

Analysis of factors influencing sensitization of Japanese cedar pollen in asymptomatic subjects

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ABSTRACT

Objective: Japanese cedar pollinosis is increasing rapidly in Japan. Although analysis has been made concerning the factors influencing the development of the cedar pollinosis, analysis concerning the risk factors influencing the sensitization in asymptomatic subjects has not been done.

Methods: Risk factors for sensitization to Japanese cedar pollen were analyzed among 73 subjects (32 men and 41 women) who do not develop symptoms of pollinosis at the time of Japanese cedar pollen scattering. Their ages ranged from 18 to 60 years with the mean of 34.1 years. Possible factors influencing sensitization were investigated through a written questionnaire and doctors' questioning. Japanese cedar-specific IgE titers and *Dermatophagoides pteronyssinus*-specific IgE titers in the serum were measured by CAP-FEIA (fluorescent enzyme immunoassay).

Results: Of the 73 subjects, 26 were sensitized to the Japanese cedar pollen, for a 36% sensitization rate. Among the eleven factors examined, only one factor was shown to significantly influence the sensitization rate to Japanese cedar pollen. It was sensitization to house dust mites (56.5% vs. 26.0% χ^2 value = 6.27, $p = 0.012$). The sensitization rate to the pollen did not correlate to the presence of other allergic diseases, history of rhinosinusitis, family history of Japanese cedar pollinosis, food preference, presence or absence of cedar trees in the surroundings, present living circumstances, childhood circumstances, age, sex, or smoking habits. We calculated odds ratios in order to estimate how much those factors influence the sensitization to Japanese cedar pollen. Significantly high odds ratio for sensitization to house dust mite (6.63; 95% confidence interval (CI): 1.76–32.2) was found.

Conclusion: The present study indicates that sensitization to the pollen in the subjects without pollinosis is influenced by sensitization to house dust mite.

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1. Introduction

Japanese cedar pollinosis was first described by Saito [1] in 1964. Since then, the prevalence of pollinosis has been increasing. The prevalence of seasonal allergic rhinitis has increased over the past 10 years due to increased pollen exposure [2]. Sakashita et al. [3] found that the prevalence of allergic rhinitis in adults between 20 and 49 years of age has increased by nearly 10% during the last 10 years. The prevalence rate of pollinosis is 26.5% among Japanese people [4].

It has been reported that genetic factors [5–7], young age [2], fish intake [8], family history of pollinosis [3], and residence along a main street [3] influence the development of Japanese cedar pollinosis.

For people to develop pollinosis, they need to be sensitized. However, it is not clearly known what factors are influencing the sensitization to Japanese cedar pollen in patients without pollinosis. To decrease the prevalence of Japanese cedar pollinosis, it is very important to analyze what factors are playing roles in the sensitization in asymptomatic subjects. The purpose of this study is to elucidate the factors influencing the sensitization to Japanese cedar pollen.

2. Materials and methods

2.1. Study subjects

The subjects were 73 people (32 men and 41 women) who do not develop symptoms of pollinosis at the time of Japanese cedar pollen scattering. Those who have perennial allergic symptoms were not included in the subjects. Their ages ranged from 18 to 60 years with a mean age of 34.1 years. The age distribution is shown

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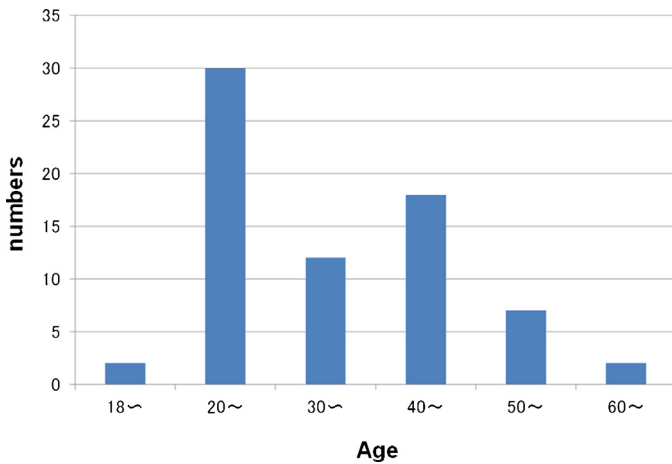


Fig. 1. Age distribution of the subjects examined.

in Fig. 1. In order to recruit subjects for the present study, we mounted posters and utilized Internet. We did not recruited subjects from patients in our outpatient clinic. Written informed consent was obtained from the subjects before their participation in the study. This study was approved by Mie University School of Medicine Ethical Committee (No. 2282).

2.2. Questionnaire

The following items were investigated by a written questionnaire and doctors' questioning.

