
Epidemiology of Japanese cedar pollinosis throughout Japan

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Background: Japanese cedar pollinosis (JCP) is a common disease posing a major public health problem in Japan. For health care policy planning and development of new treatment modalities, investigation of the accurate prevalence and current status of JCP nationwide is imperative.

Objective: To ascertain the prevalence and the current status of JCP in Japan with use of a cross-sectional random sampling method.

Methods: In a nationwide survey conducted shortly after the peak pollen season, self-evaluation questionnaire were mailed to 10,920 subjects from 390 of 3,370 places in 12 regions in Japan.

Results: The response rate was 53.7%, and the usable response rate was 51.5%. The age-adjusted prevalence was 19.4%; the estimated prevalence was 13.1% after adjustment for misdiagnosis, incorrect answers, response rate, and case mix. JCP was most prevalent in the Kanto, Tokai, and Kinki areas and in working adults rather than in children or subjects ages 60 to 79 years. Total pollen count during the pollen season correlated well with the prevalence of JCP in individual regions. In subjects with JCP, nasal symptom were more severe than eye symptoms, 62.5% had severe or moderate interference with daily activities and consulted physicians, 54.1% took prescribed drugs, and 82% used some method to avoid pollen.

Conclusions: The age-adjusted prevalence of JCP was 19.4% of the Japanese population, and estimated prevalence after correction of possible biases was 13.1%. Prescribed drugs treated approximately 60% of subjects with JCP, and 80% of subjects tried self-care by avoiding pollen.

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INTRODUCTION

Japanese cedar pollinosis (JCP) is a common allergic disease in Japan caused by inhalation of the pollen of the Japanese cedar (*Cryptomeria japonica*). The disease is a major public health problem in Japan because of its severe symptoms, high prevalence, poor spontaneous recovery rate, and expense in controlling the disease.

According to available literature, the prevalence of JCP varies from 3% to 30% in individual nonrandomized populations in schools, factories, and local communities.^{1–5} Most of the variation stems from differences in populations in local districts surveyed; the age, sex and lifestyle of subjects examined; different diagnostic criteria and testing methods used; and the season and time of the investigation. Therefore, the accurate prevalence of JCP in Japan has not been fully elucidated.^{2,6}

In addition to ignorance surrounding the true prevalence of JCP in the entire country of Japan, it remains unclear how the condition of management as well as associated morbidity vary across the country. A clearer understanding of the relationship among pollen counts and disease prevalence, variation in severity, limitations on activities of daily living, and efficacy of current treatment and prevention strategies is needed for planning of health care policy and developing new treatment modalities and drugs.

The purpose of this study is to determine the epidemiologic prevalence of JCP in Japan and its current status with use of a cross-sectional random sampling method. This study will also provide information on methodical problems encountered during performance of a large-scale population analysis for pollinosis.

METHODS

For analysis, Japan was divided into 12 regional zones (Hokkaido, Tohoku, North Kanto, South Kanto, Tokai, Koshinetsu, Hokuriku, Kinki, Shikoku, Chugoku, Kyushu, and Okinawa). Of the 12 zones, Hokkaido and Okinawa were considered control areas because of a low airborne JCP pollen count (Hokkaido) or no detection of JCP pollen (Okinawa) in these areas.^{7,8} Natural cedar trees exist sporadically on the main island of Japan but not in these areas since ancient time. For house building after the Second World War, the Japanese government planted trees throughout the country except in these areas, leading to production of large amounts of airborne pollen.

Two-step stratified random samplings were performed in individual zones. First, 390 of 3,370 places from cities, towns, and villages in Japan were randomly selected by the probability proportional sampling method in proportion to the overall population with respect to age (3 to 79 years) and sex on the basis of the National Census Report in 1995. As the second step, 2 subjects in each of the 7 age and sex groups (14 subjects in total for each factor) were sampled randomly from the resident registration lists of the aforementioned 390 places, and a list of 10,920 subjects in total was generated for

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this study. The sampling from the registration lists was conducted after official permission had been obtained from the relevant authorities, such as mayors of cities and towns or chiefs of villages and wards in each area, by application in due course. After discussion with consultant epidemiologists (mentioned in the Acknowledgments), institutional review board permission was considered unnecessary because this study was thought to have no ethical problems.

