PAPERS AND ORIGINALS

Radiological prevalence of Paget's disease of bone in British migrants to Australia

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British Medical Journal, 1978, **1**, 1655-1657

Summary and conclusions

The radiological prevalence of Paget's disease among migrants from the United Kingdom to Australia was higher than in a comparable Australian resident population but lower than in a British resident population. A probable explanation is that the migrants carry with them the higher UK risk of developing the disease.

Introduction

Paget's disease of bone has a localised distribution throughout the world, the highest recorded prevalences being in Britain. The United States, France, Germany, Australia, and New Zealand have lower prevalences, and the disease is rare in Scandinavia, throughout Africa, and in the Middle and Far East.[1] This strong geographical variation in prevalence may reflect either varying susceptibility among different ethnic groups or the operation of localised environmental influences. Studies of groups who migrate between areas of high and low prevalence offer a way of distinguishing between these alternatives.

There has been substantial emigration from Britain to Australia. Comparison of prevalences among migrants and life-long residents should show whether or not emigration reduces the risk of developing the disease and, if so, the extent to which the British risk is reduced to that of the native-born Australians. These observations, when related to the age of migration, may permit inferences about the latent period between inception of the disease and its development.

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This paper describes a survey of subclinical Paget's disease among elderly people in Western Australia and a comparison of the findings with those made in a recent survey of 14 British towns.[2]

Methods

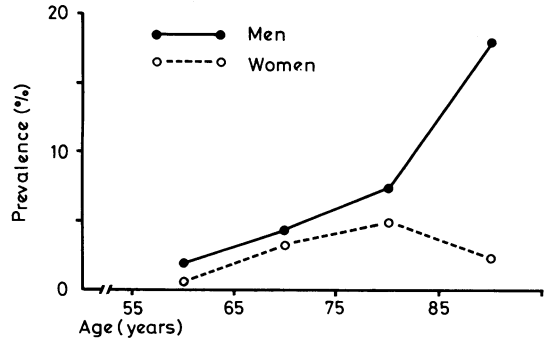
Of the Australian states Western Australia has the highest proportion of United Kingdom immigrants among its elderly population. In 1971, for example, 30% of the population over the age of 65 years was born in the UK. This is twice as high as in any other state (except Australian Capital Territory, which has only a small population). Three-quarters of the population of Western Australia live in its capital city, Perth, which was therefore chosen for the study.

Samples of about 1000 abdominal *x*-ray films of people aged 55 and over were taken from the stored films within the *x*-ray departments of the Royal Perth and Sir Charles Gairdner Hospitals, which serve the main metropolitan area of the city. The selected films showed the entire pelvis and sacrum, the femoral heads, and all the lumbar vertebrae. They included films taken specifically to show the skeleton and others taken during intravenous pyelography, barium studies, and plain abdominal examinations. In each hospital films were extracted sequentially from the records to include about 250 films from people in each of four categories: (*a*) men born in the UK, (*b*) women born in the UK, (*c*) men born in Australia, and (*d*) women born in Australia. This sampling was facilitated by the place of birth being included on the patient's identification labels.

For each patient identification data and details of the place of birth were extracted from the hospital record. All the *x*-ray films were examined, without knowledge of place of birth, by the same observer (PBG) using the same standardised criteria for the radiological diagnosis of Paget's disease as were used in a recent study of Paget's disease in Britain.[2] Ninety-five per cent of patients with Paget's disease have the disease in the sites examined,[2] and there is no published evidence of differences in skeletal distribution among different countries.

Results

Of the 2145 patients whose radiographs were included in this study, 88 (4·1%) had radiological evidence of Paget's disease. The figure shows the age-sex specific prevalence rates. For each sex the prevalence rates rose with increasing age, except for women in the oldest age group, among whom the rate was less reliable owing to the small



Radiological prevalence of Paget's disease of bone according to age and sex.

numbers. The rates for men were consistently higher than those for women.

Table I shows the radiological prevalence of Paget's disease by place of birth. Nine hundred and forty-two UK subjects were included, 48 of whom had Paget's disease; of the 1203 Australian-born subjects, 40 had the disease. Among men the rates were higher in UK-born patients than in Australian-born men in each of the four age groups. Among women, however, the UK rate was higher in only one of the four age groups. The prevalence rates for all ages shown in table I were not strictly comparable because of the different age distributions of the various groups. They are given only as summary figures, and the rates shown in later tables have been made comparable by calculating age-standardised values using the direct method of standardisation.[3]

Table II shows the age-standardised prevalence of Paget's disease by place of birth and place of residence, and includes data for UK-born patients living in the UK.[2] UK-born patients who remained in the UK had a higher prevalence (5·4%) than those who emigrated to Australia (4·0%), who in turn had a higher rate than native-born Australians (3·2%). This trend was followed by men; but among women, while UK residents had a higher rate than native-born Australians, the rate for UK-born immigrants in Australia was a little lower.

