

Early-onset hay fever in Israeli children

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Summary

In order to investigate the influence of climate and vegetation on the age of onset and clinical picture of hay fever (HF), we examined 116 children with typical HF living in a single climatic area; fifty-four were from rural farming settlements and sixty-two from towns and cities. Overall age of onset was low; 72% of rural children developed HF between the ages of 2 years and 4 years compared to only 24% of urban children ($P < 0.005$). At the same time, 57% of rural children had positive skin tests to more than three pollen extracts out of nineteen allergens tested, compared to 19% of urban children ($P < 0.005$). There were no significant differences between the rural and urban groups with regard to the incidence of asthma as part of their HF, nor were there differences in total IgE levels. The results of this study suggest that Israeli children develop hay fever earlier than generally reported in the literature, and that this is most marked in the rural areas. This can be explained by their specific environment, which consists of a basically dry, desert-like climate where lawns, crops and trees are extensively irrigated, leading to the dissemination into the environment of large amounts of pollen grains, which are not washed away because of the lack of rain.

Introduction

Since prevention of allergic diseases is a primary aim of allergists world-wide, it is important for us to try to understand some of the environmental factors that give rise to, or influence, the natural history of the symptomatic allergic diseases. Because we have been impressed by the unusually early age of onset of hay fever (HF) symptoms in our patients, we undertook to evaluate our paediatric material by comparing two groups of children—those living in rural, farming communities *vs* those living in towns and cities (urban communities).

It has been generally accepted that HF is uncommon before the age of 4–5 years [1]. In Israel, the rural farming communities organized into co-operative villages (kibbutzim and moshavim) enjoy the same high standard of medical care as the urban communities and all are in close proximity to specialized clinics. In Southern Israel,

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(served by the Kaplan Hospital), the rural and urban populations are exposed to the same general climatic conditions, which is invariably 8 dry months with only 4 months of rainfall (December to March). Some 50 years ago the area was desert but over the last 4 decades, with the aid of extensive irrigation, an extremely rich vegetation evolved, which includes orchards, field crops and artificially-irrigated lawns. These lawns and flower gardens are to be found in all the rural communities and, following grass pollination in the spring, pollen grains tend to stick to the grass until late autumn when they are washed away by the first rains. From the first weeks of life children spend most of their days outdoors, especially in the farming communities, where playing on the lawns and resting in the shades of trees take up a large part of daily activities. As a result of this way of life, their exposure to pollen grains is much more extensive than that of urban children who spend their leisure hours indoors. We were interested in evaluating whether, and how, this extensive exposure to pollens from the age of a few weeks would influence the development, clinical picture and course of HF in these children.

Patients and methods

The referral system to specialized hospital clinics is identical throughout the country in that the general practitioner or paediatrician will refer a patient based on clinical judgement. All patients arrive at our allergy clinic with a detailed medical report from the attending physician. At the clinic, a detailed history is taken from each patient, a complete physical examination performed, stools examined for parasites, blood counts taken and blood IgE levels determined by an enzyme-linked immuno-sorbent assay (ELISA) technique. Skin tests were administered by the method of Pepys [2] with extracts of nineteen allergens commonly found in Israel. The following extracts were used for skin testing (in 50% glycerin): bermuda, *Dactylis*, *Lolium*, *Poa*, wheat, *Artemisia vulgaris*, *Olea europa*, *Agrostis*, rye grass, *Cupressus arizona* (all at 1:20 dilution). Dust mite (at 1:50 dilution), *Alternaria*, *Mucor*, *Aspergillus* (mixture), *Penicillium*, dog hair, sheep wool, cat hair (all at 1:10 dilution), and histamine control (1/1000). The extracts were purchased from Hollister-Stier Laboratories (Spokane, Washington, U.S.A.); a reaction was considered positive if the weal was greater than 5 × 5 mm and a flare developed; appropriate positive (histamine) and negative (saline) controls were used.

The patients ranged in age from 2 to 15 years; seventy-seven were males and thirty-nine females. Sixty-two lived in towns and fifty-four in rural settlements. For normal IgE values, local reference tables of age-matched, normal Israeli children were used [3]. Statistical analysis was performed using chi-square tables (Yates' correction was employed).