QUESTIONNAIRES

Self-evaluation questionnaires were mailed to all 10,920 subjects between April 20 and May 2, 2001, with a letter stating the purpose of the survey, a return envelope, an educational booklet, and a reward (postage stamps). For protection of the responders' privacy, names and addresses were not requested on the questionnaire; however, to document the response, we included a postcard, which was used to indicate which individuals had responded to the questionnaire. Further questionnaires were sent to nonresponders at 2 and 8 weeks after the initial mailing if required.

The questionnaire (in the Appendix) consisted of a total of 12 questions asking about symptoms (runny nose, sneezing, stuffy nose, and eye itching), their severity, changes after treatment (severe to mild or none), occurrence during each year, seasonal variability, frequency of JCP in family, visits to a physician and clinical diagnosis, type of drug used and its efficacy, degree of interference with daily activities, methods used to avoid pollen, and the average duration of daily outdoor activities. Details of age and sex were also requested. The subjects were requested to complete the questionnaires by themselves except in the case of children. The questionnaire contained simple questions that could be answered in approximately 5 minutes. A separate pilot study had determined how accessible the questionnaire was, asking whether the questions were easily understandable and whether the subjects had answered correctly. This pilot found that 83% of 240 adults thought the questionnaire was accessible and easy to understand, and they had answered questions correctly. In

an evaluation of 12 subjects, the test-retest reliability at an interval of 2 weeks was between 90% and 100%, depending on the question asked.

Diagnostic Criteria for JCP

In the questionnaire-based diagnosis of JCP, definite JCP was diagnosed in subjects reporting 2 or more severe symptoms from a total of 3 nasal and 1 eye symptom, with recurrence during February through April for 2 or more years, or with aggravation during this time if subjects had perennial symptoms. Also included as patients with JCP were those whose symptoms had decreased to "mild" or "no symptoms" after treatment, and those whose symptoms occurred for the first time during this year (Table 1). Suspected JCP was diagnosed in subjects who had 2 or more severe symptoms during the pollen season but occasionally had recurrences throughout the year and those who had recurrence during the pollen season but in whom the symptoms were mild before treatment. In a separate preliminary study on validity at the author's outpatient clinic, the cases of questionnaire-based JCP were compared with 125 matched subjects who had established clinical diagnosis of JCP on the basis of serum specific IgE and tests for nasal eosinophilia. The questionnaire-based diagnosis had a sensitivity of 0.72 and specificity of 0.84 with a positive predictive value of 0.91 in comparison to clinical diagnosis.

Estimation of the Prevalence and Statistical Analysis

For estimation of prevalence, the ratio of the number of questionnaire-diagnosed JCP cases to the total number of completed questionnaires in each group based on regional zone and sex and age group was corrected by the inverse sampling fraction method (the ratio of total population from 3 to 79 years of age to usable response per 1,000 subjects) because of possible unequal sampling rate.⁹ The age-adjusted prevalence (estimated prevalence and standardized prevalence ratio) was also calculated by direct and indirect methods.

Because of the low response rate (in Results), minimum prevalence was estimated based on an assumption that some

Table 1. Criteria for Questionnaire-Based Japanese Cedar Pollinosis

Diagnosis	Symptoms*	Treatment effect	Recurrence	Pollen season
Definite pollinosis	2 or more severe		Every year/for the first time this year†	February to April alone/exacerbation‡
Suspected pollinosis	2 or more mild	Severe reduced to mild	None	
	2 or more severe			
	1 severe			
	2 or more severe	None	Every year/for the first time this year	
	1 mild	Indefinite Severe reduced to mild Severe to mild		

* Symptoms: runny nose, sneezing, stuffy nose, and eye itching.

