Table 9 Long-term asthma management (2–5 years)

	Step 1	Step 2	Step 3	Step 4
Basic	Symptomatic therapy	• LTRA[†] and/or • DSCG[‡] or ICS (FP or BDP 50–100 μg/day, BIS 0.25 mg/day)	ICS (FP or BDP 100–150 μg/day , BIS 0.5 mg/day)	ICS (FP or BDP 150–300 μg/day, BIS 1.0 mg/day) plus one or more • LTRA[†] • DSCG[‡] • Sustained-release theophylline (p.o.)[§] • LABA (tape, p.o. or LABA inhalation)
Additional	• LTRA[†] and/or • DSCG	• Sustained-release theophylline (p.o.)[§]	plus one or more • LTRA[†] • DSCG[‡] • Sustained-release theophylline (p.o.)[§] • LABA (tape, p.o. or LABA inhalation)	

[†]There are anti-allergic drugs such as histamine H1 antagonists and Th2 cytokine inhibitors other than LTRA. [‡]If necessary, + β2-agonists (0.05 mL–0.1 mL). [§]Be careful of side-effects. BDP, beclomethasone dipropionate; BIS, budesonide inhalation suspension; DSCG, disodium cromoglycate; FP, fluticasone propionate; ICS, inhaled corticosteroids; LABA, long-acting β2-agonists; LTRA, leukotriene receptor antagonist; p.o., per os.

or in combination with others, based on symptoms.[17,18] Sustained-release theophylline (SRT) is recommended as an option.

In younger children (aged 2–5 years), LTRA, 50–100 μg/day FP or BDP or 0.25 mg/day budesonide inhalation suspension (BIS) should be used. If a poor response to these therapies is observed, SRT should be considered (Table 9). The treatment for infants <2 years old is shown in Table 10. LTRA and/or DSCG are used as first-choice medication. In the JPGL 2008 as well as

Table 10 Long-term asthma management (<2 years)

	Step 1	Step 2	Step 3	Step 4
Basic	Not necessary (symptomatic therapy)	• LTRA and/or • DSCG (2–4 times/day)[†]	• ICS (FP or BDP 100 μg/day, BIS 0.25–0.5 mg/day)	• ICS (FP or BDP 150–200 μg/day, BIS 0.5–1.0 mg/day) plus one or more • LTRA • DSCG (2–4times/day)[†]
Additional	• LTRA and/or • DSCG (2–4 times/day)	• ICS (FP or BDP 50 μg/day, BIS 0.25 mg/day)	plus one or more • LTRA • DSCG (2–4times/day)[†] • β2-agonists (tape or p.o.) • Sustained-release theophylline[‡] (consideration) (6 months<) (serum conc. 5–10 μg/mL)	• β2-agonists (tape or p.o.) • Sustained-release theophylline[‡] (consideration) (6 months<) (serum conc. 5–10 μg/mL)

[†]If necessary, + β2-agonists (0.05 mL–0.1 mL). [‡]Exercise caution. Steps 3 and 4 should be carried out by the pediatricians specializing in allergies. BDP, beclomethasone dipropionate; BIS, budesonide inhalation suspension; DSCG, disodium cromoglycate; FP, fluticasone propionate; ICS, inhaled corticosteroids; LTRA, leukotriene receptor antagonist; p.o., per os.

Table 11 Apparent severity and actual severity of asthma

Apparent severity determined on the basis of current symptoms	Actual severity (severity considering current therapies administered)			
	Step 1	Step 2	Step 3	Step 4
Intermittent P	Intermittent P	Mild P	Moderate P	Severe P
Mild P	Mild P	Moderate P	Severe P	Severe P
Moderate P	Moderate P	Severe P	Severe P	Very severe P
Severe P	Severe P	Severe P	Severe P	Very severe P

P, persistent.

JPGL 2005, SRT is omitted owing to the possibility of side-effects, which occur more frequently in infants. Theophylline administration is not recommended for children <6 months of age because there is no clear evidence of its effectiveness and safety, or for children with fever or convulsive diseases. In addition, the recommended dosage of ICS is 50 μg/day FP or BDP, or 0.25 mg/day BIS. If a poor response to these drugs is observed, the inhalation of a combination of 2 mL of liquid DSCG and 0.05–0.1 mL 0.5% salbutamol solution using a nebulizer is recommended in younger children or infants. BIS is now available for younger children and infants.

Treatment of moderate persistent asthma (step 3)

ICS should be used regularly; 100–200 μg/day FP or BDP in older children, 100–150 μg/day FP or BDP, or 0.5 mg/day BIS in younger children, and 100 μg/day FP or BDP, or 0.25–0.5 mg/day BIS in infants. In children who have frequent asthma symptoms despite regular treatment with ICS, additional treatment with LTRA, SRT, or DSCG (+ β2-agonist, if necessary, in younger children or infants) should be considered, regardless of age. In older and younger children, if symptoms persist, long-acting β2-agonist in the oral or tape forms or long-acting β2-agonist (LABA) inhalation should be administered at bedtime.[19]

In older children, salmeterol fluticasone propionate combination (SFC) is also available (Table 8). In infants, if symptoms persist, a tape or oral β2-agonist is recommended.

Treatment of severe persistent asthma (step 4)

The dosage of ICS should be increased in cases of severe asthma. The inhalation of 200–400 μg/day FP or BDP in older children, 150–300 μg/day FP or BDP, or 1.0 mg/day BIS in younger children, and 150–200 μg/day FP or BDP, or 0.5–1.0 mg/day BIS for infants is recommended. LTRA, SRT, or DSCG (+ β2-agonist, if necessary, in younger children or infants) should be added regularly as a concomitant treatment, on the basis of the symptoms. In younger children and older children, LABA (tape, oral, or inhalation) can be administered. In older children, SFC is also available. If symptoms persist in older children, the use of short-term oral prednisolone should be considered. If symptoms persist in infants, an oral or tape β2-agonist can be administered and SRT could be considered. However, SRT should be used carefully.

Infantile asthma

Infantile asthma, which is defined as asthma in children aged <2 years in JPGL 2008, should be identified because infantile asthma patients have special characteristics not only in anatomy but also in pathophysiology. In comparison to older children, the internal airway is narrower and there is less lung flexibility and contractility in younger children.[20] Moreover, airflow limitation is more likely in young children than older children owing to factors such as less smooth muscle in airways, hyperplasia of mucus secretion, and limited breathing movement owing to a horizontally oriented diaphragm. Airflow limitation induces rapid exacerbation of asthma symptoms in younger children. Respiratory viral infections in infancy influence both the onset and exacerbation of asthma. Respiratory syncytial virus and parainfluenza virus are the most common pathogens of bronchiolitis.[21]

The onset of infantile asthma occurs at <2 years of age, and the disease may become a chronic condition after its establishment. Moreover, patients with infantile asthma cannot subjectively complain of respiratory failure, and symptoms can be observed only objectively. Therefore, early diagnosis and intervention are required in infancy. The management in a medical facility for acute attacks and the medication plan for long-term management in infants (infantile asthma) are mentioned above.

Exercise-induced asthma

Exercise-induced asthma (EIA) is an important symptom to be aware of in the management of childhood asthma. EIA often occurs in patients with severe or uncontrolled asthma, in response to persistent extreme exercise, and its onset can occur in either cool or dry air. Children are often very active both at school and at home, and the occurrence of EIA may damage their quality of life or may cause them to avoid exercise. It is therefore important that patients, parents, and teachers have a sufficient understanding of the mechanism and characteristics of EIA. It is also important to understand that the proper management and the continuation of appropriate physical exercise can lead to an improvement in EIA.[22]

Asthma during adolescence

The characteristics of asthma in the period from adolescence to young adulthood include a decreasing response to medication therapy; a risk of transitioning to adult asthma; an adverse effect on menstruation; a disturbed lifestyle due to psychological stress related to family, friendships, school work, and employment; lower treatment compliance rates; and an increased mortality rate of asthma.[23]

The check points for clinicians treating patients with adolescent asthma are as follows: monitoring the patient to avoid irregular visits to the clinic, attention to lapses in compliance regarding medication use, attention to the abuse of β2-agonist metered-dose inhalers, clarification of the transition period in moving from pediatrics to internal medicine, re-evaluation regarding whether or not to use ICS in patients not currently inhaling ICS, and maintenance of the relationship between physician and patients by providing sufficient information on available medication and medication plans.

