



National Hospital Organization  
FUKUOKA NATIONAL HOSPITAL

*Sympathy, compassion with  
persons fighting against illness, and  
aspiration for medicine of better  
quality*

# Exercise-Induced Bronchoconstriction (EIB) and Asthma (EIA) in the General Population and Asthmatic Subjects

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# **Exercise-induced bronchoconstriction (EIB)**

“Exercise, especially strenuous exercise, causes hyperpnea, which in turn causes drying of the airways, requiring humidification and often warming of large volumes of air during a short interval. The respiratory water loss that occurs at high ventilation rates, which may be associated with airway cooling and dehydration, leads to increases in osmolarity of the airway surface. The increase in osmolarity of the airway is postulated to induce degranulation of airway mast cells with release of chemical mediators including prostaglandins, leukotrienes, and histamine, with bronchoconstriction of the airway” (Weiler JM et al, 2010).

# EIB and exercise-induced asthma (EIA)

- The diagnosis of EIB usually requires a decrease in FEV<sub>1</sub> after exercise of 10% to 15% of the preexercise value (*Ibid*).
- “as many as 90% of asthmatic patients and 50% of competitive athletes may experience EIB” (*Ibid*).
- The following features are typical of asthma and, if present, increase the probability that the patient has asthma:
  - Symptoms are triggered by viral infections (colds), **exercise**, allergen exposure, changes in weather, laughter, or irritants such as car exhaust fumes, smoke or strong smells (Global Initiative for Asthma).

# **Exercise-induced wheezing (EIW)**

**Definition of having EIW:** if a child (or a guardian) answered “Yes” to a question, “In the past 12 months, has your (or your child’s) chest sounded wheezy during or after exercise?” (a question of the ISAAC questionnaire)

**Logic of use of EIW as proxy for EIA (exercise-induced asthma (attack)):**

Large population surveys with concomitant use of challenge test to diagnose EIB are unlikely feasible.

Proportion of children with wheezing during/after exercise due to non-asthmatic diseases may be smaller among children with current asthma than that among children without current asthma.