† For the first time this year denotes that the onset of the symptom occurred this year and that no symptoms had been noted during previous year.

‡ Exacerbation denotes worsened symptoms in subjects with perennial symptoms.

nonresponders did not have JCP. The crude prevalence, based on the assumption that the prevalence in nonresponders was the same as that in responders, was also calculated. In addition, the prevalence at a 100% response rate was estimated by the regression analysis; responses from initial nonresponders were collected by repeated mailings from nonresponders and the prevalence was calculated after each mailing.

In statistical analysis of differences between JCP prevalence in the various groups, the Mantel-Haenszel extended test was used, with a significance level set at 0.05. In addition, 95% confidence intervals were also calculated. WS 21 Tokyo, a market research company in Tokyo, Japan, conducted the mailing of the questionnaires, collated the data, and performed a computer-based analysis with guidance from the author.

RESULTS

Because of errors in mailing lists, 54 questionnaires were returned to the sender; thus, 10,866 of 10,920 questionnaires were distributed. The responses were as follows: 3,528 responses after the first mailing, 1,430 after the first reminder, and 878 after the second reminder, with 5,836 (53.7% in 10,866) received in total. Of the received responses, however, 238 were excluded from the study. Two hundred twenty-eight subjects differed in age from the original mailed list and 10 subjects did not specify their age or sex. Thus, the usable response rate was 51.5% (5,598 of 10,866) and 52.6% (5,598 of 10,638) when the usable responses (228) are excluded from the total questionnaires mailed (10,866).

Prevalence

The crude prevalence of JCP was estimated at 17.3% (966 of 5,598). The minimum prevalence was 10.1%, and the age-adjusted prevalence was 19.4% for the entire country (see Methods for further details). The estimated prevalence at a 100% response rate was calculated by the following regression equation ($Y = 22.732 - 0.001X$; Fig 1). The prevalence was 17.3% at a 53.7% response rate and was presumed to be 12.2% (95% confidence interval, 7.6% to 16.8%) at a 100% response

On the basis of the age-adjusted maximum prevalence, the rates were lowest in Hokkaido (4.8%) and Okinawa (2.7%), with higher rates being observed in Tokai (28.7%), South Kanto (23.6%), North Kanto (21.0%), and Kinki (20.3%; Table 2). With regard to sex, the prevalence of JCP in male subjects (18.5%) was comparable in female subjects (19.8%). The difference in the prevalence was also analyzed in relation to age groups. The lowest rates were observed in male subjects age 3 to 9 years (12.8%) and 60 to 79 years (10.6%), as well as in female subjects aged 3 to 9 years (9.7%) and 60 to 79 (10.6%; Table 3).

Current Status of JCP

The current status of JCP was analyzed in 966 subjects with a JCP diagnosis based on the questionnaires (questionnaire-diagnosed JCP). Nasal symptoms were more severe than eye symptoms in 86.0% of 966 subjects, comparable

Figure 1. Regression graph for the relationship between cumulative number of responses to the survey and estimated prevalence of Japanese cedar pollinosis. The regression equation was as follows: $Y = 22.732 - 0.001X$. With use of this equation, prevalence at 100% response can be estimated.

with eye symptoms in 5.9%, and eye symptoms were more severe than nose symptoms in only 7.1%. Only eye symptoms were present in just 1.0% of 966 subjects. Recurrence in each year was seen by 90% of the subjects, whereas 10% had JCP for the first time during the year of completion of the questionnaire.