It is important to improve treatment compliance through effective patient education with suitable explanations of asthma and individual treatment plans. Physicians also need to establish a good partnership with their patients.

Asthma death

The asthma mortality rate in patients aged 5–34 years has risen dramatically twice in previous years. The asthma mortality rate significantly increased in patients aged 10–14 years during the 1960s and had a sevenfold increase in male subjects. During the 1980s the rate increased threefold in patients aged 15–29 years, and this increase continued until 1990 before decreasing abruptly

in 1995. The asthma mortality rates per 100 000 individuals were 0.2 (male) and 0.1 (female) in patients aged 5–19 years in 2007.

Factors contributing to the increase in asthma mortality rate include delays in receiving medical care, and sudden and unexpected worsening of symptoms. The causes of delays in receiving medical care include a misunderstanding of asthma severity by patients or families and an excessive dependence on β2-agonist pressured metered-dose inhalers.[24]

Conclusion

The JPGL 2008 is a guideline that provides recommendations for standard therapies for childhood asthma under the present conditions in our country, and we emphasize that it is not a textbook aimed at therapeutic standardization. During asthma treatment the individual background and/or living situation of each patient should be considered.

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Original Paper

International Archives of Allergy and Immunology

Int Arch Allergy Immunol 2010;153:280–287
DOI: 10.1159/000314369

Received: September 1, 2009
Accepted after revision: January 7, 2010
Published online: May 20, 2010

Nationwide Cross-Sectional Population-Based Study on the Prevalences of Asthma and Asthma Symptoms among Japanese Adults

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Key Words
Asthma · Prevalence · Epidemiology · Japan

Abstract
Background: Asthma is a common respiratory disease worldwide. However, few reports are available on the prevalences of asthma and asthma symptoms among Asian subjects. ***Methods:*** To determine the prevalences of asthma and asthma symptoms among Japanese subjects, we performed a nationwide cross-sectional, population-based study on Japanese adults aged 20–79 years. Ten areas spread throughout the country were randomly selected. Door-to-door or postal surveys were performed using a translated version of the European Community Respiratory Health Survey questionnaire. ***Results:*** The survey was completed by 23,483 participants. The overall response rate was 70.6%. The prevalences of wheeze and current asthma among all participants aged 20–79 years were 10.1% (95% CI: 9.7–10.5%) and 4.2% (95% CI: 4.0–4.5%), respectively. The prevalences among young adults aged 20–44 years were 9.3% (95% CI: 8.7–9.9%) and 5.3% (95% CI: 4.8–5.8%), respectively. The prevalence of current asthma was highest in females aged 30–39 years in comparison with the other gender and age groups. ***Conclusions:*** This nationwide study determined the prevalences of asthma and asthma symptoms among Japanese adults. The results provide fundamental information on the respiratory health of Japanese adults.

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Introduction

Asthma is a common chronic respiratory disease which is internationally recognized as a public health problem. The burden of this disease on the government, health care systems, patients and their families is increasing worldwide. It is estimated that there are approximately 300 million asthma patients worldwide and that 15 million disability-adjusted life years are lost annually because of asthma [1].

Many studies using standardized methods to measure the prevalence of asthma have revealed large geographic variation in the disease prevalence. High prevalence in English-speaking countries [2] and low prevalence in Asian countries [3, 4] have been reported. However, there have been relatively few studies using a standardized questionnaire to determine the prevalences of asthma and asthma symptoms among Japanese adults. Determining the prevalence of the disease is important as this is a fundamental piece of information about the respiratory health of the Japanese adults.

To determine the prevalences of asthma and asthma symptoms among Japanese adults, we conducted a nationwide cross-sectional study on the prevalences of asthma and asthma symptoms using a standardized questionnaire.

Fig. 1. Locations of the study areas.

Materials and Methods

Study Design

A population-based cross-sectional study was conducted on subjects aged 20–79 years, covering ten different areas in Japan. Areas spread throughout the country were randomly selected and included both urban and suburban areas (see fig. 1). The sample size of the study population was calculated from the estimated prevalence of 15%, with a confidence interval width of 4% and significance criterion of 5%. At least 1,224 subjects were needed. In each area, the subjects were either all of the residents or randomly selected. They were then asked to participate in the study and complete a self-administered questionnaire. We mainly used the basic resident registers as the source for the random sampling of the subjects. However, in Setagaya Ward, Tokyo, and Kurashiki City, Okayama, the local governments did not permit the use of the basic resident registers. Nominal lists of the residents' associations were used as an alternative source for the random sampling in these areas. The survey method was basically a door-to-door survey, but a postal survey was used for Sagamihara City (Kanagawa), Fujieda City (Shizuoka) and Nangoku City (Kochi). In the door-to-door survey, nonresponders in all areas were recontacted at least two times. In the postal survey, nonresponders were recontacted three times. Study methods in each area are summarized in table 1. These areas were classified as urban and suburban on the basis of size, function and population density (the cutoff points of population density was 1,000/km^2). This study was conducted from July to October in 2006, except for Mitake town (Gifu), which was conducted from January to February in 2007. The study was approved by the Ethics Committee of Sagamihara National Hospital.

Questionnaire

To evaluate asthma symptoms, the same questions were asked as in the European Community Respiratory Health Survey (ECRHS). We prepared the Japanese version of the questionnaire on the basis of the one-page ECRHS questionnaire, and page one of the two-page questionnaires prepared for a stage 1 repeat study [5]. The validity of the questionnaire was guaranteed by first translating the original ECRHS questionnaire into Japanese and then translating the Japanese version back into English [6]. The items of the questionnaire are given in the Appendix. The questionnaire also included additional questions on smoking status, weight and height, allergic rhinitis, living environment, and pet ownership.

Ever asthma confirmed by a doctor was defined as an affirmative response to the question 'Have you ever had asthma?' (Q5), followed by 'Was this confirmed by a doctor?' (Q5.1). Current asthma was defined as meeting the following two criteria: (1) an affirmative response to the question 'Have you ever had asthma?' (Q5), followed by 'Was this confirmed by a doctor?' (Q5.1), and (2) 'Having at least one asthma-related symptom in the last 12 months.' [7]. Therefore, the subjects who are defined as having current asthma are those who have both been diagnosed with asthma by a physician and have shown an active symptom in the

Table 1. Methods and response rate by study area

Study area[a]	Urban/ suburban	Method	20–79 years				20–44 years			
			Population, n	Subjects n	Responders, n	Response rate	Population, n	Subjects n	Responders, n	Response rate
(1) Hokkaido Kamishihoro Town	suburban	BRR/RS door-to-door	4,172	3,231	3,065	94.9%	1,432	1,096	1,004	91.6%
(2) Toyama Fuchu Town	suburban	BRR/ER door-to-door	3,714	3,714	2,898	78.0%	1,552	1,552	1,164	75.0%
(3) Tokyo Setagaya Ward	urban	NLRA/ER door-to-door	3,132	3,132	1,823	58.2%	1,399	1,399	779	55.7%
(4) Kanagawa Sagamihara City	urban	BRR/RS postal	10,500	6,142	3,614	58.8%	4,095	2,395	1,369	57.2%
(5) Shizuoka Fujieda City	suburban	BRR/ER postal	3,935	3,935	2,596	66.0%	1,593	1,593	974	61.1%
(6) Gifu Mitake Town	suburban	BRR/RS door-to-door	19,272	2,152	1,507	70.0%	5,444	900[b]	646	70%[b]
(7) Aichi Nagakute Town	urban	BRR/RS door-to-door	41,941	2,000	1,286	64.3%	17,631	800[b]	531	65%[b]
(8) Okayama Kurashiki City	urban	NLRA/RS door-to-door	376,036	3,111	2,273	73.1%	156,152	1,399	947	67.7%
(9) Hiroshima Akiohta Town	suburban	BRR/RS door-to-door	5,997	2,860	2,109	73.7%	1,559	743	497	66.9%
(10) Kohchi Nangoku City	suburban	BRR/RS postal	37,377	3,000	2,312	77.1%	15,307	1,127	849	75.3%

BRR = Basic resident registers; RS = random sampling; NLRA = nominal lists of residents' associations; ER = entire residents. Subjects who did not specify age or gender, or did not answer all the asthma symptoms (Q1–Q4) were excluded from the analysis.