- Past history of rhinosinusitis.
- Presence of other allergic diseases (allergic conjunctivitis, urticaria, drug allergy, food allergy, atopic dermatitis, bronchial asthma): information of the past history alone of other allergic diseases was not included.
- Family history of Japanese cedar pollinosis (siblings, parents, grandparents, children): presence of Japanese cedar pollinosis was defined as development of typical symptoms of nose and eyes at the time of cedar pollen scattering.
- Smoking habit: ex-smoking was not included.
- Food preference (whether they prefer meat or fish).
- Environment of the present residence (urban or rural).
- Environment of their childhood (urban or rural).

2.3. Laboratory analysis

Japanese cedar-specific IgE titers and *Dermatophagoides pteronyssinus*-specific IgE titers in the serum were measured by CAP-FEIA (fluorescent enzyme immunoassay). We examined the two IgE titers because cedar pollen and mites were the predominant allergen sources among seven aeroallergens in the Japanese population [3]. Sensitization was defined as serum allergen specific IgE titers with 0.70 UA/mL and over (IgE CAP score ≥ 2).

2.4. Statistical analysis

A chi-square test was used to compare sensitization rates to Japanese cedar pollen according to each factors examined in univariate analysis. The outcome variable of this study was sensitization to cedar pollen. Multivariate regression logistic test was used to assess putative relationship between the factors of interest and sensitization to cedar pollen. The factors of interest were sensitization to house dust mite, presence of other allergic diseases, age (less than 40 years vs. 40 years and over), family

history of cedar pollinosis, history of rhinosinusitis, smoking habit, preference of eating (meat vs. fish), environment lived in childhood (in urban vs. in rural), environment currently living (in urban vs. in rural), exposure to cedar pollen (being surrounded by many cedar trees vs. none), and sex (female vs. male). The magnitude of the relation between these factors and sensitization to cedar pollen was expressed by odds ratios with 95% confidence intervals. To compare the means of Japanese cedar-specific IgE titers and scores between subjects sensitized to house dust mite, Student's *t*-test and Mann–Whitney's *U*-test were used respectively. Statistical significance was defined as $P < 0.05$. All statistical analyses were performed with JMP version 5.1.1 (SAS Institute Inc., USA).

2.5. Determination of sample size

Prevalence of sensitization to house dust mite was defined as primary factor of interest. According to previous surveys assessed sensitization rate to various airborne antigens in certain populations in Japan, prevalence of sensitization to house dust mite in subjects who were not sensitized to Japanese cedar pollen ('controls') was estimated at about 20%. In this study, whether a subject was sensitized to cedar pollen could not be identified until titer of cedar pollen-specific IgE was measured. We assumed the ratio of subjects not sensitized ('controls') to subjects sensitized to cedar pollen ('cases') to be 2. We also assumed prevalence of sensitization to house dust mite in subjects not sensitized to cedar pollen ('controls') to be 20% and odds ratio of 4 for prevalence of sensitization to house dust mite in subjects sensitized to cedar pollen ('cases'). According to these assumptions, we calculated the sample size with 80% power of obtaining a significant difference at the 5% significance level. Required numbers of subjects sensitized to cedar pollen ('cases') and subjects not sensitized ('control') were 26 and 56, respectively. However, despite of maximum effort, a total of 73 subjects finally participated in this study.

3. Results

Of the 73 subjects, 26 were sensitized to Japanese cedar pollen (Fig. 2). The sensitization rate was 36%. The IgE titers in response to Japanese cedar pollen ranged from 0.34 to 84.7 UA/mL and the scores ranged from 0 to 5 (Fig. 2). The mean IgE score of this population was 1.12 and that of the sensitized subjects was 2.8.

Among the eleven factors examined, only one factor was shown to significantly influence the sensitization rate to Japanese cedar pollen. It was sensitization to house dust mites (Table 1).

The subjects who were sensitized to house dust mites had significantly higher sensitization to the Japanese cedar pollen than

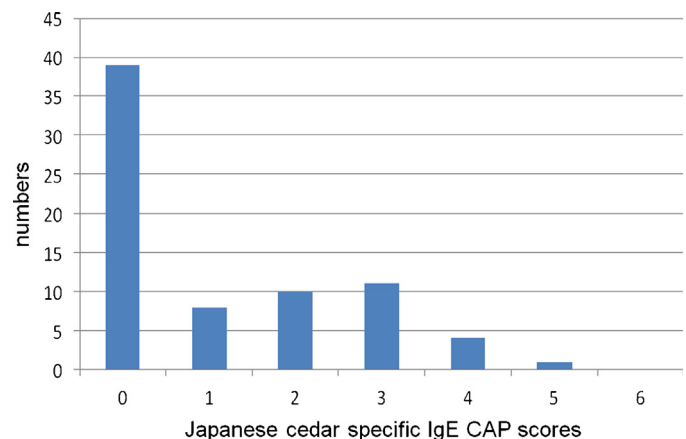


Fig. 2. Distribution of Japanese cedar-specific IgE CAP scores.

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