In terms of the pollen season, 67.4% of the subjects had symptoms only between February and April. In contrast, 32.6% of subjects had perennial symptoms with aggravation

Table 2. Prevalence of Japanese Cedar Pollinosis in National Zones in Japan*

Zones, prevalence	Age-adjusted (direct)	Age-adjusted (indirect)
Hokkaido, 5.1% (2.5, 7.6)	4.8% (2.5, 7.6)	0.27 (0.20, 0.35)
Okinawa, 2.8% (0.2, 5.4)	2.7% (0.2, 5.4)	0.18 (0.12, 0.27)
Kyushu, 12.2% (9.2, 15.2)	12.6% (9.5, 15.2)	0.66 (0.53, 0.81)
Shikoku, 15.7% (12.1, 19.3)	16.9% (13.1, 19.3)	0.84 (0.67, 1.05)
Hokuriku, 17.6% (13.6, 21.6)	17.4% (13.6, 21.6)	0.92 (0.73, 1.17)
Chugoku, 16.3% (12.8, 19.8)	16.4% (12.9, 19.8)	0.85 (0.69, 1.06)
Kinki, 20.5% (17.2, 23.7)	20.3% (17.0, 23.7)	1.05 (0.88, 1.26)
Koshinetsu, 15.6% (12.1, 19.1)	16.1% (12.5, 19.1)	0.84 (0.68, 1.05)
Tokai, 28.4% (24.7, 32.0)	28.7% (25.1, 32.0)	1.46 (1.21, 1.76)
South Kanto, 23.8% (20.9, 26.6)	23.6% (20.9, 26.6)	1.22 (1.05, 1.41)
North Kanto, 20.9% (17.1, 24.6)	21.0% (17.2, 24.6)	1.07 (0.87, 1.33)
Tohoku, 12.5% (9.5, 15.5)	13.7% (10.4, 15.5)	0.69 (0.55, 0.85)
Total 19.2% (18.0, 20.4)	19.4% (18.2, 20.4)	1.0

* Numbers in parentheses denote 95% confidence intervals. The prevalence was adjusted by inverse sampling fraction for possible unequal sampling of age groups among zones. The age-adjusted prevalences (estimated prevalence and standardized prevalence ratio) are also indicated.

Table 3. Prevalence of Japanese Cedar Pollinosis, Stratified by Age and Sex*

Age group, y	Male	Female
3–9	12.8% (9.3, 16.2)	9.7% (6.6, 12.7)
10–19	20.2% (16.0, 24.4)	18.8% (14.7, 23.0)
20–29	22.1% (10.4, 27.7)	21.9% (16.9, 26.8)
30–39	22.1% (17.3, 26.8)	25.8% (21.5, 30.1)
40–49	24.8% (20.2, 29.4)	26.1% (21.8, 30.3)
50–59	14.7% (10.7, 18.6)	24.1% (19.8, 28.4)
60–79	10.6% (7.5, 13.7)	10.6% (7.6, 13.6)
Total	18.5% (16.8, 20.2)	19.8% (18.3, 21.4)

* Numbers in parentheses denote 95% confidence intervals. The prevalence is adjusted for possible unequal sampling of sex and age groups in the population. $P < 0.001$.

of the condition during the pollen season. This finding suggests that people with allergic rhinitis had symptoms precipitated by house-dust mites or other allergens in association with JCP.

Of the 966 subjects with questionnaire-diagnosed JCP, 58.9% had visited physicians. Of this group, 54.1% were prescribed drugs and 42.0% took over-the-counter drugs.

With respect to the degree of interference of JCP with daily activities, 30.4% had suffered severe interference, 31.8% had moderate difficulty, and 29.5% had mild problems. Among subjects who received drug treatment, interference with daily activities was severe in only 5.9%, moderate in 19.5%, and mild in 46.4%. This outcome suggests that pharmaceutical intervention was effective in subjects experiencing severe or moderate interference with daily activities.

The measures used most frequently to evade pollen exposure were gargling (removal of pollen from throat; 48.1%), wearing a face mask (39.6%), avoiding exposure of futon mattresses to sunshine (37.0%), eye washing (35.8%), and keeping the window or door closed (31.3%).

JCP was present in 77.2% of family members of subjects, which is a higher percentage than in family members of subjects without JCP. No significant difference was found in the reported duration of daily outdoor activities between subjects with and without JCP.