[a] Specific districts of the city or town were selected for random sampling, except for Kamishihoro town, Hokkaido (1), Kurashiki town, Okayama (8), and Akiohta town, Hiroshima (9).

[b] Data are presented as rounded numbers, because the precise number of subjects was not provided by the local government for the protection of the resident privacy.

last 12 months. Patients who had symptoms in the past and have remitted were not included. A subject who was considered to have asthma-related symptoms was one who answered in the affirmative to at least one of Q1–Q4, i.e. experiencing wheeze, waking with tightness in the chest, waking with an attack of shortness of breath and waking with cough.

Analysis

Subjects who did not specify age or gender or did not answer all the questions concerning asthma symptoms (from Q1 to Q4) were excluded from the analysis. The collected data were analyzed using SPSS 11.0 for Windows (SPSS Japan Inc.). The prevalences of asthma symptoms and current asthma with 95% CI were estimated for all the participants aged 20–79 years and for young adults aged 20–44 years. Fisher's exact tests were carried out to assess the differences in prevalences between males and females, with $p < 0.05$ regarded as statistically significant. To assess the differences in prevalences between the areas, the prevalence in each area was adjusted to a standard population with an equal distribution by age and gender, using age groups 20–29, 30–39, 40–49, 50–59, 60–69 and 70–79 for males and females separately. Gender- and age-group-specific prevalences of wheezing and current asthma with 95% CI were also calculated to explore the effects of age and gender. Fisher's exact tests were carried out to assess gender differences in prevalence among each age group.

Results

A total of 23,483 participants were included in the analysis. Table 1 shows the methods and response rate by study area. The overall response rate was 70.6%. The response rate among young adults aged 20–44 years was approximately 67%, which was lower than that among all the participants aged 20–79 years. Response rates in urban areas were generally lower than those in suburban areas. Kamishihoro Town (Hokkaido) joined in the study

Table 2. Smoking prevalence by gender and age

	Age group						Total
	20–29 years	30–39 years	40–49 years	50–59 years	60–69 years	70–79 years	
Subjects, n	2,974	3,899	3,838	4,859	4,440	3,473	23,483
Male smoking status							
Nonsmoker	737 (47.7)	596 (32.5)	514 (27.9)	661 (28.1)	758 (35.5)	668 (39.1)	3,934 (34.4)
Past smoker	102 (6.6)	259 (14.1)	420 (22.8)	595 (25.3)	653 (30.5)	623 (36.4)	2,652 (23.2)
Current smoker	688 (44.5)	967 (52.7)	886 (48.1)	1,058 (45.0)	681 (31.9)	381 (22.3)	4,661 (40.8)
Unknown	19 (1.2)	12 (0.7)	21 (1.1)	39 (1.7)	46 (2.2)	38 (2.2)	175 (1.5)
Total	1,546	1,834	1,841	2,353	2,138	1,710	11,422
Female smoking status							
Nonsmoker	1,126 (78.9)	1,511 (73.2)	1,564 (78.3)	2,105 (84.0)	2,041 (88.7)	1,614 (91.5)	9,961 (82.6)
Past smoker	75 (5.3)	177 (8.6)	129 (6.5)	103 (4.1)	105 (4.6)	58 (3.3)	647 (5.4)
Current smoker	220 (15.4)	366 (17.7)	290 (14.5)	276 (11.0)	121 (5.3)	58 (3.3)	1,331 (11.0)
Unknown	7 (0.5)	11 (0.5)	14 (0.7)	14 (0.9)	35 (1.5)	33 (1.9)	122 (1.0)
Total	1,428	2,065	1,997	2,506	2,302	1,763	12,061

Smoking status data presented as n (%).

Table 3. Prevalences of asthma symptoms and asthma in relation to gender among all the participants aged 20–79 years

	Males (n = 11,422)	Females (n = 12,061)	Total (n = 23,483)
(Q1) Wheeze*	11.3 (10.7–11.9)	9.0 (8.5–9.5)	10.1 (9.7–10.5)
(Q1.1) Wheeze with breathlessness*	6.9 (6.4–7.3)	5.4 (5.0–5.8)	6.1 (5.8–6.4)
(Q1.2) Wheeze without a cold*	7.6 (7.1–8.1)	5.7 (5.3–6.1)	6.6 (6.3–6.9)
(Q2) Waking with tightness in the chest*	5.7 (5.2–6.1)	4.2 (3.8–4.5)	4.9 (4.6–5.2)
(Q3) Waking with an attack of shortness of breath*	4.1 (3.7–4.4)	2.9 (2.6–3.2)	3.5 (3.2–3.7)
(Q4) Waking with cough*	11.6 (11.0–12.2)	13.3 (12.7–13.9)	12.5 (12.1–12.9)
(Q5) Ever asthma	8.7 (8.2–9.2)	8.2 (7.7–8.7)	8.4 (8.1–8.8)
(Q5.1) Ever asthma confirmed by a doctor	7.4 (6.9–7.9)	7.3 (6.9–7.8)	7.4 (7.0–7.7)
(Q6) Asthma medication	2.5 (2.2–2.8)	2.4 (2.1–2.7)	2.5 (2.3–2.7)
(Q8) Chronic bronchitis*	10.6 (10.0–11.1)	5.4 (4.9–5.8)	7.9 (7.5–8.2)
Current asthma	4.1 (3.9–4.5)	4.3 (4.0–4.7)	4.2 (4.0–4.5)

Data presented as percentages with 95% CI in parentheses. * $p < 0.001$, significant difference between males and females.

as the town's project, and showed a response rate which was markedly high. Table 2 shows smoking prevalence by gender and age. In all age groups, the smoking prevalence was significantly higher among males than among females (Fisher's exacts tests, $p < 0.05$).

Table 3 shows the prevalences of asthma symptoms and current asthma among all the participants aged 20–79 years. The prevalences of wheeze, ever asthma confirmed by a doctor and current asthma were 10.1% (95% CI: 9.7–10.5%), 7.4% (95% CI: 7.0–7.7%) and 4.2% (95% CI: 4.0–4.5%), respectively. Compared with the prevalence of current asthma, the prevalence of asthma medication was low [2.5% (95% CI: 2.3–2.7%)]. Most of the asthma symptoms were more common in males than in females, except for waking with cough. However, the prevalences of ever asthma, ever asthma confirmed by a doctor, asthma medication and current asthma were not statistically different between males and females.

Table 4. Gender- and age-standardized prevalences of wheeze and current asthma per area

Study area		Urban/suburban	Wheeze	Current asthma
(1)	Hokkaido, Kamishihoro Town	suburban	11.2 (10.1–12.3)	4.3 (3.6–5.1)
(2)	Toyama, Fuchu Town	suburban	9.3 (8.3–10.4)	3.2 (2.6–3.8)
(3)	Tokyo, Setagaya Ward	urban	12.3 (10.8–13.8)	5.6 (4.6–6.7)
(4)	Kanagawa, Sagamihara City	urban	10.3 (9.3–11.3)	5.4 (4.7–6.1)
(5)	Shizuoka, Fujieda City	suburban	7.2 (6.3–8.3)	3.5 (2.8–4.2)
(6)	Gifu, Mitake Town	suburban	9.3 (7.9–10.8)	2.8 (2.0–3.6)
(7)	Aichi, Nagakute Town	urban	9.2 (7.8–11.0)	4.2 (3.1–5.3)
(8)	Hiroshima, Akiohta Town	suburban	12.4 (10.9–13.7)	4.3 (3.4–5.2)
(9)	Okayama, Kurashiki City	urban	9.5 (8.3–10.7)	5.1 (4.2–6.0)
(10)	Kochi, Nangoku City	suburban	9.5 (8.3–10.7)	3.8 (3.0–4.5)

Data presented as percentages with 95% CI in parentheses.

