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Age–sex incidence in symptomatic allergies: an excess of females in the child-bearing years

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SUMMARY

Eight-hundred and one patients amongst 1912 referred for skin testing because of suspected allergies were found suffering from asthma due to the house-dust mite or from grass pollenosis. They were analysed in terms of sex, age of referral and age of onset of symptoms. Amongst children referred below the age of 10 with house-dust mite asthma the ratio of males to females was 3:1; with grass pollenosis 2·1:1, as expected. The sex ratio gradually became reversed with increasing age of referral, females overtaking males in the third decade. Female–male ratios increased to a mean of 1·8:1 in the fourth and fifth decades. Reliable ages of onset of symptoms were obtained in 388 males and 323 females. Of these, 280 males and 162 females experienced their first symptoms before the age of 10 whereas 96 males and 148 females first developed symptoms between 10 and 29 years of age. The remaining 12 males and 13 females showed their first symptoms after the age of 29.

INTRODUCTION

Beverley, Fleck, Kwantes & Ludlam (1976) discussed numerous diseases in which young males are affected more often than young females, numerous others in which adult females are affected more often than adult males, and showed ratio reversals from males to females with increasing age of incidence of toxoplasmic lymphadenopathy. They disclaimed a comprehensive list and did not include reaginic allergy in their survey. In asthma, an excess of boys over girls of two or three to one has been demonstrated (Morrison Smith, 1961; Dawson, Horobin, Illsley & Mitchell, 1969; Morrison Smith, Harding & Cumming, 1971). The purpose of this paper is to show that in asthma or bronchospasm due to the house-dust mite, and in grass pollenosis, the ratio is also reversed with increasing age from an excess of males to an excess of females.

MATERIALS AND METHODS

The observations were made from analysis of records of new patients referred for routine skin testing in the 6 years 1970–5. These came from consultants and practitioners from Salisbury, South Wilts. and contiguous parts of Dorset and Hants., an approximate population of 200000. Prick tests were done with standard extracts, controlling the patients' reactions with a standard histamine solution and recording weals after 10 min. Weal diameters of more than 3 mm were re-

corded as positive; lesser reactions are excluded. Extracts of *Dermatophagoides farinae* were used throughout the six years and in addition an extract of *D. pteronyssinus* from June 1975. The slightly increased number of positive mite results in these last 6 months is not of significance because the analysis depends on male/female ratios. A total of 1912 new patients, 934 males and 978 females, were skin tested. All were tested with mite extract and with grass mix. Numbers of tests on each patient varied from 5 to 35 according to indication.

RESULTS

In Table 1, analysed by age of referral, the first group comprises 235 males and 176 females with non-seasonal asthma or bronchospasm yielding positive prick tests with mite extracts. Males exceed females by 3:1 in the first decade, reversing in the third decade and showing an excess of females in the fourth and fifth decades of 1·5:1 and 1·6:1 respectively. The variation in age–sex ratios is described by a linear increase in the proportion of females up to the age of 50 ($P \ll 0{\cdot}001$). The second group, with seasonal grass pollenosis and positive prick tests with grass mix, includes 197 males and 193 females, the corresponding ratios being male–female 2·1:1 in the first decade, reversing in the third decade, and female–male 2·2:1 and 1·9:1 in the fourth and fifth decades respectively ($P \ll 0{\cdot}001$).

One-third of the patients with mite allergy and with grass pollenosis gave skin reactions and clinical evidence to both, as is usual. Each patient in Table 1 was allotted to one or other category by assessment of weal size and history. Because of the closely similar age–sex patterns and in order to obtain sufficient numbers these two sets of patients are combined in Table 2. Nearly all of them gave a reliable history of age at onset of symptoms; those who did not are excluded.

In the group of patients with onset in the first decade the proportion of females increases with increased age of referral from 1:2·6 under 10 to 1:1 in the years 30–49 ($P < 0{\cdot}005$). In the group with onset in the second decade the same continuous increase occurs in the proportion of females from an excess of 1·2:1 in the 10–19 group to 3:1 in the years of referral 30–49 ($P < 0{\cdot}05$). The excess of females is also evident in those with onset in the third decade but only if onset of symptoms was more than 10 years before referral.

Thus there are 280 males and 162 females (ratio 1·63:1) with onset under 10 years of age and 96 males and 148 females (ratio 1:1·54) with onset in the decades 10–29 ($P \ll 0{\cdot}001$).