For the season in 2001, the relationship between the prevalence of JCP and the total pollen count was examined in each of the 12 regional zones previously mentioned. This investigation yielded a significant correlation with a correlation coefficient of 0.849 ($P < 0.001$; Fig 2).

DISCUSSION

In this study, the prevalence of JCP throughout the entire country of Japan was investigated by a cross-sectional population analysis with use of random sampling. A national survey regarding allergic rhinitis has been carried out every 5 years by the Japanese National Census Survey in questionnaire form, and the survey focuses on the number of patients in the population undergoing medical treatment on one specific day in July.¹⁰ Because July is not the peak season for

Figure 2. Relationship between prevalence of Japanese cedar pollinosis and total pollen count in various zones of Japan during the pollen season in 2001. Pollen counts are the average of airborne Japanese cedar pollen in different areas of individual zones according to the report of the Japan Meteorological Foundation. Redline indicates pollen count and blue bars show prevalences. Pollen count and prevalence are well correlated. Correlation coefficient = 0.849.

JCP, the prevalence calculated from the survey may be misleadingly low. Recently, Baba¹¹ reported the national prevalence of JCP as 16.2% in a household study of otolaryngologists conducted by mailed questionnaires. The study did not sample from the general population, and it was a nonrandomized family study, unlike our randomized population study.

Two types of approaches have commonly been used in large-scale population studies: a telephone interview and a postal questionnaire with or without an additional interview. The response rate for the questionnaires in a recent separate population survey about JCP by telephone was 23.6% (4,048 of 17,162). Perhaps, this result is attributable to the wide distribution of cellular telephones, which makes it difficult to conduct samplings based on the telephone directory. In our study, we used mailed questionnaires without an interview because of the large number of subjects sampled. The samples spanned a wide distribution of ages and geographic areas across Japan; thus, inclusion of an additional interview or performance of a clinical examination was impossible.

Various factors such as a low response rate, insufficient number of subjects who consulted physicians, and reliance on a questionnaire-based diagnosis without clinical examination may have caused bias in our study. The total response rate was 53.7% (5,836 of 10,866). Although this percentage is not very high, it is similar to the response rate of 58.3% (2,078 of 3,600) achieved in a survey of 3 cities in Tokyo in 1997, in which mailed questionnaires were collected by visiting homes in the Tokyo Metropolitan Survey.³ Furthermore, it is higher than the rate of 42.8% attained in the questionnaires mailed to otolaryngologists in 1997.¹¹ Large variations in response rates have similarly been reported in other surveys.

In London, Sibbald and Rink¹² reported a rather low response rate of 39% in questionnaires mailed to 7,702 subjects 16 to 65 years of age who were registered with physicians.

In a separate preliminary investigation on the reasons of nonresponse in 240 subjects, 31.3% who did not respond to the questionnaires confessed that they were indifferent because they had no symptoms of JCP. In the current study, the prevalence declined from 19.4% (655 of 3,373) after the first mailing to 14.2% (196 of 1,370) after the second mailing and to 13.0% (143 of 855) after the third mailing. These results indicate that there may be fewer cases of JCP in nonresponders than in the initial responders, and some adjustment may be needed for the accurate estimation of prevalence. A linear relationship was noted between the cumulative number of usable responses and the prevalence of JCP (Fig 1). Therefore, the prevalence at a 52.5% and 100% response rate has been calculated to be 17.3% and 12.2%, respectively. If the ratio of prevalence at a 100% response rate compared with a 52.5% response rate (12.2 divided by 17.2, or 0.71) could be used as coefficient of correction to correct a bias caused by a low response rate, the estimated age-adjusted prevalences of

the entire country, Hokkaido, and Okinawa were 13.8%, 3.4%, and 1.9%, respectively (Fig 3).