Table 5. Prevalences of asthma symptoms and asthma in relation to gender among young adults aged 20–44 years

	Males (n = 4,331)	Females (n = 4,431)	Total (n = 8,762)	Standardized prevalence[1]
(Q1) Wheeze	9.7 (8.8–10.5)	8.9 (8.1–9.7)	9.3 (8.7–9.9)	9.3 (8.7–9.9)
(Q1.1) Wheeze with breathlessness	6.0 (5.3–6.7)	5.5 (4.9–6.2)	5.8 (5.3–6.3)	5.8 (5.3–6.3)
(Q1.2) Wheeze without a cold	6.5 (5.7–7.2)	5.9 (5.2–6.6)	6.2 (5.7–6.7)	6.2 (5.7–6.7)
(Q2) Waking with tightness in the chest*	5.0 (4.3–5.6)	3.7 (3.1–4.2)	4.3 (3.9–4.7)	4.3 (3.9–4.7)
(Q3) Waking with an attack of shortness of breath	3.1 (2.6–3.6)	2.6 (2.2–3.1)	2.9 (2.5–3.2)	2.8 (2.5–3.2)
(Q4) Waking with cough**	9.7 (8.8–10.6)	13.8 (12.8–14.9)	11.8 (11.1–12.5)	11.6 (10.9–12.2)
(Q5) Ever asthma	11.3 (10.3–12.2)	10.8 (9.9–11.7)	11.0 (10.4–11.7)	11.1 (10.5–11.8)
(Q5.1) Ever asthma confirmed by a doctor	10.4 (9.5–11.3)	10.0 (9.1–10.9)	10.2 (9.6–10.8)	10.3 (9.7–10.9)
(Q6) Asthma medication	2.2 (1.8–2.7)	2.6 (2.1–3.0)	2.4 (2.1–2.7)	2.4 (2.1–2.7)
(Q8) Chronic bronchitis**	9.0 (8.2–9.9)	4.3 (3.7–4.9)	6.6 (6.1–7.2)	6.5 (6.0–7.0)
Current asthma	5.1 (4.4–5.8)	5.5 (4.9–6.2)	5.3 (4.8–5.8)	5.3 (4.8–5.8)

Data presented as percentages with 95% CI in parentheses. * $p < 0.05$, ** $p < 0.001$, significant difference between males and females.
[1] Prevalence was adjusted to a standard population by age and gender, using the age groups 20–24, 25–34, and 35–44 years; the first of these given half the weight of the other two for males and females separately.

There was about a twofold variation in the standardized prevalences of wheeze and current asthma across the areas (table 4). The mean prevalence (±SD) of wheeze in 4 urban areas and in 6 suburban areas was 10.3% (±1.5) and 9.8% (±1.8), respectively, which was not statistically significantly different (t test, $p = 0.65$). However, the mean prevalence of current asthma in 4 urban areas was significantly higher than that in 6 suburban areas (mean prevalence ±SD: urban areas, 5.1 ± 0.6%; suburban areas, 3.7 ± 0.6%).

Table 5 shows the prevalences of asthma symptoms and current asthma among young adults aged 20–44 years, which is used as the age group for international comparison. The standardized prevalences of wheeze and current asthma were 9.3% (95% CI, 8.7–9.9%) and 5.3% (95% CI 4.8–5.8%), respectively. The prevalence of wheeze among young adults was lower than that among all the participants aged 20–79 years; however, the prevalence of current asthma among young adults was higher than that among all the participants aged 20–79 years. Among asthma symptoms, only the prevalence of waking with tightness in the chest was significantly higher among males than among females. As shown in the results for all the participants, waking with cough was more

Table 6. Prevalences of current asthma and wheeze by gender and age

Age, years	Males	Females	p
Current asthma			
20–29	5.5 (4.4–6.6)	4.3 (3.2–5.3)	n.s.
30–39	4.9 (3.9–5.8)	6.4 (5.4–7.5)	0.038
40–49	4.3 (3.4–5.3)	4.4 (3.5–5.3)	n.s.
50–59	2.3 (1.7–2.9)	3.5 (2.8–4.2)	0.016
60–69	3.4 (2.6–4.1)	3.6 (2.8–4.3)	n.s.
70–79	5.2 (4.2–6.3)	4.0 (3.1–4.9)	n.s.
Wheeze			
20–29	10.0 (8.5–11.5)	8.1 (6.6–9.5)	n.s.
30–39	9.8 (8.4–11.1)	9.6 (8.4–10.9)	n.s.
40–49	8.7 (7.4–10.0)	8.5 (7.3–9.7)	n.s.
50–59	10.5 (9.3–11.8)	8.7 (7.6–9.8)	0.036
60–69	13.0 (11.6–14.5)	9.6 (8.4–10.8)	<0.001
70–79	15.7 (13.9–17.4)	9.4 (8.1–10.8)	<0.001
Wheeze in nonsmokers[1]			
20–29	8.8 (6.8–10.9)	6.7 (5.3–8.2)	n.s.
30–39	6.4 (4.4–8.3)	7.7 (6.3–9.0)	n.s.
40–49	8.0 (5.6–10.3)	7.1 (5.8–8.4)	n.s.
50–59	8.5 (6.3–10.6)	7.1 (6.0–8.2)	n.s.
60–69	9.5 (7.4–11.6)	8.8 (7.6–10.1)	n.s.
70–79	11.8 (9.4–14.3)	8.6 (7.2–10.0)	0.019

Data presented as percentages with 95% CI in parentheses.
[1] Prevalence of wheeze among subjects limited to nonsmokers (sample size: males 3,934; females 9,961).

common in females than in males; however, the prevalences of ever asthma, ever asthma confirmed by a doctor, asthma medication and current asthma was not statistically different between males and females.

To explore the associations of age and gender with the prevalences of wheeze and current asthma, gender- and age-group-specific prevalences were also calculated (table 6). In the age groups of 30–39 and 50–59 years, the prevalence of current asthma was significantly higher among females than among males. In the other age groups, no significant difference was observed in the prevalence of current asthma between genders. However, the prevalence of wheeze in age groups of more than 50 years was significantly higher among males than among females. To adjust for the effect of gender difference in smoking prevalence on that in wheeze prevalence, the prevalences were calculated after limiting the subjects to nonsmokers. The prevalence of wheeze among nonsmokers was not significantly different between genders in the age groups of 20–69 years. A significantly higher prevalence of wheeze was only observed in the age group of 70–79 years.

Discussion

This cross-sectional study of the prevalences of asthma and asthma symptoms is the first large-scale nationwide population-based study conducted on Japanese adults. The prevalences of wheeze and current asthma among adults aged 20–79 years were 10.1 and 4.2%, respectively. These data are fundamental pieces of information for respiratory health and public health plans in this country.

This study used the Japanese version of ECRHS questionnaire, which is frequently used as a standardized questionnaire. It revealed that the prevalence of wheeze among young adults aged 20–44 years, which is commonly used as an internationally comparable parameter for the prevalence of asthma symptom, was 9.3% (95% CI: 8.7–9.9%). When compared with the prevalence of wheeze in the previous study on ECRHS stage 1 in the 1990s (median: 20.7%, ranging from 4.1 to 32.0%) [2], that among Japanese young adults was relatively low and did not reach the median of European countries.

