Rheumatic Disorders in the South African Negro

PART I. RHEUMATOID ARTHRITIS AND ANKYLOSING SPONDYLITIS

L. SOLOMON, P. BEIGHTON, H. A. VALKENBURG, G. ROBIN, C. L. SOSKOLNE

SUMMARY

Epidemiological studies to determine the prevalence of rheumatoid arthritis (RA) have been carried out in two South African Negro populations: one a rural people in the north-western Transvaal, and the other an urban community in Johannesburg. Altogether 1352 subjects over the age of 15 years were examined clinically and radiologically; serological tests for rheumatoid factor (RF) were carried out in 920. Rheumatoid arthritis was graded 'definite' or 'probable' on the basis of a modification of the 'Rome criteria' of 1963.

A marked difference in the prevalence of RA was encountered in the two populations. Among the rural Blacks only 1 respondent had definite RA and 6 had probable RA, giving a prevalence of 0.87% for combined definite and probable RA. Among the urban group 5 respondents had definite RA and 13 had probable RA, a combined prevalence of 3.3%. This difference is statistically highly significant ($P<0.01$).

Moreover, the form and severity of the disorder differed markedly in the two populations. In the rural community such changes as were encountered were invariably mild and no-one had clinical features resembling classical rheumatoid arthritis; by contrast, among the urban Blacks the changes resembled those of rheumatoid disease in White populations. Such marked differences in genetically closely related communities point to the importance of sociological and environmental factors in the pathogenesis of rheumatoid arthritis.


Although all the common rheumatic disorders of western Caucasians have been encountered in the South African Negro, their precise distribution and clinical pattern are still poorly defined, and little is known of the manner in which they may be modified by specific genetic, cultural and environmental factors. In an attempt to elucidate these problems a number of epidemiological surveys and localised studies have been carried out in various Black populations. The findings are presented in a series of articles, the first of which deals with rheumatoid arthritis and ankylosing spondylitis.

DEMOGRAPHY

Epidemiological surveys were carried out in two separate populations, chosen deliberately because they were genetically closely related, but culturally and environmentally dissimilar. One was a rural and semi-tribal people in the village of Phokeng, which lies at the foot of the Magaliesberg in the north-western Transvaal. The other was a fully urbanised community in the south-western townships of Johannesburg.

The Rural Population

The villagers of Phokeng are Tswana, a Bantu-speaking tribe belonging to the large group of Western Sotho peoples. They number approximately 10 000, of whom half are under the age of 18 years. As in many other Bantu villages there is a preponderance of women in the middle and older age groups, because the men work in towns and cities elsewhere. The economy of Phokeng is based largely on the money sent home by these men, but small-scale farming is still practised in the village, and food crops such as maize are grown on tribal lands. In addition, the community as a whole draws a substantial revenue from mining operations conducted on their land by outside companies. The village thus enjoys a fair degree of prosperity, its people being adequately housed and well nourished.

There are five schools in the village and 95% of the children attend primary school while about 20% complete their secondary education. Many of the young people remain at school until over the age of 20 years.

The general health of the population is good and medical services are available both in the village and in the nearby town of Rustenburg. About 10% of the population are over the age of 60 years.

The Urban Population

The south-western townships of Johannesburg, known collectively as Soweto, are 24 in number and together they make up the largest urban complex in Southern Africa.

Almost 600 000 of Johannesburg's estimated 750 000 Blacks live in Soweto. There are now over 200 schools and...
day nurseries; municipal health services include 18 clinics and health centres which are linked to the 2,000-bed teaching hospital at Baragwanath.

The survey was carried out in Orlando East, the oldest of the townships, which was established in 1932. Over 80% of its 32,000 residents were either born in Johannesburg or have lived there for at least 20 years. Orlando East is the most settled of the Black communities around Johannesburg, and 7% of its residents are over 64 years old.

**METHODS**

Similar epidemiological methods were employed in each area. On a map of the village or township several large blocks of houses were randomly selected and a complete census of the people living there was carried out by census workers recruited in the area. At pre-arranged times respondents were collected by bus and transported to a central clinic. Here they were examined, radiographs of the hands and feet were obtained in every instance, and in those over 54 years (except in pregnant women) radiographs of the pelvis and spine were taken as well. Blood samples were collected from those over 18 years.

For the purpose of the arthritis survey only individuals aged 15 years and older were included in this study. This gave 801 subjects in Phokeng and 551 in Soweto; their age and sex distributions are shown in Fig. 1.

The radiographs were assessed for evidence of erosive arthritis according to Kellgren et al. Serum specimens were tested for the presence of rheumatoid factor (RF) by the latex fixation test (LFT) and the human erythrocyte agglutination test (HEAT). Titres of 1:640 or more for the LFT, and 1:32 or more for the HEAT were regarded as positive, these being the values obtained in less than 5% of a normal White population.