The contents of the questionnaires may also affect the satisfactory response and may lead to inaccurate estimation of the prevalence. The questions should be simple, answerable by general population, sensitive, valid, and reliable for diagnosis.

Internationally, many questionnaires pertaining to allergic rhinitis are available, including those of the International Survey of Asthma and Allergies in Childhood by the British Medical Research Council, the European Community Health Survey Questionnaire, the South London Survey, the American Thoracic Society questionnaire, and the Swiss Community Survey.^{13,14} In Japan specifically, surveys about JCP have been compiled by the Tokyo Metropolitan Government as well as Tanihara et al,² Sakakura and Ukai,¹⁵ Kozasa and Takenaka,¹⁶ and Okuda.¹⁷ In general, all these questionnaires have similar content. These questionnaires were found to be unsatisfactory for the correct diagnosis of JCP in our preliminary study on diagnostic criteria. The patients with JCP should have at least 2 of 4 nasal or ocular symptoms, which occur repeatedly during February through April every year or

Figure 3. The prevalences of Japanese cedar pollinosis in 12 individual regions of Japan, age-adjusted and corrected for possible biases because of nonresponders and questionnaire-based diagnosis. The prevalences in Hokkaido and Okinawa are very low, and those in North and South Kanto and Tokai are high.

almost every year. Questions relating to a physician's diagnosis may be useful. This information, however, may introduce a sampling bias in the process of calculating prevalence in a population study, inasmuch as the prevalence of JCP was higher in subjects who visited a physician than in subjects who had not, and only approximately 50% of subjects with JCP visited a physician.

On the basis of preliminary studies of questionnaire-diagnosed JCP, criteria for JCP were determined with respect to the degree of severity and number of individual symptoms, recurrence in each year, and preference season. In the current population study, however, 547 subjects with questionnaire-based JCP had a history of visiting a physician and 478 of them (87.4%, 478 of 547) were diagnosed as having JCP by physicians (Table 4). This finding suggested that questionnaire-based diagnosis might result in misclassification and an overestimation of prevalence, as shown in a preliminary study at the outpatient clinic.

The current study was conducted between April and July 2001, just after the peak pollen season, when the subjects' memory of the severity of their symptoms is likely to have been most accurate. During this period, the major airborne pollen in Japan is that of the Japanese cedar tree, although small amounts of cypress pollen are also detected. Patients with allergies to cypress pollen alone, however, are rare; hence, association with JCP occurs because of cross-reactivity.

In approximately 10% of subjects with JCP, symptoms had decreased from severe to mild or none after medical treatment in the preliminary study regarding change of symptom severity after treatment. Therefore, the question, "Did you have a severe symptom before treatment that changed to a mild one or disappeared after treatment?" was essential for avoidance of treatment bias at the time of completing the questionnaire.

Hokkaido and Okinawa were surveyed as control areas, and the prevalences were considered a baseline of bias through incorrect answers leading to misdiagnosis and through a low response rate. The age-adjusted prevalences

were 3.4% and 1.9%, respectively, after correction by the estimated prevalence at a 100% response rate.

There is an issue about whether the cases of JCP suspected by the questionnaire-based diagnosis of JCP should be added to the prevalence of subjects with JCP. This group of subjects with questionnaire-suspected JCP will consist of actual cases of JCP and also those without the disease. By including only the subjects who were suspected of having JCP on the basis of the questionnaire and had JCP diagnosed by a physician as cases, excluding those subjects with suspected JCP who did not have severe symptoms or interference with daily activities or need for medication, and assuming that no cases of JCP existed among nonresponders, a further 120 cases (1.1% of the population surveyed) may be included in the prevalence of JCP.

If biases because of nonresponder and questionnaire-based diagnosis are adjusted and physician-diagnosed JCP in the suspected JCP group is included, the age-adjusted prevalence is 13.1% in total. This figure is estimated as follows: 19.4% (age-adjusted prevalence) $\times$ 0.71 (coefficient of correction for nonresponder bias) $\times$ 0.87 (coefficient of correction for questionnaire-based diagnosis) + 1.1% (true JCP in the "suspected" group).