There have been few reports on the prevalence of asthma symptoms among Asian countries using a standardized questionnaire. Chan-Yeung et al. [3] reported that the prevalence of wheeze in rural Beijing in 1996–1997 was 2.5% (95% CI: 2.4–2.6%) in males and 2.7% (95% CI: 2.6–2.8%) in females. Therefore, those in our study were higher than those in rural Beijing. However, many studies have shown that the prevalence of asthma has been increasing [8]. It is assumed that a similar tendency was also observed in rural areas of Beijing and that the prevalence of asthma was much higher in 2006 than in 1996–97. Furthermore, our study covered both urban and suburban areas and was different from that of Chan-Yeung et al. [3], which was conducted only in rural areas of Beijing. These differences make a simple comparison between the two studies difficult. A study on the prevalence of wheeze carried out in both urban and rural areas of Thailand has also been reported recently [4]. The prevalence of wheeze in Thailand in 2001–2002 was 16.4% (95% CI: 15.1–17.6%), which was higher than in our study.

Female predominance in the prevalence of current asthma in the age groups of 30–39 and 50–59 years observed in our study was compatible with the results of previous studies [9–11]. However, female predominance was not observed in the prevalence of wheeze. On the contrary, wheeze was more common in males in the age groups of more than 50 years. The reason for this discrepancy in association between the gender and the prevalences of two conditions, namely, current asthma and

wheeze, may be related to the difference in the prevalence of smoking status. When subjects in our study were restricted to nonsmokers, the prevalence of wheeze in age groups of 20–69 years were not statistically different between genders. Furthermore, Sunyer et al. [12] reported that, after a mutually adjusted factor analysis, wheeze/shortness of breath and asthma have opposite associations with smoking status, i.e. a positive association between smoking and wheeze/shortness of breath and a negative association between smoking and asthma.

One limitation of this study is the inconsistency in the method of selecting subjects (sampling from basic resident registers or sampling from nominal lists of residents' associations) and approaching subjects (door-to-door survey vs. postal survey). However, the results of the two different methods of selecting subjects or approaching subjects showed no systematic difference in the prevalences of asthma and asthma symptoms or in gender and age group distributions. The mean prevalence of current asthma in urban areas was higher than that in suburban areas. The degree of urbanization may affect the prevalence of current asthma. However, we cannot exclude the possibility that the relatively lower response rates observed in urban areas may cause sampling bias and increase the prevalence in urban areas. A further large-scale ecological study is needed to explore the effect of urbanization on the prevalence of asthma in Japan.

One more limitation of this study is that the prevalence of current asthma was merely determined on the basis of the questionnaire results, i.e. no objective indicators for asthma were used. However, the ECRHS questionnaire has been extensively validated by previous studies [12].

In conclusion, this cross-sectional study using the Japanese version of the ECRHS questionnaire revealed that the prevalences of wheeze and current asthma among Japanese adults aged 20–79 years were 10.1 and 4.2%, and standardized prevalences among young adults aged 20–44 years were 9.3 and 5.3%, respectively. While the prevalences were lower than those in Western countries, asthma was found to be also relatively common in Japan.

Appendix

Questionnaire

- Q1 Wheeze: 'Have you had wheezing or whistling in your chest at any time in the last 12 months?'
  - Q1.1 Wheeze with breathlessness: 'Have you been at all breathless when the wheezing noise was present?'
  - Q1.2 Wheeze without a cold: 'Have you had this wheezing or whistling when you did not have a cold?'
- Q2 Waking with tightness in the chest: 'Have you woken up with a feeling of tightness in your chest at any time in the last 12 months?'
- Q3 Waking with an attack of shortness of breath: 'Have you been woken by an attack of shortness of breath at any time in the last 12 months?'
- Q4 Waking with cough: 'Have you been woken by an attack of coughing at any time in the last 12 months?'
- Q5 Ever asthma: 'Have you ever had asthma?'
  - Q5.1 Ever asthma confirmed by doctor: 'Was this confirmed by a doctor?'
  - Q5.2 Onset age: 'How old were you when you had your first attack of asthma?'
  - Q5.3 Frequency of asthma attack: 'How many attacks of asthma have you had in the last 12 months?'
- Q6 Asthma medication: 'Are you currently taking any medicines (including inhalers, aerosols or tablets) for asthma?'
- Q7 Nasal allergy: 'Do you have any nasal allergies, including hay fever?'
- Q8 Chronic bronchitis: 'Have you had coughing and phlegm on most days for a minimum of 3 months a year and for at least 2 successive years?'

Acknowledgement

This work was supported by Health and Labor Sciences Research Grants.

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アレルギー 39(5),
536-544, 2010(平22)

原　著

気管支喘息及び鼻炎における血清総 IgE 値及び末梢血好酸球数の検討

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【背景・目的】血清総 IgE 値，末梢血好酸球数はアレルギー疾患の診療で広く用いられている．気管支喘息，アレルギー性鼻炎は互いに合併することが知られているが，合併を考慮した上で，これらの指標との関連を詳細に検討した報告はない．本研究では，両疾患の合併を考慮し，血清総 IgE 値，末梢血好酸球数との関連を検討した．

【方法】北海道十勝郡上士幌町住民 347 人を対象に，問診，血清総 IgE 値，末梢血好酸球数の測定を行い，両疾患との関連を検討した．

【結果】血清総 IgE 値は，特異的 IgE 反応の有無に関わらず，喘息単独群，鼻炎喘息合併群で有意に高値であった（$p<0.01$）が，鼻炎単独群では，上昇を認めなかった．末梢血好酸球数は鼻炎喘息合併群でのみ有意に高値であった（$p<0.005$）．

【結語】喘息は，鼻炎と比較し，抗原非特異的な血清総 IgE 値の上昇がより関与することが示唆された．また，血清総 IgE 値と末梢血好酸球数の指標としての相違が示唆された．

Key words: allergic rhinitis —— antigen specific IgE responses —— bronchial asthma —— peripheral eosinophil count —— total serum IgE levels

はじめに

血清総 IgE 値，末梢血好酸球数の測定は，気管支喘息，アレルギー性鼻炎などのアレルギー性疾患の診療において，その補助的診断として広く行われている．気管支喘息においては，血清総 IgE 値は，抗原特異的 IgE 反応陽性の有無に関わらず高値であることが，我々の検討も含め報告されている[1)-4)]．一方，鼻炎においては，アレルギー性鼻炎単独，特に花粉症単独の場合は，血清総 IgE

Received: November 12, 2009, Accepted: January 28, 2010
利益相反（conflict of interest）に関する開示：著者全員は本論文の研究内容について他者との利害関係を有しません．
Abbreviations: ANOVA "analysis of variance", COPD "chronic obstructive pulmonary disease", GM-CSF "granulocyte macrophage colony-stimulating factor", IL "interleukin", MAST "multiple antigen simultaneous test", TSLP "thymic stromal lipoprotein"
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値は高値を示さないとされている[3]．よって，両疾患における血清総IgE値の関与は異なっている可能性が考えられる．また，末梢血好酸球数は，アレルギー性鼻炎患者において高値であり，さらに喘息合併アレルギー性鼻炎患者では喘息非合併アレルギー性鼻炎患者と比べ高値であったとの報告があり[6]，アレルギー性疾患の指標として，末梢血好酸球数は血清総IgE値と異なっている可能性も考えられる．

気管支喘息，アレルギー性鼻炎は互いに高頻度で合併することが知られているが，両疾患の合併を考慮した上での，血清総IgE値，末梢血好酸球数との関連を詳細に検討した報告はない．今回我々は，厚生労働省免疫アレルギー疾患予防治療研究事業「気管支喘息の有病率，ガイドラインの普及効果とQOLに関する全年齢全国調査に関する研究」の分担研究の一環として，平成18年～20年に北海道上士幌町民を対象に，気管支喘息，鼻炎と血清総IgE値，末梢血好酸球数との関連を検討した．

対象と方法

平成18年から20年にかけて毎年11月～12月に，検査結果を還元することを条件に募集し，同意の得られた20歳以上の上士幌町民347人を対象とし，アレルギーに関する種々の問診，胸部レントゲン，呼吸機能検査，血清総IgE値，multiple antigen simultaneous test (MAST) 26®を用いた特異的IgE抗体（日立化成工業），シラカンバに対する特異的IgE抗体（IgE ImmunoCAP® (Phadia社，CAP RAST法)）及び末梢血好酸球数の測定をおこなった．