Of the 2145 films examined, 239 (11%) were taken specifically to show the skeleton, 973 (45%) were plain abdominal films, 588 (27%) were intravenous pyelograms, and 345 (16%) were taken during barium studies. The non-skeletal radiographs were combined into one group as there were no important differences in prevalence between the different types of examination. Among the skeletal *x*-ray films the overall prevalence rate of Paget's disease was 8·8% (21/239) and among the remaining films it was 3·5% (67/1906). Table III shows the variation between UK migrants and Australian-born patients according to type of radiological examination. The rates, which were age-standardised, were higher for the former group, except among films of women taken for non-skeletal purposes, among whom the prevalence rates were lowest. When the overall prevalence rates of 8·8% and 3·5% for skeletal and non-skeletal examinations were age-standardised, the excess rates in skeletal films was diminished, the rates becoming 7·8% and 3·7% respectively. This was due to the older age of patients referred for films of the skeleton than for other types of radiograph.

TABLE I—*Prevalence of Paget's disease in Australia among hospital patients aged 55 years and over born in UK and Australia*

Age group	Men		Women	
	UK	Australian	UK	Australian
55–64:				
No of patients	96	238	95	187
No (%) of cases	4 (4·2)	3 (1·3)	0	2 (1·1)
65–74:				
No of patients	237	260	180	224
No (%) of cases	13 (5·5)	9 (3·5)	4 (2·2)	10 (4·5)
75–84:				
No of patients	105	84	149	138
No (%) of cases	8 (7·6)	6 (7·1)	11 (7·4)	4 (2·9)
≥85:				
No of patients	32	34	48	38
No (%) of cases	7 (21·9)	5 (14·7)	1 (2·1)	1 (2·6)
All ages:				
No of patients	470	616	472	587
No (%) of cases	32 (6·8)	23 (3·7)	16 (3·4)	17 (2·9)

TABLE II—*Age-standardised prevalence of Paget's disease by place of birth and place of residence*

Place of birth	Place of residence	Prevalence (%) of Paget's disease		
		Men	Women	Both sexes
UK	UK	7·0*	3·8*	5·4*
UK	Australia	5·7	2·3	4·0
Australia	Australia	3·5	2·8	3·2

*From Barker *et al*,[2] 1977.

TABLE III—*Age-standardised prevalence of Paget's disease in Australia by type of radiological examination*

Sex and place of birth	Prevalence (%) of Paget's disease*	
	Skeletal radiographs to show lumbar spine and pelvis	Radiographs taken for plain abdominal examinations, intravenous pyelography, or barium studies
Men:		
UK	11·2 (37)	6·3 (433)
Australia	7·8 (62)	4·1 (554)
Women:		
UK	7·4 (57)	1·9 (415)
Australia	5·0 (83)	2·6 (504)
All patients	7·8 (239)	3·7 (1906)

*Figures in parentheses are numbers of patients in each group.

Although there was a smaller proportion of skeletal examinations in the present survey than in the previous British survey,[2] the difference was not enough to influence the results shown in table II.

Among the 942 patients born in the UK the specific country of birth was recorded for 850. Of these, 631 were born in England, and their radiological prevalence of Paget's disease was 5·7% (36/631). Because of the small numbers of patients from Scotland, Wales, and Ireland their individual rates were unreliable, but together the prevalence rate was somewhat lower at 3·2% (7/217). A similar comparison for State of birth among the 1203 Australian patients showed that 900 were born in Western Australia and had a prevalence rate of 3·0% (27/900). The remaining states showed similar rates, their combined prevalence being 3·9% (11/285). The prevalence rates in the two different hospitals were also similar, being 4·3% (49/1132) at the Royal Perth Hospital and 3·8% (39/1013) at the Sir Charles Gairdner Hospital.

Discussion

The rates for the radiological prevalence of Paget's disease found in this survey are consistent with findings in other studies.[2 4] They are higher in men than in women, and in both sexes they rise with increasing age. These results give strength to the use of prevalence rates based on routine *x*-ray films as measures of the frequency of Paget's disease. Although the prevalence among patients attending for routine *x*-ray investigations is a biased estimate of the true prevalence in the community, it seems unlikely that these biases will greatly influence comparisons between different groups of the population attending the same hospitals.