To my knowledge, no documentation is available on the difference in prevalence rates of JCP in general populations of individual geographic areas in Japan examined by the random sampling method. In a study of specific IgE antibody levels in pooled serum at blood banks in various areas, Inoue¹⁸ reported that positive rates were high in the Kanto and Tokai areas, followed by the Shikoku, Kinki, Hokuriku, Kyushu, and Tohoku. Baba¹¹ conducted a family study by mailed questionnaires and reported that the prevalence was highest in the Tokai, Kanto, and Koshinetsu areas, followed by the Shikoku, Kinki, Hokuriku, Kyushu, and Tohoku areas. The rates of a positive skin test result were found to be highest in the Kanto, Tokai, and Kinki areas.¹⁹ On the basis of the foregoing reports and current survey, it seems likely that JCP is most prevalent in the Kanto, Tokai, and Kinki areas in Japan.

When differences were evaluated, the prevalence rates for JCP were low in the age groups consisting of subjects younger than 10 years and subjects 60 years old or older. The prevalence, stratified by age groups, is shown in Table 3 and described in the previous report.⁹ No substantial differences in JCP prevalence were noted between the sexes, although the male subjects outnumbered the female subjects in the group of subjects younger than 10 years old (Table 3).

In addition to estimating the true prevalence of JCP in Japan, the current study is the first to examine the health effects of this condition. In Japan, patients with severe nasal symptoms usually visit an otolaryngologist, whereas those with severe eye symptoms request a consultation with an ophthalmologist, and the incidence of symptoms in patients with JCP may differ between these specialist clinics. This national survey revealed that patients had symptoms affecting both the nose and the eyes, and only 1% had eye symptoms alone, in contrast to a report (7%) by Kogure and Ishizaki.²⁰

Table 4. Physician's Diagnosis in Subjects with Questionnaire-Based Japanese Cedar Pollinosis (JCP)*

Physician's diagnosis	No. (%) of subjects with questionnaire-based JCP
JCP	478 (87.4%)
Other pollinosis	158 (28.9%)
Dust mite rhinitis	131 (23.9%)
Other rhinitis	57 (10.4%)
Nonallergy	3 (0.5%)
Undefined diagnosis	51 (9.3%)

* The data were only obtained from responders who visited physicians. The number of subjects with physician-diagnosed JCP compared with those who had questionnaire-based JCP. Physician's diagnosis from the answers to survey question Q4b (what was/is the physician's diagnosis?) is shown in subjects with JCP who were evaluated according to the criteria for questionnaire-based diagnosis. Multiple answers on physician's diagnosis are included and totaled.

Nasal symptoms were more troublesome than eye symptoms in most subjects with JCP.

The rate of medical treatment given was 18.2% of the total of 5,598 responders. A further analysis of the current study revealed the rate of subjects with questionnaire-diagnosed JCP who had severe or moderate interference with daily activities to be 62.2%, and 54.1% took prescribed drugs. Thus, the rates of visiting a physician (58.9%), reported interference with daily activities, and intake of prescribed drugs were similar.

First-generation antihistamines were purchased over the counter by 42.0% of subjects with JCP who had visited physicians. The use of over-the-counter drugs has increased to an annual expenditure of 35 billion Japanese yen (US\$28 million).²¹

Of the 966 subjects with questionnaire-diagnosed JCP, 62.2% had severe or moderate interference with daily activities before drug treatment, but this rate decreased to 25.4% after drug treatment. This finding suggested that treatment yielded improvement. Single or combined use of second-generation H₁-blocking agents and topically applied corticosteroids relieved symptoms satisfactorily, and more than 90% of treated patients did not have significant interference with daily activities during the pollen season.²²⁻²⁴ Okuda²⁵ first recommended early intervention in JCP. Administration of medication should begin 1 to 2 weeks before the pollen season and should continue treatment throughout the entire season.