# **The nation-wide cross-sectional survey of asthma and other allergic diseases in Japan**

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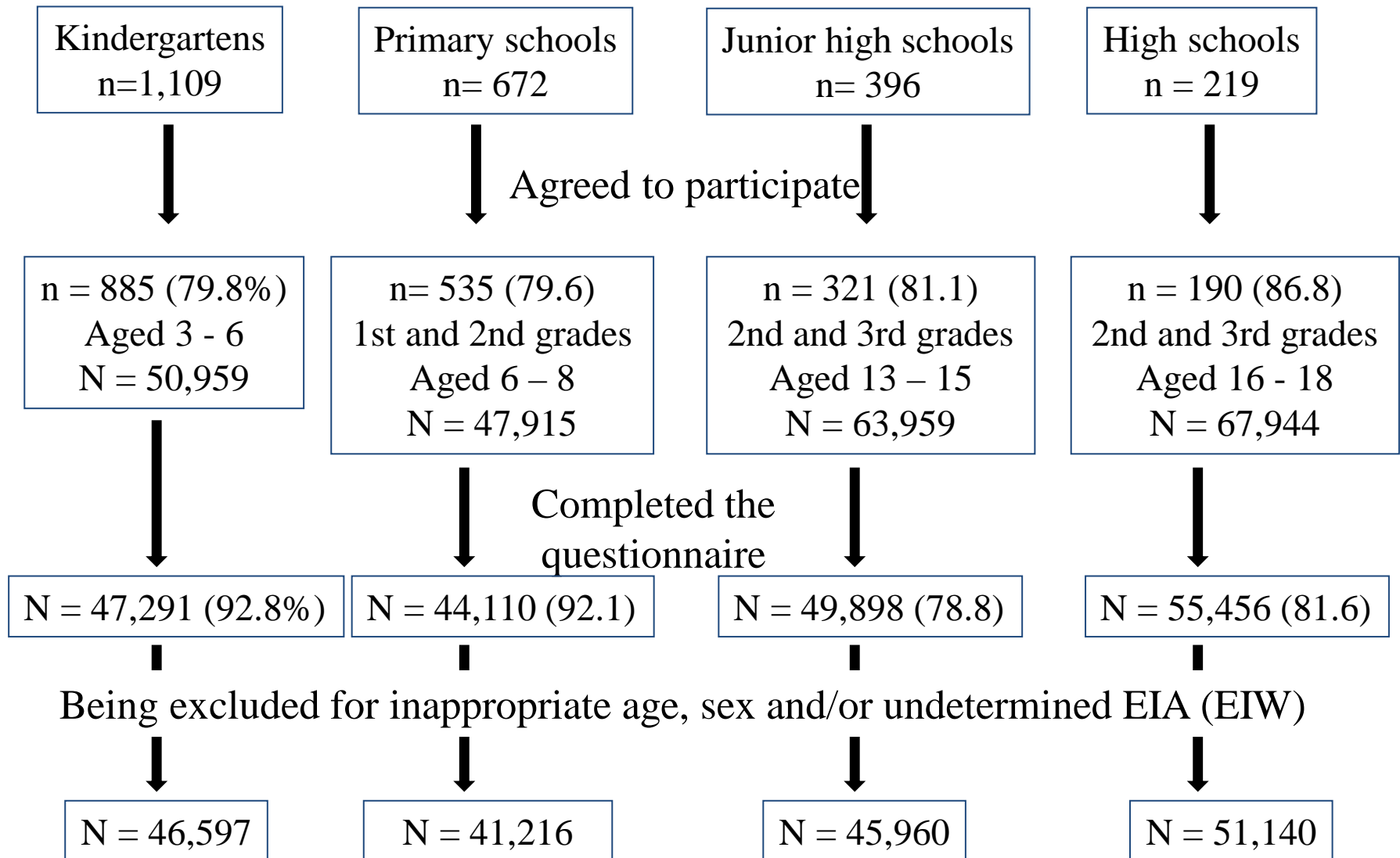
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# Study subjects

Being asked by each of 47 prefectural boards of education



# Definition of current asthma

**Having current asthma;** if a child or a guardian answered “Yes” to both of two questions,

*“Have you (or has your child ) ever had wheezing or whistling in the chest at any time in the past?”*

*“Have you (or has your child ) had wheezing or whistling in the chest in the past 12 months?”*

**Severity of asthma: wheezing in the past 4 weeks;**

None: intermittent

Monthly or more but not weekly: mild

Weekly or more but not every day: moderate

Every day: severe



# Prevalence of exercise-induced wheezing (EIW) according to current asthma status by age group, a nation-wide survey in Japan

	Current asthma				All
	Yes		No		
<b>Kindergartners aged 3 - 6</b>					
EIW Yes	1,955	20.92%	278	0.75%	4.8%
No	7,388	79.08%	36,934	99.25%	95.2%
<b>Primary school pupils aged 6 - 8 in the 1st and 2nd grades</b>					
EIW Yes	1,672	28.65%	263	0.74%	4.7%
No	4,163	71.35%	35,118	99.26%	95.3%
<b>Junior high school pupils aged 13 - 15 in the 2nd and 3rd grades</b>					
EIW Yes	3,459	76.12%	4,783	11.55%	17.9%
No	1,085	23.88%	36,633	88.45%	82.1%
<b>High school pupils aged 16 - 18 in the 2nd and 3rd grades</b>					
EIW Yes	3,225	73.61%	4,657	9.97%	15.4%
No	1,156	26.39%	42,066	90.03%	84.6%

(Murakami Y et al. Allergol Int. 2014; 63(2): 251-9.)