The presence of rheumatoid arthritis (RA) was finally determined according to a modification of the "Rome criteria." These are:

(i) a history of polyarthritis;
(ii) symmetrical deformity of peripheral joints, and especially of the metacarpophalangeal or metatarsophalangeal joints, with involvement of at least one hand or foot;
(iii) radiographic changes of erosive arthritis of grade 2 or more according to Kellgren et al.;
(iv) a positive serological test for rheumatoid factor.

A diagnosis of definite arthritis is reached if at least 3 of these criteria are fulfilled, provided the diagnosis is not negated by any of the exclusions listed in the American Rheumatism Association criteria of 1958.

During the course of these surveys it became apparent that a past history of polyarthritis was too unreliable to be included and it was therefore decided that those with the remaining 3 criteria should be called 'definite' RA and that those with 2 of these 3 criteria should be called 'probable' RA.

**RESULTS**

**Clinical Assessment**

Clinical polyarthritis was encountered in 7 (0.9%) of the rural population and in 24 (4.4%) of the urban group (Fig. 2). This difference is statistically highly significant.
Radiographic Assessment

Erosive arthritis as shown in radiographs of the hands or feet was again much more common in the urban than in the rural community. No less than 25 individuals (4.5%) in the Soweto survey had changes of grade 2-4 arthritis, while similar features were encountered in 13 subjects (1.6%) in the Phokeng survey (Fig. 3). This difference is statistically significant ($\chi^2 1 df = 9.11; c = 0.08; P<0.01$). The more severe grades of erosive arthritis occurred in 4 females in the urban group and not at all in the rural group. In the latter, however, there were several examples of well-defined peri-articular erosions with densely sclerotic endosteal margins unassociated with any symptoms (Fig. 4).

Serological Investigations

Tests for rheumatoid factor were carried out on 516 respondents in the Phokeng survey and on 404 respondents in the Soweto survey (Tables I and II). The results in the two population groups were similar, the LFT being positive in 8.9% of the rural, and in 12.1% of the urban Blacks, and the HEAT being positive in 2.8% of the rural group and in 3.2% of the urban group. In both sexes of both populations the percentage of positive results with the LFT increased progressively with age, reaching a maximum of 22.9% in the 65-74-year cohort in the urban survey.

Evaluation of Combined Criteria

By the modified combined criteria adopted here only one respondent — a 98-year-old woman — in the rural survey had definite rheumatoid arthritis and 6 (5 men and 1 woman) had probable rheumatoid arthritis. For the rural population over 15 years old this gave a prevalence
TABLE I. POSITIVE RHEUMATOID FACTOR TESTS IN 516 RURAL RESPONDENTS

<table>
<thead>
<tr>
<th>Age group</th>
<th>15 - 24</th>
<th>25 - 34</th>
<th>35 - 44</th>
<th>45 - 54</th>
<th>55 - 64</th>
<th>65 - 74</th>
<th>75+</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M F M F</td>
<td>M F M F</td>
<td>M F M F</td>
<td>M F M F</td>
<td>M F M F</td>
<td>M F M F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample</td>
<td>72 70 18 28</td>
<td>17 31 21 40</td>
<td>26 64 22 53</td>
<td>16 38 19 29</td>
<td>46 (8,9%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LFT+</td>
<td>0 4 1 3</td>
<td>1 3 1 4</td>
<td>5 6 6 6</td>
<td>3 3 1 2</td>
<td>0 3 6 6</td>
<td>17 29</td>
<td>46 (2,8%)</td>
<td></td>
</tr>
<tr>
<td>HEAT+</td>
<td>1 0 1 0</td>
<td>0 0 1 0</td>
<td>3 2 0 1</td>
<td>0 3 6 6</td>
<td>17 29</td>
<td>46 (2,8%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TABLE II. POSITIVE RHEUMATOID FACTOR TESTS IN 401 URBAN RESPONDENTS

<table>
<thead>
<tr>
<th>Age group</th>
<th>15 - 24</th>
<th>25 - 34</th>
<th>35 - 44</th>
<th>45 - 54</th>
<th>55 - 64</th>
<th>65 - 74</th>
<th>75+</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M F M F</td>
<td>M F M F</td>
<td>M F M F</td>
<td>M F M F</td>
<td>M F M F</td>
<td>M F M F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample</td>
<td>30 61 29 55</td>
<td>22 34 13 30</td>
<td>22 0 12 36</td>
<td>7 13 13 5</td>
<td>49 (12,1%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LFT+</td>
<td>1 1 2 3</td>
<td>3 3 1 10</td>
<td>4 1 11 0</td>
<td>3 8 5 13 (3,2%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEAT+</td>
<td>0 2 1 0</td>
<td>0 2 0 0</td>
<td>4 1 3 0</td>
<td>0 0 0 0</td>
<td>8 5 13 (3,2%)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Among the men the difference between the two populations was not statistically significant; among the women, however, the difference was statistically highly significant ($\chi^2 1 \, df = 5.49; \epsilon = 0.08; \, P<0.01$).