Among patients referred to two hospitals in Perth, UK immigrants to Western Australia have a higher prevalence of Paget's disease than native-born Australians. This difference is more definite in men than in women, but the prevalence rates for women are less reliable than those for men as they are based on smaller numbers. These observations on radiological prevalence are supported by the finding that in Western Australia hospital discharge rates for patients with Paget's disease as the principal diagnosis are 10% higher among UK-born migrants than among the native population.[5]

On the other hand, UK immigrants have lower prevalence rates than those reported in patients born and resident in the UK. This difference exists within each sex. The prevalence among immigrants (4·0%) was lower than that found among

residents in any of the 14 British towns that were studied, where the rates ranged from 4·2% to 7·5%.[2]

The decline in prevalence that accompanies migration to Australia points to environmental influences in causing the disease. The rates among immigrants do not, however, fall to the levels of natives of Australia. There are two possible explanations for this. Firstly, some people who have already developed the disease while living in the UK may be included among the immigrants. Secondly, there may be a latent period between inception of the disease and its first radiological manifestation, so that, progression being to some extent irreversible, migrants carry with them the higher UK risk of developing the disease. It seems likely that both explanations apply.

Since Paget's disease is uncommon before the age of 45 the reduction in risk among migrants in comparison with those who remain in the UK is probably related to the age at migration. Those who migrate as children will have had cumulatively less exposure to adverse influences in the UK environment, and there may be some critical age range below which migrants take on the lower risk of Australia rather than taking with them the higher risk of the UK. A study of variations in prevalence among immigrants according to the age at migration is being carried out to explore this. This study will also provide detailed data on the place of origin of migrants in the UK. There is, in England, an apparent area of high prevalence in the Lancashire towns, and the prevalence among migrants to Australia may also be related to the prevalence in their place of origin.

We are grateful to Dr H T ApSimon, head of diagnostic radiology at the Royal Perth Hospital, and to Dr J Glancy, head of diagnostic radiology at the Sir Charles Gairdner Hospital, for allowing us access to their records and x-ray films and to all their staff. We also acknowledge the generous support given by Professor M S T Hobbs of the unit of clinical epidemiology, Department of Medicine, University of Western Australia. The study was funded by a grant from the Department of Health and Social Security. Armour Pharmaceutical Company Limited also gave financial support.

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(*Accepted 17 April 1978*)

Antibiotic resistance in Streptococcus pneumoniae and Haemophilus influenzae

Report of a study group on bacterial resistance*

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British Medical Journal, 1978, **1**, 1657-1660

Summary and conclusions

Twenty laboratories in England and Scotland took part in 1977 in a survey of antibiotic resistance in Streptococcus pneumoniae and Haemophilus influenzae. In Str pneumoniae 59 (6·8%) of the 866 strains studied were resistant to tetracycline and three to chloramphenicol, and one strain showed a decreased susceptibility to penicillin. The prevalence of resistance to tetracycline was lower than that found in a similar study performed in 1975. Nine hundred and fifty-two strains of H influenzae were examined: 15 (1·6%) were resistant to ampicillin (all were beta-lactamase producers) and 26 (2·7%) to tetracycline. Only two strains were resistant to chloramphenicol and two to trimethoprim. Sixty-three H influenzae strains were capsulated. Thirty-four of these were of Pittman type b, and antibiotic resistance, particularly to ampicillin, was more common in these than in other serotypes or non-typable strains.

Some variation was seen in the resistance rate of both H influenzae and Str pneumoniae to tetracycline in strains from different centres, but too few were isolated to assess whether this represented a true geographical difference.

Introduction

Both *Streptococcus pneumoniae* and *Haemophilus influenzae* are among the more antibiotic susceptible of bacterial species, but resistance in both to all the commonly used antibiotics in respiratory infections has now been described. In *Str pneumoniae*, for example, sulphonamide resistance was described at an early date by Ross.[1] Tetracycline resistance was described in 1963[2]; penicillin,[3] erythromycin, and lincomycin[4 5] resistance in 1967; and chloramphenicol resistance in 1970.[6] Recently strains showing multiple resistance to several antibiotics, including penicillin, have been reported from South Africa.[7-9] In *H influenzae* sporadic isolates resistant to tetracycline had been described by 1970,[10] chloramphenicol resistance was reported in 1972,[11] and in 1974 ampicillin-resistant Pittman type b strains were reported by several workers in different parts of the world.[12-14]

In 1975 a study group was established in the United Kingdom to investigate the prevalence of tetracycline resistance in *Str pneumoniae* and *Str pyogenes*.[15] At the beginning of 1977 it was

*The study group comprised: Dr A B White, Inverness; Dr T D Brogan, Stockport; Dr I A Porter, Aberdeen; Dr M H Robertson, Epping; Dr C A C Ross, Ayr; Dr D A Leigh, High Wycombe; Dr R J Fallon, Glasgow; Professor I Phillips, London; Dr K Cartwright, Edinburgh; Professor J D Williams, London; Dr J B Selkon, Newcastle; Dr N A Simmons, London; Dr R N Peel, York; Dr E J Stokes, London; Dr A Percival, Liverpool; Dr D S Reeves, Bristol; Dr R Wise, Birmingham; Dr O A Okubadejo, Portsmouth; Dr M J Lewis, Nottingham; Dr G M Churcher, Plymouth.

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