Attaining satisfactory relief of symptoms of JCP is difficult, although one can avoid pollen for prevention of symptoms. In the current study, gargling, wearing a mask, eye washing, and keeping the window closed were often used as prophylactic measures. In a separate study on prevention methods in 200 patients with JCP at the outpatient clinic, effective treatments and their effective improvement rates were documented: staying indoors (83.7%), wearing a mask (69.2%), eye washing (44.6%), wearing eyeglasses (33.3%), gargling (35.2%), and keeping the window closed (26.3%).²⁶ Wearing a mask worked efficiently to keep out approximately 60% of pollen inhaled from a pollen chamber.²⁷ The weather during the pollen season of Japanese cedar tree is cold and windows are usually kept closed. Thus, pollen count is low indoors compared with the outside environment.²⁸ The prevalence of JCP correlates well with the total pollen count in individual areas as Baba¹¹ reported (Fig 2). The major factor in the occurrence of JCP is postulated to be the amount of allergen, although many other risk factors have been proposed, including air pollution, stress, nutrition, and lifestyle.^{29,30}

CONCLUSION

The current study clearly demonstrates that JCP is a common disease in Japan and a major public health problem because of its high prevalence (at least 13% of the population) and morbidity (causing severe or moderate interference with daily activity in 62.2% of patients). Nevertheless, drug treatments and pollen avoidance are very effective for symptomatic

relief. Almost 60% of patients visited physicians. This finding may be attributable to the severity of their symptom, financial support by the Japanese medical insurance system, and the tendency of Japanese people to visit physicians for confirmation and treatment for allergies. This study also provides methods for nationwide random sampling, including details on sampling method, survey approach, questionnaire criteria, and techniques to overcome biases because of a low response rate, a questionnaire-based diagnosis, and miscomprehension of questions, leading to incorrect answers.

APPENDIX

Self-Evaluated Questionnaire for JCP

JCP is a common allergic disease in Japan caused by inhalation of Japanese cedar pollen. It is characterized by symptoms such as sneezing, running nose, stuffy nose, and eye itching, during February through April, and it recurs yearly, usually, in patients who have previously had the disease. At present, the disease is a considerable health problem because of its high incidence and severe symptoms, but little is known about its exact prevalence and current status in the country as a whole. That is why we are conducting this survey, and we would appreciate your cooperation.

1. Please fill out the questionnaire and send it back to us as soon as possible.

2. Please note that we are asking you about the condition of your nose and eyes during February through April of this year when you did not have a cold or flu.

3. Please answer each question by checking the appropriate number in each item.

Q1a: Symptom

Did/do you have the following symptoms during February through April of this year when you did not have a cold or flu? Please check the severity of each symptom.

Q1b: Treatment Effect

Please answer only when you did not have any severe nose or eye symptoms.

Did you have a severe symptom before treatment that changed to a mild one or disappeared after treatment?

1. Yes
2. No
3. Other

(Please proceed to Q8, if you had/have no symptom and checked “no” for all symptoms.)

Q2: Recurrence

Do your nose/eye symptoms occur repeatedly almost every year?

1. Almost every year
2. Manifested for the first time this year
3. Some years, not every year
4. Other

Q3: Season

What is/was the most frequent season for your symptom(s) to appear?

1. February to April alone
2. Perennial, but it worsens in this season
3. Preference in another season or perennial
4. Other

Q4a: Consultation with a Physician

Did you visit a physician this year for your symptoms?

1. Yes
2. No

Q4b: Physician's Diagnosis

What was the physician's diagnosis?

1. JCP
2. Pollinosis due to a plant other than cedar
3. Dust mite rhinitis
4. Another allergic rhinitis
5. Nonallergic rhinitis
6. Other/undefined

(Q5 through Q10 are not included in this Appendix because they are not crucial for the diagnosis of JCP.)

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1. b
2. b
3. c
4. d
5. a