北海道大学病院第一内科の医師による問診で，「現在，気管支喘息に罹っていますか？」という質問に「はい」と答えた場合を“喘息あり”，「現在，花粉症を含む鼻アレルギーがありますか？」という質問に「はい」と答えた場合を“鼻炎あり”とした．15種類の吸入抗原（コナヒョウヒダニ，ハウスダスト，ネコ上皮，イヌ上皮，オオアワガエリ，ハルガヤ，ブタクサ混合物，ヨモギ，スギ，ペニシリウム，クラドスポリウム，カンジダ，アルテルナリア，アスペルギルス，シラカンバ）に対する特異的IgE抗体が一項目以上陽性である場合をアトピー素因ありと定義し，シラカンバ以外の14種についてはMAST法にて1.01ルミカウント以上を陽性とし，シラカンバについてはRAST法にて0.35UA/ml以上を陽性とした[7,8]．血清総IgE値，末梢血好酸球数の比較は，それぞれの値を対数変換後にanalysis of variance (ANOVA) を用いた．有意差が認められた場合にはpost hoc test (Bonferroni correction) を用いて群間比較を行った．すべての比較において性別，年齢，喫煙歴，他のアレルギー性疾患の有無で補正を行った．それぞれの疾患群におけるアトピー素因の割合の検討はカイ二乗検定にて行った．解析には統計ソフトウェアSYSTAT®11 (SYSTAT社) を用い$p<0.05$を有意差ありとした．本研究はヘルシンキ宣言を遵守し，「環境因子の免疫システムを中心とした生体恒常性維持機構への影響の研究」に関して北海道大学大学院医学研究科・医学部医の倫理委員会の承認を得ておこなわれた．

結　果

対象とした347人全体の背景及び気管支喘息を有する群，鼻炎を有する群の背景をTable 1に示す．対象全体で気管支喘息，鼻炎の有症率，アトピー素因者は過去の報告と比べて高率であった．本研究が募集に応じた町民のみを対象としたこと，気管支喘息と鼻炎の有無を問診のみで判断したこと，などが影響したものと考えられる．鼻炎は若年者，女性に多い傾向が認められ，非喫煙者が多かった．気管支喘息の59.3%に鼻炎が，鼻炎の24.7%に気管支喘息が認められた．

気管支喘息，鼻炎と血清総IgE値の関連をFig. 1 (A), (B) に示す．血清総IgE値は気管支喘息患者において有意に高値であり（$p<0.0001$），鼻炎患者でも高い傾向（$p=0.054$）が認められた．両疾患が血清総IgE値に独立して与える影響を検討するために，全対象者を，(i) 非鼻炎非喘息群（n=158），(ii) 鼻炎のみ群（n=122），(iii) 喘息のみ群（n=27），(iv) 鼻炎喘息合併群（n=40）の4群に分けて解析を行った．4群の背景はTable 2に示す通りである．血清総IgE値は，非鼻炎非喘息群と比較して喘息のみ群，鼻炎喘息合併群で有意に高値であったが（$p<0.01$），鼻炎のみ群では差をみと

Table 1 Characteristics of all subjects, subjects with rhinitis and subjects with asthma

	All subjects	Subjects with rhinitis	Subjects with asthma
Number	347	162	67
Sex (male/female)	127/220	49/113§	22/45
Age*	49 (21-87)	44 (21-76)§	45 (21-85)
Smoking habits (never/ex/current)	190/79/78	101/27/34§	37/12/18
Asthma†	67 (19.3%)	40 (24.7%)§	—
Rhinitis†	162 (46.7%)	—	40 (59.3%)¶
Other allergic disease†‡	106 (30.5%)	67 (41.4%)§	28 (41.8%)¶
Atopy†	196 (56.5%)	113 (69.8%)§	45 (67.2%)¶
log (IgE) (log[IU/ml])* (serum)	1.89 (0.70-3.88)	1.98 (0.79-3.68)§	2.22 (0.81-3.88)¶
Eosinophil count (log[eosinophil]) *(blood)	2.14 (0-3.15)	2.18 (0-3.15)§	2.28 (0-3.10)¶

*Median (range); †Number (%); ‡Subjects with allergic disease other than asthma and rhinitis (e.g., atopic dermatitis); §$p < 0.05$ (compared with subjects without rhinitis); ¶$p < 0.05$ (compared with subjects without asthma).

めなかった（$p=0.237$）(**Fig. 1 (C)**)．

アトピー素因と気管支喘息，アレルギー性鼻炎との関連は広く知られているが[5][9]，今回の検討において，アトピー素因は気管支喘息患者の 67.2% に認められ，気管支喘息のない人と比較して多い傾向が認められた（$p=0.05$）．一方，鼻炎患者の 69.8% にアトピー素因を認め，両者に有意な関連が認められた($p<0.05$)．問診上，気管支喘息，鼻炎に加えて，アトピー性皮膚炎，食物アレルギー，薬剤アレルギーなどのアレルギー性疾患を一切有さない対象において，アトピー素因の有無と血清総 IgE 値との関連を検討したところ，アトピー素因を有する群では，血清総 IgE 値が有意に高値であった（$p<0.0001$）(**Fig. 2**)．気管支喘息と血清総 IgE 値との関連において，アトピー素因の関与を検討するために，アトピー素因の有無別に血清総 IgE 値と喘息との関連を検討したところ，アトピー素因の有無によらず血清総 IgE 値は，非喘息非鼻炎群と比較し喘息のみ群において有意に高値であった（**Fig. 3 (A)**）．一方，アトピー素因の有無によって鼻炎のみ群と非鼻炎非喘息群と比較した場合，アトピー素因の有無にかかわらず，鼻炎と血清総 IgE 値との間に関連は認められなかった（**Fig. 3 (B)**）．

Fig. 4 (A), (B) に示すように，末梢血好酸球数は気管支喘息（$p<0.05$）及び鼻炎（$p=0.080$）患者で上昇していた．両疾患の有無による 4 群での比較では，非鼻炎非喘息群と鼻炎喘息合併群との間でのみ有意な差が認められた（$p<0.005$）(**Fig. 4 (C)**)．喘息のみ群と鼻炎喘息合併群との間では有意な差は認めなかった（$p=0.144$）．図には示していないが，問診上アレルギー性疾患がない対象者においては，アトピー素因と末梢血好酸球数との関連は認められなかった（$p=0.464$）．

考　察

血清総 IgE 値，末梢血好酸球数の測定は，気管支喘息，アレルギー性鼻炎などのアレルギー性疾患の診療において，その補助的診断として広く行われている．しかし，これらの指標と気管支喘息，

