PERTHES' DISEASE OF THE HIP IN THREE REGIONS OF ENGLAND

D. J. P. BARKER, E. DIXON, J. F. TAYLOR

From the Department of Community Medicine, University of Southampton

Throughout 1976 orthopaedic surgeons in three regions of England forwarded details of all new patients with Perthes' disease attending outpatient clinics or admitted as inpatients. The incidence in the Mersey region (11.1 per 100 000 children under fifteen years) was twice that in Wessex (5.5) with Trent having an intermediate incidence (7.6). The ratio of male to female incidence varied between the regions as did the age distribution of male cases. These findings point to the importance of environmental factors in the aetiology of the disease, and suggest the need for further epidemiological studies.

The study of the marked regional variations in the frequency of certain diseases in Great Britain has helped to explain factors in their aetiology. Perthes' disease has been thought to be more common in some parts of this country than in others. Table I shows the variation in the

overlapped standard regions shown to have high, average and low discharge rates. Our findings are discussed in this paper.

MATERIAL AND METHOD

Orthopaedic surgeons treating Perthes' disease in the three regions under survey were asked to notify us each month during 1976 of all children of fourteen years of age and under, newly diagnosed as having

Table 1. Hospital discharge rates for Perthes' disease expressed as standardised morbidity ratios. (Hospital In-patient Enquiry, 1968-70)

Region of residence	
Northern	153
Yorkshire and Humberside	102
North Western	95
West Midland	122
East Midland	190
East Anglia	61
Wales I (south)	57
Wales II (remainder)	173
South Western	55
South Eastern	80

discharge rates for patients with Perthes' disease in the standard regions of England and Wales as listed in the Hospital In-patient Enquiry of the Department of Health and Social Security from 1968 to 1970. These figures take no account of multiple admissions for the same condition nor do they include patients who received only outpatient care. They therefore do not give a wholly accurate picture of the number of patients with Perthes' disease.

In 1976 we carried out a survey in the three Health Regions of Trent, Mersey and Wessex (Fig. 1) which

Fig. 1

Incidence of Perthes' disease in 1976 per 100 000 children aged fourteen years and under.

D. J. P. Barker, M.D., Ph.D., M.R.C.P. } Department of Community Medicine, South Academic Block, Southampton General
E. Dixon, B.M. } Hospital, Southampton SO9 4XY, England.

J. F. Taylor, M.D., M.Ch., F.R.C.S., Alder Hey Children's Hospital, Eaton Road, West Derby, Liverpool L12 2AP, England.
Requests for reprints should be sent to Dr Barker.

Perthes' disease. In places from which patients were regularly referred to hospitals outside their region, either the consultants concerned were asked to co-operate in the survey or the population was excluded from the survey.

Before starting the investigation, each hospital concerned was visited and the appropriate medical secretaries were briefed so that they could assist the consultant in the collection of information.

Radiographs of the patients were collected and reviewed by two independent observers.

RESULTS

One hundred and eighty-four children newly diagnosed as having Perthes' disease were recorded during the survey: seventy-two came from Mersey, seventy-eight from Trent and thirty-four from Wessex. Copies of the radiographs of 153 patients were obtained. After review by the two independent observers, it was concluded that the radiographs of four patients did not meet their criteria for Perthes' disease. All four patients came from Mersey and were excluded from the analysis, leaving 180 patients available for study.

The main findings are summarised in Table II. The incidence of Perthes' disease per 100 000 children aged

Table II. Incidence of Perthes' disease in 1976 per 100 000 children aged fourteen years and under

Region of residence	Males	Females	Total
Mersey	16.9 (53)	5.0 (15)	11.1 (68)
Trent	12.0 (63)	3.0 (15)	7.6 (78)
Wessex	8.7 (28)	2.0 (6)	5.5 (34)
Total	12.4 (144)	3.3 (36)	8.0 (180)

Figures in brackets are numbers of patients

fourteen years and under was 11.1 in Mersey, 7.6 in Trent and 5.5 in Wessex. Within each region the incidence was higher among boys than among girls, with the overall ratio of male to female rates being 12.4 to 3.3. The ratio of male to female rates was 3.4:1 in Mersey, 4:1 in Trent and 4.4:1 in Wessex. Within each sex the regional ranking of incidence agreed with that of the total rates.

The breakdown of the results by Health Area within each region is shown in Table III. There is considerable variation in the area incidences. They range from 17.6 in Liverpool to 1.6 in Leicestershire. In Mersey the four areas Liverpool, St Helens and Knowsley, Sefton and Wirral form the metropolitan county, or conurbation, of Merseyside. Likewise, in Trent the four areas Barnsley, Doncaster, Sheffield and Rotherham form the South Yorkshire conurbation. Within the Mersey region the combined incidence for the conurbation is 12.1 per 100 000, which is greater than that of 9.0 in Cheshire, which lies outside the

conurbation. Within Trent the combined incidence for the conurbation is 9.9, which is greater than the incidence in three of the four areas outside the conurbation. There is overlap in the area rates inside and outside the South Yorkshire conurbation, for the rates in Derbyshire and Nottinghamshire are higher than those in Sheffield and Rotherham. However, the rates in Lincolnshire and Leicestershire are very low.

Fig. 2

Age distribution of boys with Perthes' disease.

In Wessex there is no conurbation. The rates in each of the four areas are all below the overall regional rates in Mersey and Trent. There were no cases recorded in the Isle of Wight, but this is a small area with only 20 000 children aged fourteen and under, and on the basis of the overall Wessex incidence would only have an average of one new case a year.

Figure 1 shows these results on a map. In Mersey, the region with the highest incidence, the rate in the conurbation (12.1) is higher than that in the conurbation within Trent (9.9). Outside the conurbations the gradient of incidence is maintained from Mersey (9.0) down to Trent (6.6) and Wessex (5.5).