Ankylosing Spondylitis

Only one case of ankylosing spondylitis was encountered in the entire study. This was a 66-year-old man in Phokeng who had the classical clinical and radiographic features of the disease. Serological tests for rheumatoid factor in this man were negative.

DISCUSSION

"Though small differences between places have been demonstrated with respect to the frequency of rheumatoid arthritis, the general impression is that this disease is ubiquitous and that the geographic and racial variations uncovered to date are not of sufficient magnitude to lead us to new ideas about etiology." This statement was made by Cobb and Kasl in a paper presented at the Third International Symposium on Population Studies of the Rheumatic Diseases in 1966. Although it is a somewhat sweeping generalisation it does reflect the trend of point prevalence studies in various parts of the world. At that time, however, accurate data for Blacks based on random population studies were not yet available. The findings reported here show striking differences, not only between Negroses and other racial groups but also between two genetically similar populations separated by a distance of some 100 kilometres and differing only in their cultural and social environment. Among the rural Blacks there was only one instance of 'definite' rheumatoid arthritis, giving a prevalence of 0,12% in the population over 15 years, 'Definite' and 'probable' rheumatoid arthritis combined, occurred in 0,87% of the same population. These findings are very similar to those of a survey in...
Western Nigeria and Liberia where 'definite' and 'probable' rheumatoid arthritis combined occurred in 0.8%, 1.6% and 2.8% of the people in three different villages.\(^5\) By contrast the prevalence of RA in the urban Blacks of Johannesburg was strikingly similar to that in other industrialised countries throughout the world;\(^6\) to 11 ‘definite’ RA occurred in 0.9% and ‘definite’ and ‘probable’ RA combined in 3.3% of those over 15 years. For the combined forms of inflammatory polyarthritis the difference between the two Black populations studied here is statistically highly significant (\(\chi^2 1 df = 8.44; P<0.01\)). Even if one excludes the large number of young people in order to match the two populations more closely, the difference is still highly significant; for those over 35 years the prevalence of combined RA was 1.8% in Phokeng and 6.6% in Soweto (\(\chi^2 1 df = 8.53; c = 0.11; P<0.01\)).

Equally striking was the difference in the type and degree of inflammatory polyarthritis encountered in the two populations. In the rural group this was invariably mild and associated with little or no disability; even the 1 case classified as ‘definite’ RA on the basis of the criteria employed here bore little resemblance to clinical rheumatoid disease. In the urban group, on the other hand, 2 respondents had the changes of long-standing rheumatoid disease with marked deformities and subcutaneous nodules; the other 3 respondents classified as having ‘definite’ RA had a moderately severe inflammatory polyarthritis. In addition another 6 respondents had clinical features suggestive of rheumatoid disease, including chronic synovitis of the wrists and metacarpophalangeal joints, but without the other criteria to permit a diagnosis of definite RA.

Radiographic features of erosive arthritis of the hands or feet also occurred with remarkable frequency in the urban Blacks. Twenty-five respondents — 4.5% of those over 15 years and 9.2% of those over 35 years — had grade 2-4 changes; this is more than twice the prevalence in the rural Blacks and approaches that in the Jamaican population studied by Lawrence and his colleagues.\(^1\)

As in other Negro populations,\(^1\) the latex fixation test for rheumatoid factor was positive in a high percentage of cases — 8.9% in the rural group and 12.1% in the urban group over 15 years. This may suggest a common genetic characteristic shared by various Negro subgroups; it is more likely that the different Black populations are exposed to a common environmental factor which affects immunoglobulin levels. Chronic pulmonary tuberculosis, for example, which is still relatively common in both rural and urban Blacks, is known to be associated with a positive latex fixation test in a high percentage of cases.\(^1\)

This finding, therefore, does not detract from the fundamental observation that there is a marked difference in the occurrence of rheumatoid arthritis between rural and urban Blacks. Moreover, since these two groups of people are genetically closely related, one must conclude that the differences observed are due not to racial or genetic, but to social and environmental factors. For the South African Negro, urbanisation has brought profound changes from the agrarian existence of tribal life: changes in dietary habits, exposure to new types of infection, a higher rate of venereal disease, alterations in physical activity and a marked increase in psychological stress. Each of these has at some time or another been implicated in theories of the pathogenesis of rheumatoid arthritis. Their precise significance to the clinical expression of rheumatoid disease in the South African Negro must await further investigation.

We gratefully acknowledge the following people and institutions whose co-operation and interest made these studies possible: Chief Edward Mokgatle and the Council of Phokeng; the Commissioner for Bantu Affairs, Phokeng; the Department of Bantu Administration and Development; the Johannesburg Native Affairs Department, the Union Corporation Limited and the Medical Centre of the Bafokeng Mine.

The project was supported jointly by the Orthopaedic Chair Trust Fund and the Carl and Emily Fuchs Foundation.

REFERENCES