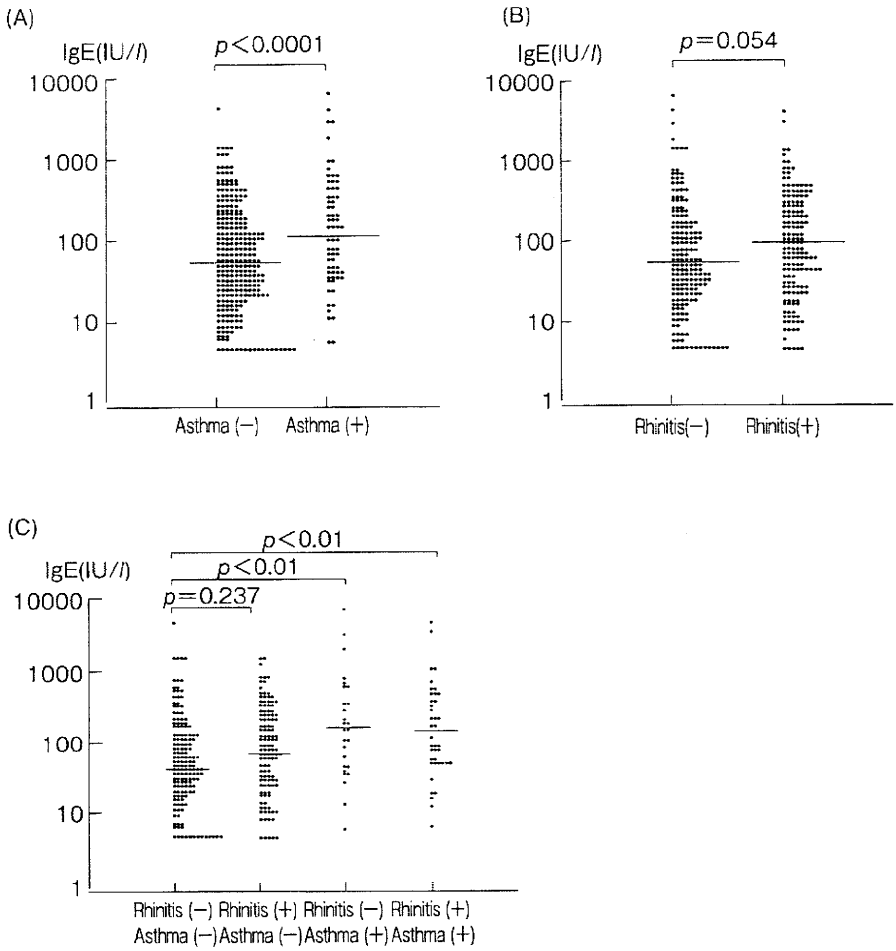

Fig. 1. Total serum IgE levels according to disease.
(A) With or without asthma; (B) with or without rhinitis; (C) 4 groups combining asthma and rhinitis status.
Bars indicate mean levels in each group.

鼻炎との関連は，異なっていることが過去の報告より示唆されている．

喘息ではアトピー素因の程度にかかわらず総IgE値と強く関連しているとする報告がある[1)2)]．今回の検討においても気管支喘息はアトピー素因の有無に関わらず血清総IgE値と強く関連していた．この結果は以前我々が報告した，当科通院喘息患者と健常ボランティアを対象とした研究の結果と一致している[3)]．IgE産生は抗原特異的なものと抗原感作によらない抗原非特異的なものとに分けられる[10)]．アトピー素因のない気管支喘息患者においても非鼻炎非喘息群と比較して血清総IgE値が高値であったことから，気管支喘息における血清総IgE値の上昇は，今回検討した15種類の吸入抗原以外の抗原が関与している可能性を完全には否定できないものの，環境などのアレルゲン以外の要因や喘息の発症の結果として抗原非特異的IgE反応性が亢進している可能性も考えられる．

一方，喘息を合併していない鼻炎では非喘息非鼻炎と比較して総IgE値に差を認めなかった．アトピー素因別の検討においても血清総IgE値と

Table 2 Characteristics of subjects in the 4 groups

	Rhinitis (−) Asthma (−)	Rhinitis (+) Asthma (−)	Rhinitis (−) Asthma (+)	Rhinitis (+) Asthma (+)
Number	158	122	27	40
Sex (male/female)	69/89	36/86	9/18	13/27
Age*	54 (21-87)	43 (21-76)	44 (21-85)	44 (23-75)
Smoking habits (never/ex/current)	76/46/36	77/21/24	13/6/8	24/6/10
Other allergic disease†‡	29 (18.4%)	49 (40.2%)	10 (37.0%)	18 (45.0%)
Atopy†	67 (42.4%)	84 (68.9%)	16 (59.3%)	29 (72.5%)
log (IgE) (log[IU/ml])* (serum)	1.71 (0-3.70)	1.95 (0.70-3.21)	2.26 (0.81-3.88)	1.98 (0.82-3.68)
Eosinophil count (log[eosinophil])* (blood)	2.09 (0-3.03)	2.14 (0-3.15)	2.20 (0-2.88)	2.26 (1.26-3.10)

*Median (range); †Number (%); ‡Subjects with allergic disease other than asthma and rhinitis (e.g., atopic dermatitis).

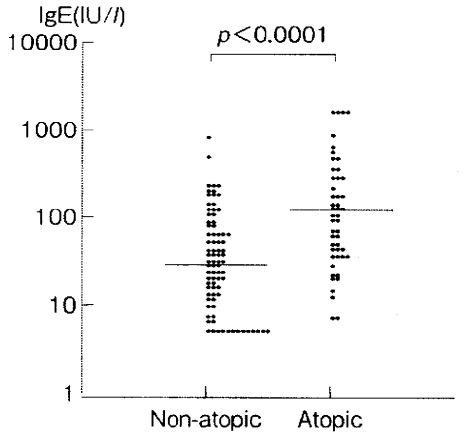

Fig. 2. Total serum IgE levels in non-allergic subjects according to atopic status.
Bars indicate mean levels in each group.

鼻炎との関連は認められなかった．よって，喘息では鼻炎と比較して抗原非特異的な IgE 産生との関連が強いことが示唆された．

近年，気道上皮細胞からの thymic stromal lipoprotein (TSLP)[11]，interleukin (IL)-25[12]，IL-33[13]，granulocyte macrophage colony-stimulating factor (GM-CSF)[14]などの proallergic cytokine が，気道上皮細胞に発現する Toll 様受容体刺激により産生され[15]，特異的 IgE 抗体の産生とは独立した慢性気道炎症に関与することが注目されている．今回の検討で，気管支喘息においてより抗原非特異的 IgE 産生が亢進していたのは，鼻炎と比較しこれらのパスウェイが下気道においてより深く関与している可能性も考えられる．

末梢血好酸球数は気管支喘息で高値であり，鼻炎で高値の傾向を認めた (**Fig. 4 (A), (B)**)．Braunstahl らは気管支喘息，アレルギー性鼻炎と末梢血好酸球数との関連について，気管支喘息合併アレルギー性鼻炎患者の末梢血好酸球数は気管支喘息非合併アレルギー性鼻炎患者よりも有意に高値であったと報告している[6]．また，喀痰中好酸球割合が鼻炎喘息合併群において，鼻炎非合併喘息群よりも高値であったとの報告もある[16]．我々の検討結果もこれらの一連の報告に矛盾しないものであった．