Results

The overall age of onset of HF symptoms was low, and as can be seen from Fig. 1, they appeared significantly earlier in those children brought up in a rural area ($P < 0.005$). The number of children having symptoms both in spring and in summer was greater in the rural areas than the number with spring symptoms only, whereas in the urban areas the numbers were almost equal. However, statistical significance between the two groups was not established.

The number of children suffering from asthmatic symptoms as part of their HF picture (70%) was greater than expected, but the difference between the two groups was not significant (Table 1). Seventy-one patients (61%) had IgE blood levels higher

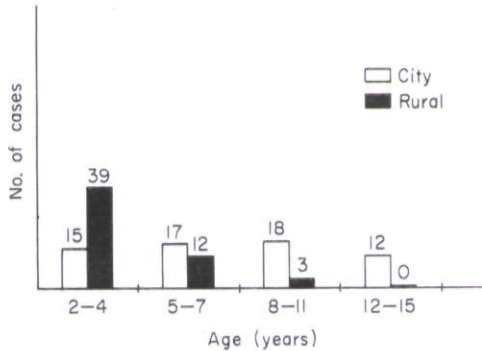


Fig. 1. Comparison between age of onset of hay fever in rural and urban children.

Table 1. Clinical picture of hay fever in Israeli children

		Age of onset (years)				Asthma	Total IgE(μ /ml) > Mean $\pm$ 2 s.d.	Positive skin tests to > 3 pollens
	n	2-4(%)	5-7(%)	8-11(%)	12-15(%)	n (%)	n (%)	n (%)
Urban	62	15(25)	17(27)	18(29)	12(19)	41(66)	35(56)	12(19)
Rural	54	39(72)	12(22)	3(6)	0	41(76)	36(67)	31(57)
Total	116	54(47)	29(25)	21(18)	12(10)	82(71)	71(61)	43(37)
Chi-Square:		33.8				0.9	0.3	16.3
P value:		$P < 0.005$				n.s.	n.s.	$P < 0.005$

n = number of cases, n.s. = non-significant.

than the geometrical mean $\pm$ 2 s.d. of age-matched normal children. There was no statistically significant difference between IgE levels of country and town children. However, there was a markedly significant statistical difference ($P < 0.005$) between the number of children in the two groups having positive skin tests to more than three out of ten pollen extracts (57% rural *vs* 19% urban children). Stools for parasites were negative in all cases.

Discussion

Many of the epidemiological surveys dealing with the incidence of HF do not refer to children under 10 years of age [4-10]. However, there are a few reports in which HF in the very young is mentioned, such as that of Kuzemko [11] from Peterborough in England, who found that the onset of HF in 28% of his patients occurred before the age of 4 years. Broder and colleagues [12,13], reporting a total community study from Tecumseh in Michigan, U.S.A., found that the lowest prevalences and cumulative prevalences for HF were found within 0-4 years of age. A more recent review article concluded that under the age of 5 years, allergens play a minimal role in the development of asthma [14]. In Israel, no epidemiological studies of this kind have been made until now. The overall incidence of HF in the whole population is roughly 5% and in the rural population (adults and children) about 7%, according to recent data collected by us [15].

In the present study, we found that 72% of rural children with HF had their first symptoms (including asthma) between 2 years and 4 years of age. This finding is at variance with the data in the literature, and is probably the results of the special local environmental conditions and way of life, namely prolonged exposure to pollen inhalation from an early age. Analysing the differences between children from rural and urban homes, it appears that some parameters, which may be genetically determined, such as IgE levels and bronchial hyperreactivity (as expressed by the development of asthma) are not influenced much by the environment, whereas other parameters such as the age of onset of HF symptoms and multiple positivity of skin tests are significantly influenced by it. Our findings confirm the work of Bjorksten *et al.*, [16] who demonstrated that early exposure to pollens influences the development of allergy in childhood.

We conclude that the clinical picture of HF in children, particularly the age of onset of symptoms and number of positive skin tests, is strongly influenced by the amount and duration of their exposure to pollen inhalations. This finding contributes to our understanding of the disease, and should guide our attempts to prevent or delay the onset of HF in children, particularly those coming from atopic families living in rural farming areas.

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