## Severity of current asthma and exercise-induced wheezing (EIW), a nation-wide survey in Japan

Severity of asthma	Total (n)	EIW (n)	%	<i>Odds ratio</i>	95% CI		P value
<b>Kindergartners aged 3 - 6</b>							
None in the past 4 weeks	5,844	732	12.5%	<b>1.00</b>	Reference		
Monthly or more but not weekly	2,485	766	30.8%	<b>3.11</b>	2.77	3.50	<0.01
Weekly or more but not every day	881	404	45.9%	<b>5.91</b>	5.04	6.95	<0.01
Every day	109	52	47.7%	<b>6.37</b>	4.32	9.39	<0.01
<b>Primary school pupils aged 6 – 8 in the 1st and 2nd grades</b>							
None in the past 4 weeks	3,776	739	19.6%	<b>1.00</b>	Reference		
Monthly or more but not weekly	1,471	617	41.9%	<b>2.97</b>	2.59	3.40	<0.01
Weekly or more but not every day	486	269	55.3%	<b>5.09</b>	4.16	6.24	<0.01
Every day	66	35	53.0%	<b>4.64</b>	2.83	7.60	<0.01
<b>Junior high school pupils aged 13 – 15 in the 2nd and 3rd grades</b>							
None in the past 4 weeks	2,424	1,630	67.2%	<b>1.00</b>	Reference		
Monthly or more but not weekly	1,322	1,123	84.9%	<b>2.75</b>	2.30	3.28	<0.01
Weekly or more but not every day	625	565	90.4%	<b>4.59</b>	3.45	6.10	<0.01
Every day	123	110	89.4%	<b>4.12</b>	2.30	7.39	<0.01
<b>High school pupils aged 16 - 18 in the 2nd and 3rd grades</b>							
None in the past 4 weeks	2,413	1,610	66.7%	<b>1.00</b>	Reference		
Monthly or more but not weekly	1,268	1,008	79.5%	<b>1.93</b>	1.64	2.27	<0.01
Weekly or more but not every day	543	472	86.9%	<b>3.32</b>	2.54	4.33	<0.01
Every day	107	98	91.6%	<b>5.43</b>	2.72	10.85	<0.01

(Murakami Y et al. Allergol Int. 2014; 63(2): 251-9.)

# Allergic rhinitis and exercise-induced wheezing

- EIB can be incurred with increased osmolarity of the airway surface in response to such cooling and dehydration.
- Nose is involved in humidification, and the damaged nasal airway in subjects with allergic rhinitis (AR) may increase occurrence of the EIB.
- Possible relationship AR and exercise-induced wheezing, a some proxy of EIB: results will be presented in the workshop.

# Atopic dermatitis, food allergy and EIW

- Atopic dermatitis (AD) is a chronic relapsing inflammatory skin disorder, characterized by severe pruritus, a distinctive distribution of eczematous skin lesions and often a personal and family history of atopic diseases.
- Because AD and food allergy as well frequently precede asthma on the way to the atopic march.
- It would be worth enquiring into possible association between AD and FA and a risk for having EIW, a proxy for EIA: results will be presented in the workshop.

# **Definition of atopic dermatitis, food allergy and sensitivity to specific antigens**

## **Doctor-diagnosed atopic dermatitis:**

“Yes” to a question, “Has your child been diagnosed as having atopic dermatitis by a doctor?”

## **Food allergy (FA):**

“Yes” to a question, “Has your child ever had any food allergy?”

## **FA with laboratory confirmation:**

“Yes” also to another question, “Has it (FA) been confirmed with blood examination or skin test?”.

## **Sensitivity to specific allergens:**

“Yes” to a question, “Has your child had allergy to mite, house dust, dog, cat or pollen?”

## **Sensitivity to specific allergen with laboratory confirmation:**

Defined in a similar way to that for food allergy with laboratory confirmation.