DISCUSSION

It is clear from Table 2 that young adult females were referred more often than males with recent onset of mite allergy or grass pollenosis over a quite short age range. As females became older their symptoms persisted longer or were reactivated more often than in males the further back in time the original onset had occurred. The prevalence of positive skin reactions with mite extract and grass mix in normal schoolchildren between 8 and 14 years of age was shown to be the same in both sexes (Godfrey & Griffiths, 1976). The prevalence of toxoplasmal infection as

Table 1. *Analysis by age and sex at referral*

	< 10			10–19			20–29			30–39			40–49			50 or more			
	M	F	M/F ratio	M	F	M/F ratio	M	F	M/F ratio	M	F	M/F ratio	M	F	M/F ratio	M	F	M/F ratio	Totals
Non-seasonal asthma or bronchospasm – house-dust mite	63	21	*3:1*	89	57	*1·6:1*	36	38	*1:1·1*	17	26	*1:1·5*	15	24	*1:1·6*	15	10	*1·5:1*	M 235 F 176
Seasonal grass pollenosis	36	17	*2·1:1*	96	77	*1·2:1*	36	40	*1:1·1*	16	35	*1:2·2*	9	17	*1:1·9*	4	7	*1:1·7*	M 197 F 193

Table 2. *Age of onset of symptoms compared with age of referral in patients with mite asthma and grass pollenosis*

	< 10			10–19			20–29			30–39			40–49			50 or more		
	M	F	M/F ratio	M	F	M/F ratio	M	F	M/F ratio	M	F	M/F ratio	M	F	M/F ratio	M	F	M/F ratio
Age groups of patients on referral	99	38	*2·6:1*	185	134	*1·4:1*	72	78	*1:1·1*	33	61	*1:1·8*	24	41	*1:1·7*	19	17	*1·1:1*
Onset of symptoms in above patients										M	F	R						
< 10	99	38	*2·6:1*	131	78	*1·7:1*	32	28	*1·1:1*	18	18	*1:1*						
10–19				39	48	*1:1·2*	17	34	*1:2*	7	21	*1:3*						
20–29							16	13	*1·2:1*	17	32	*1:1·9*						
30–49										12	13	*1:1·1*						

Only patients with a reliable history of onset of symptoms are recorded for the second to fifth decades.

judged by serological surveys was also the same in both sexes (Beverley *et al.* 1976, who commented on the known tendency for women to be more prone to immunologically mediated disease than men, possibly due to modifications in immune processes during the child-bearing age). The sex differences in each case were only in prevalence of clinical disease.

Positive skin tests with common allergens particularly *Dermatophagoides* and Timothy grass pollen, develop in reaginic children very early in life (Soothill *et al.* 1976). Incidence of onset of asthma, and also male excess, is greatest in the first year of life, both diminishing progressively to equality with females by the age of 12 (Morrison Smith, 1973). Therefore it also seems likely that more of the pool of females than males congenitally at risk from developing reaginic disease remain to suffer from their first symptoms in adolescent and early adult life.

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REFERENCES

BEVERLEY, J. K. A., FLECK, D. G., KWANTES, W. & LUDLAM, G. B. (1976). Age–sex distribution of various diseases with particular reference to toxoplasmic lymphadenopathy. *Journal of Hygiene* **76**, 215.

DAWSON, B., HOROBIN, G., ILLSLEY, R. & MITCHELL, R. (1969). A survey of childhood asthma in Aberdeen. *Lancet* i, 827.

GODFREY, R. C. & GRIFFITHS, M. (1976). The prevalence of immediate positive skin tests to *Dermatophagoides pteronyssinus* and grass pollen in schoolchildren. *Clinical Allergy* **6**, 79.

MORRISON SMITH, J. (1961). Prevalence and natural history of asthma in schoolchildren. *British Medical Journal* i, 711.

MORRISON SMITH, J. (1973). Skin tests and atopic allergy in children. *Clinical Allergy* **2**, 109.

MORRISON SMITH, J., HARDING, L. K. & CUMMING, G. (1971). The changing prevalence of asthma in schoolchildren. *Clinical Allergy* **1**, 57.

SOOTHILL, J. F., STOKES, C. R., TURNER, M. W., NORMAN, A. P. & TAYLOR, B. (1976). Predisposing factors and the development of reaginic allergy in infancy. *Clinical Allergy* **6**, 305.