The age distribution of the male patients by region is shown in Figure 2. Since the peak age of onset of the

Table III. Incidence of Perthes' disease in 1976 per 100 000 children aged fourteen years and under

Region	Conurbation	Health area	Number of patients	Incidence
Mersey	Merseyside	Liverpool	22	17.6
		St Helens and Knowsley	12	11.1
		Sefton	8	10.8
		Wirral	6	7.1
		Cheshire	20	9.0
Trent	South Yorkshire	Barnsley	9	16.3
		Doncaster	8	11.2
		Sheffield	10	8.1
		Rotherham	4	6.3
		Nottinghamshire	24	10.1
		Derbyshire	17	9.5
		Lincolnshire	3	2.8
		Leicestershire	3	1.6
Wessex		Hampshire	22	7.1
		Dorset	5	4.4
		Wiltshire	7	4.1
		Isle of Wight	—	—

disease is earlier in girls than in boys, and since the proportion of male to female patients varies from region to region (Table II), the figure excludes the thirty-six female patients and therefore refers to 144 males. Numbers of patients rather than age-specific incidence rates are shown since population data for the regions for each year of age are not available. In Wessex, with the lowest incidence, the peak of the age distribution occurs at six to seven years whereas in Mersey, with the highest incidence, the peak is earlier at five years. Trent is intermediate in having a sustained peak from five to seven years of age.

DISCUSSION

In this study a twofold difference has been found between the reported incidence of Perthes' disease in Mersey and Wessex, with Trent having an intermediate incidence. A review of the radiographs of the patients shows that this regional variation cannot be accounted for by differences in the radiological criteria used to diagnose the disease.

The findings of higher rates in the conurbations is open to the interpretation that patients living at some distance from hospital centres are less likely to be referred there for specialist treatment; but general practitioners are unlikely to treat a child with a persistent unexplained limp without a specialist opinion. Parents in rural areas may be less inclined to consult their general practitioners about minor symptoms but will not usually ignore a persistent painful limp.

It is therefore concluded that the regional pattern of Perthes' disease found in this survey results from variations in overall incidence. The annual incidence of 5.5 in Wessex is similar to those of 5.7 recorded in Massachusetts (Molloy and MacMahon 1966) and 5.1 recorded in British Columbia (Gray, Lowry and Renwick 1972). These are the only two reported investigations which are directly comparable with the present survey. However, the incidences of 11.1 in Mersey and 7.6 in Trent are considerably greater and suggest that the overall incidence of the disease may be

higher in Britain than in Canada or the United States. The sex ratio of incidence of 4.4 to 1 in Wessex is comparable to that of around 5 to 1 recorded in the Canadian and American surveys but the ratio of 3.4 to 1 in Mersey is low.

Perthes' disease has been regarded as a genetically determined disorder. The finding of a marked regional variation in incidence indicates that environmental influences may have a dominant role in the aetiology of the disease. This accords with recent evidence from family studies which suggests that genetic factors are of secondary importance (Wynne-Davies and Gormley 1978).

This study has characterised the environmental influences as being associated with conurbations, although this association cannot be the sole explanation of the regional variations which also occur outside the conurbations (Fig. 1). The nature of these influences requires further investigation and one method of doing this is by detailed comparison of the socioeconomic characteristics of the patients and of a group of controls. A study of this kind is planned. It might also be useful to expand this survey of three regions into a national study encompassing all regions.

There is some evidence that the disease may be the late manifestation of a congenital disorder. Recent anthropometric studies have demonstrated that patients with the disease show delayed bone maturation which affects the entire skeleton, but especially the pelvis and lower limbs (Burwell *et al.* 1978). This delayed maturation may be due to impaired development during embryonic life. Further support for the prenatal origin of the disease comes from the increased frequency of minor congenital abnormalities shown by patients (Hall and Harrison 1978).

Current evidence therefore suggests that epidemiological investigations into Perthes' disease should be directed towards identifying prenatal influences that are associated with urban areas and have a higher frequency in the north-west of England than in the south.

We are most grateful to the orthopaedic surgeons and their secretaries who completed monthly returns on their patients and made the radiographs available to us. Professor R. G. Burwell, Dr P. H. Dangerfield and Mr A. Pyne gave invaluable advice and assistance in the survey. Dr B. T. Williams kindly supplied hospital discharge data for Trent. The study was supported by grants from the Mersey Regional Health Authority and the Department of Health and Social Security.

REFERENCES

- Burwell, R. G., Dangerfield, P. H., Hall, D. J., Vernon, C. L., and Harrison, M. H. M. (1978) Perthes' disease. An anthropometric study revealing impaired and disproportionate growth. *Journal of Bone and Joint Surgery* **60-B**, 461-477.
- Gray, I. M., Lowry, R. B., and Renwick, D. H. G. (1972) Incidence and genetics of Legg-Perthes disease (osteochondritis deformans) in British Columbia: evidence of polygenic determination. *Journal of Medical Genetics*, **9**, 197-202.
- Hall, D. J., and Harrison, M. H. M. (1978) An association between congenital abnormalities and Perthes' disease of the hip. *Journal of Bone and Joint Surgery*, **60-B**, 138.
- Molloy, M. K., and MacMahon, B. (1966) Incidence of Legg-Perthes disease (osteochondritis deformans). *New England Journal of Medicine*, **275**, 988-990.
- Wynne-Davies, R., and Gormley, J. (1978) The aetiology of Perthes' disease: genetic, epidemiological and growth factors in 310 Edinburgh and Glasgow patients. *Journal of Bone and Joint Surgery*, **60-B**, 6-14.