アレルギー性鼻炎，気管支喘息は，上下気道に生じるアレルギー性気道疾患として，病態の共通性及び，ひとつの気道疾患として，いわゆる，one

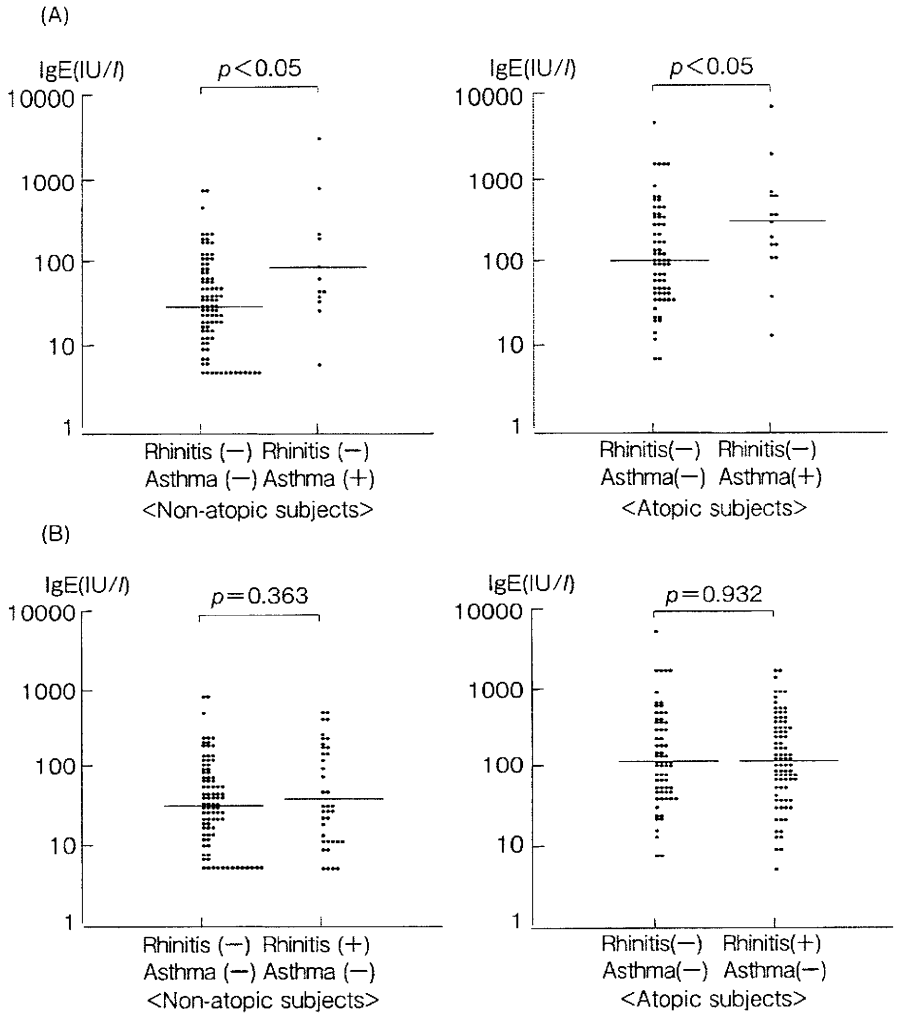

Fig. 3. Total serum IgE levels according to disease and atopic status.
(A) With or without asthma; (B) with or without rhinitis.
Bars indicate mean levels in each group.

airway one disease の概念が提唱されている[17]．一方で，上下気道における解剖学的な相違，また両疾患の病態の相違は存在し，本研究の結果は，特に血清総 IgE 値との関連において，両疾患の異なる一側面と考えられた．

本研究の限界として，自主的に募集に応じた町民を対象としたこと，気管支喘息，鼻炎の診断を問診でおこなったこと，北海道においてシラカンバをはじめとした花粉の飛散時期ではない 11 月～12 月に検査をおこなったことが挙げられる．募集に応じた町民を対象にしたことで，既にアレルギー疾患を指摘されている人やアレルギー症状がある人などが多く集まったと考えられ，実際，今回検討した集団の気管支喘息，鼻炎をはじめとしたアレルギー性疾患の有病率は，過去に報告されているものよりも高く，本研究の結果に影響を与えた可能性はある．また，気管支喘息，鼻炎の診断を医師による問診のみで行ったことにより，特に高齢者においては，慢性閉塞性肺疾患 (COPD) などが含まれている可能性があり，鼻炎

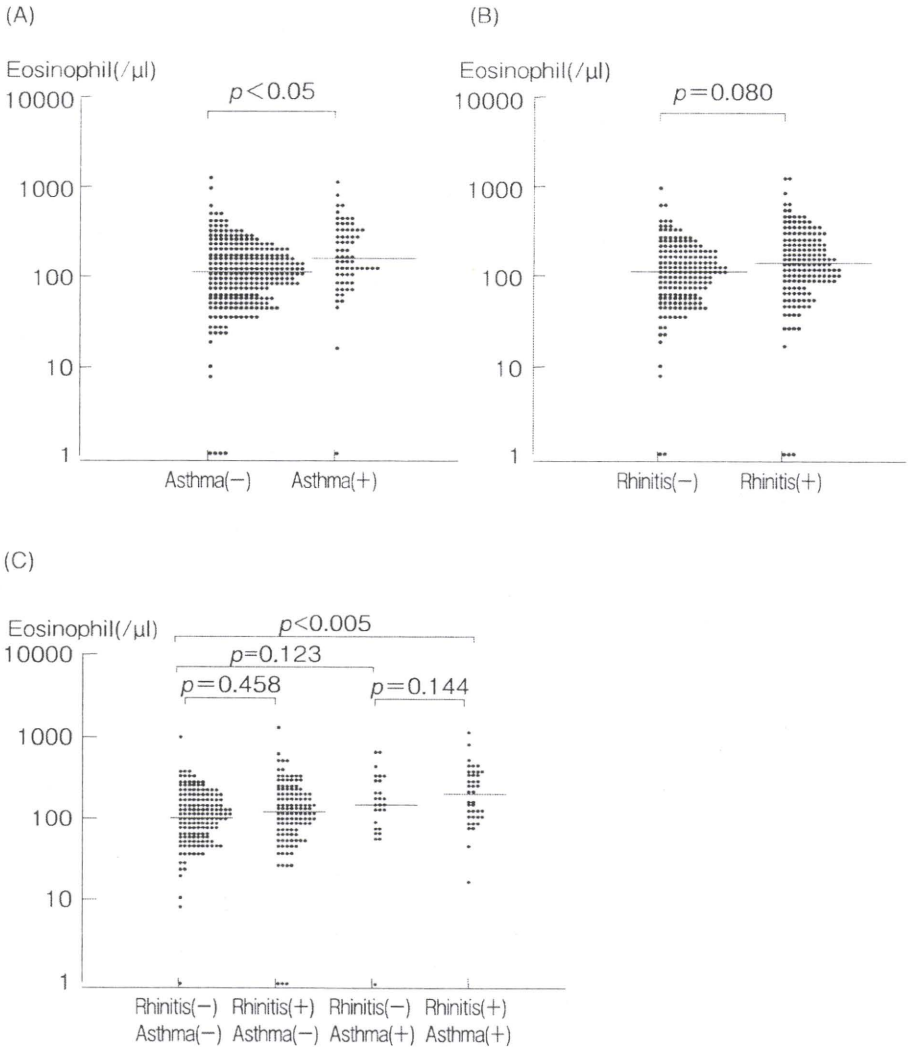

Fig. 4. Peripheral eosinophil counts according to disease.
(A) With or without asthma; (B) with or without rhinitis; (C) 4 groups combining asthma and rhinitis status.
Bars indicate mean levels in each group.

においては非アレルギー性の鼻炎が含まれている可能性がある．また，本調査は，花粉の飛散時期でない 11 月～12 月に検査を行っており，特に鼻炎における血清総 IgE 値，末梢血好酸球数は，花粉飛散時期に行った場合と結果が異なった可能性がある．

本研究の結果より，類似点が多いと考えられている気管支喘息と鼻炎において，両疾患と血清総 IgE 値との関連は異なる可能性が示され，喘息は，鼻炎と比較し，抗原非特異的な血清総 IgE 値の上昇がより関与することが示唆された．また，通常，アレルギー検査として広く用いられる血清総 IgE 値と末梢血好酸球数のアレルギー性疾患の指標としての相違が示唆された．

謝　辞

IgE MAST26®測定にご協力いただいた日立化成工業株式会社に感謝申し上げます.

本論文の要旨は日本アレルギー学会第21回春季臨床大会にて発表した.

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EVALUATING TOTAL SERUM IgE LEVELS AND PERIPHERAL EOSINOPHIL COUNT IN ASTHMA AND RHINITIS

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Background: Total serum immunoglobulin (Ig)E levels and peripheral blood eosinophil counts are widely examined to evaluate patients with various allergic diseases. Asthma and allergic rhinitis often coexist. However, the significance of these indices for asthma and rhinitis under consideration of the status of co-existence has not been fully elucidated and was therefore examined in the present study.

Methods: Subjects comprised 347 adult residents in Kamishihoro town, Hokkaido. Relationships between two indices and asthma, rhinitis and their coexistence were analyzed.

Results: Serum IgE (sIgE) levels were significantly higher in asthma with ($p<0.01$) or without ($p<0.01$) rhinitis, regardless of atopic status, but not in rhinitis alone. Peripheral eosinophil counts were significantly higher only in asthma with rhinitis ($p<0.005$).

Conclusion: Compared with rhinitis, non-antigen-specific IgE production may contribute more to elevated levels of sIgE in asthma. In addition, the significance of sIgE and peripheral eosinophil count as indices of evaluating asthma and rhinitis might differ.

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