# **Relation between atopic dermatitis (AD) and exercise-induced asthma among school children aged 6 to 18**

**Having current AD:** “Yes” to all of three questions,

1. “Have you ever had an itchy rash which was coming and going for at least six months?”
2. “Have you had this itchy rash at any time in the past 12 months”
3. “Has this itchy rash at any time affected any of the following places: the folds of the elbows, behind the knees, in front of the ankles, under the buttocks, or around the neck, ears or eyes?”

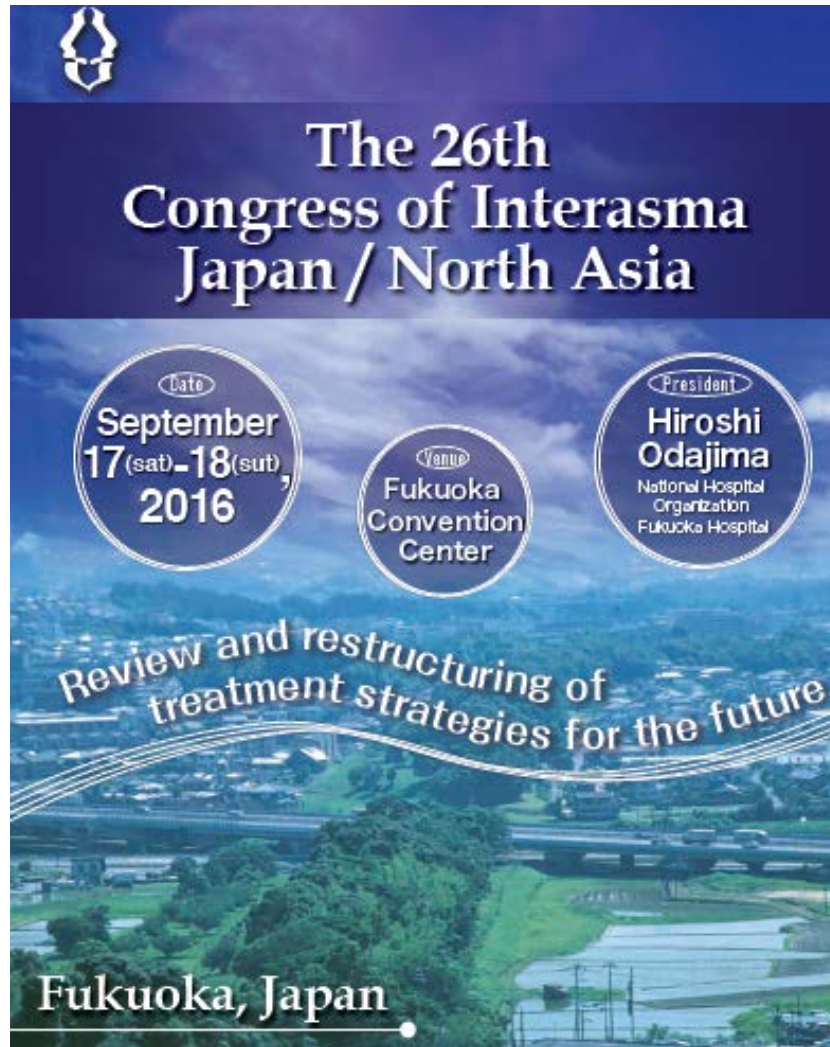
**Persistency of the AD:** “Yes” to a question,

“Has this rash cleared completely at any time during the past 12 months?”

**Degree of itching due to AD:**

“In the past 12 months, how often, on average, have you been kept awake at night by this itchy rash?:

1. Never in the past 12 months,
2. Less than one night per week, or
3. One or more nights per week.



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(Fukuoka is one of)  
**The Ten Most Dynamic Cities**  
“Fukuoka is riding the Kyushu factor. The local airport is bustling”.  
**Newsweek, 2006**

**Quality of Life Survey 2014 by Monocle, British magazine**  
**Fukuoka City was ranked number 10.**

“Finding the measure of a city is as much about the intangibles that light up a community as the infrastructure keeping it going. We've sized up where the balance is best with our annual top 25.”