribution around 4.5 mg. per 100 ml. for men and 3.5 mg. for women under 45, though there is a kind of positive skew, with one or two high values in the men. At ages over 45 there is a big difference; the women now have a distribution very similar to that in men, but in the latter there is a bimodal distribution with the second peak at 6 mg. per 100 ml. The first thing that this curve tells us is that the value of 6 mg. per 100 ml. will occur in middle-aged people in a proportion of about 5 per cent of the population in males and about 2 per cent in females; this is a great deal higher than the prevalence of clinical gout. Furthermore, in Wensleydale, which is a relatively
poor area, people work hard and are rather abstemious; they live on a mixed diet with plenty of carbohydrate and don't drink much beer.

Dr Sydney Cobb, in Pittsburgh, U.S.A., has studied a population of business executives, and he gets an entirely different distribution. The first big peak instead of being centred over 4.5 mg. is centred over 5.5 to 6 mg., the second peak is centred over 7 mg., and then there is a third peak, up in the 8—10 mg. range, so the whole curve is shifted to the right; further there is a significant incidence of gout. So it would appear that the hazard of being an executive has a very important influence on the general distribution of serum uric acid. This is borne out by our own experience when we classify our patients by social class. A sample of individuals coming to our rheumatism clinic at the Royal Infirmary is already pretty well selected, with far too many executives. We have a three-months waiting list for appointments, so only the special patients get sent there. But when we get to the gout clinic, 30 per cent are business executives or consultants and there is only in fact one manual worker among 95 patients. There are also about 30 per cent of people in social class II and 30 per cent in social class III, but this is also very special; it is largely made up of people in the beer trade and the like. Hence there seems little doubt that we have in gout a nice illustration of the interaction of an inherited defect with an environmental factor possibly related to diet and the occupational stresses of being an executive or a consultant.

The above are examples of the ways in which studies of disease in a population may give different results from a study of disease in inpatients.

DEGENERATIVE JOINT DISEASES—DISCS AND OSTEOARTHRITIS

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Problems in General Practice

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I propose to use the material from my own practice to illustrate one of the main difficulties in general practice—accurate, early