

Table 1 Prevalence of exercise-induced wheezing (EIW) by age and sex, a nation-wide survey in Japan

Age (years)	All									Boys							Girls							P for difference between boys and girls				
	Total (n)	EIW (-)		EIW (+)		Odds ratio	95% confidence interval		P value	Total (n)	EIW (-)		EIW (+)		Odds ratio	95% confidence interval		P value	Total (n)	EIW (-)		EIW (+)			Odds ratio	95% confidence interval		P value
		n	%	n	%		Lower limit	Upper limit			n	%	n	%		Lower limit	Upper limit			n	%	n	%			Lower limit	Upper limit	
Kindergartners																												
3	6,557	6,317	96.3%	240	3.7%	0.66	0.57	0.76	<0.01	3,317	3,170	95.6%	147	4.4%	0.67	0.55	0.80	<0.01	3,240	3,147	97.1%	93	2.9%	0.65	0.52	0.81	<0.01	
4	16,106	15,385	95.5%	721	4.5%	0.81	0.74	0.89	<0.01	8,163	7,722	94.6%	441	5.4%	0.82	0.72	0.93	<0.01	7,943	7,663	96.5%	280	3.5%	0.80	0.69	0.93	<0.01	
5	20,795	19,662	94.6%	1,133	5.4%	1.00		Reference		10,504	9,820	93.5%	684	6.5%	1.00		Reference		10,291	9,842	95.6%	449	4.4%	1.00		Reference		
6	3,139	3,000	95.6%	139	4.4%	0.80	0.67	0.96	0.02	1,616	1,538	95.2%	78	4.8%	0.73	0.57	0.93	<0.01	1,523	1,462	96.0%	61	4.0%	0.91	0.70	1.20	0.52	
Total	46,597	44,364	95.2%	2,233	4.8%		P for trend of odds		<0.01	23,600	22,250	94.3%	1,350	5.7%		P for trend of odds		<0.01	22,997	22,114	96.2%	883	3.8%		P for trend of odds		<0.01	<0.01
Primary school pupils in the 1st and 2nd grades																												
6	17,491	16,667	95.3%	824	4.7%	1.00	0.91	1.10	0.99	8,926	8,419	94.3%	507	5.7%	1.07	0.95	1.22	0.26	8,565	8,248	96.3%	317	3.7%	0.90	0.78	1.05	0.17	
7	20,223	19,270	95.3%	953	4.7%	1.00		Reference		10,345	9,796	94.7%	549	5.3%	1.00		Reference		9,878	9,474	95.9%	404	4.1%	1.00		Reference		
8	3,502	3,344	95.5%	158	4.5%	0.96	0.80	1.14	0.60	1,786	1,693	94.8%	93	5.2%	0.98	0.78	1.23	0.86	1,716	1,651	96.2%	65	3.8%	0.92	0.71	1.21	0.56	
Total	41,216	39,281	95.3%	1,935	4.7%		P for trend of odds		0.73	21,057	19,908	94.5%	1,149	5.5%		P for trend of odds		0.24	20,159	19,373	96.1%	786	3.9%		P for trend of odds		0.38	<0.01
Junior high school pupils in the 1st and 2nd and 3rd grades																												
13	19,229	15,785	82.1%	3,444	17.9%	0.99	0.94	1.04	0.76	9,355	7,703	82.3%	1,652	17.7%	1.02	0.95	1.10	0.54	9,874	8,082	81.9%	1,792	18.1%	0.96	0.90	1.03	0.31	
14	22,563	18,496	82.0%	4,067	18.0%	1.00		Reference		11,061	9,144	82.7%	1,917	17.3%	1.00		Reference		11,502	9,352	81.3%	2,150	18.7%	1.00		Reference		
15	4,168	3,437	82.5%	731	17.5%	0.97	0.89	1.05	0.45	2,186	1,813	82.9%	373	17.1%	0.98	0.87	1.11	0.76	1,982	1,624	81.9%	358	18.1%	0.96	0.85	1.09	0.51	
Total	45,960	37,718	82.1%	8,242	17.9%		P for trend of odds		0.82	22,602	18,660	82.6%	3,942	17.4%		P for trend of odds		0.43	23,358	19,058	81.6%	4,300	18.4%		P for trend of odds		0.61	<0.01
High school pupils in the 1st and 2nd and 3rd grades																												
16	21,567	18,028	83.6%	3,539	16.4%	1.12	1.07	1.18	<0.01	11,094	9,238	83.3%	1,856	16.7%	1.13	1.06	1.21	<0.01	10,473	8,790	83.9%	1,683	16.1%	1.11	1.03	1.19	<0.01	
17	25,166	21,418	85.1%	3,748	14.9%	1.00		Reference		12,938	10,990	84.9%	1,948	15.1%	1.00		Reference		12,228	10,428	85.3%	1,800	14.7%	1.00		Reference		
18	4,371	3,776	86.4%	595	13.6%	0.90	0.82	0.99	0.03	2,331	2,013	86.4%	318	13.6%	0.89	0.78	1.01	0.08	2,040	1,763	86.4%	277	13.6%	0.91	0.79	1.04	0.18	
Total	51,104	43,222	84.6%	7,882	15.4%		P for trend of odds		<0.01	26,363	22,241	84.4%	4,122	15.6%		P for trend of odds		<0.01	24,741	20,981	84.8%	3,760	15.2%		P for trend of odds		<0.01	0.17

All tables are from Murakami Y, Honjo S, Odajima H et al. Exercise-induced wheezing among Japanese pre-school children and pupils. *Allergol Int.* 2014 Jun; 63(2): 251-9.

Table 2 Relation between exercise-induced wheezing (EIW) and sex, age, daily use of leukotriene receptor antagonist and daily use of inhaled medication, a nation-wide survey in Japan: multivariate analysis

Variables	Total* (n)	EIW (n)	%	Severe EIW (n)**	%	EIW			Severe EIW				
						Adjusted odds ratio [†]	95% confidence interval		P value	Adjusted odds ratio [†]	95% confidence interval		P value
							Lower limit	Upper limit			Lower limit	Upper limit	
Sex													
Boy	93,622	10,563	11.3%	3,173	3.4%	1.00		Reference		1.00		Reference	
Girl	91,255	9,729	10.7%	2,625	2.9%	0.99	0.96	1.02	0.456	0.89	0.84	0.94	<0.01
Educational facility type													
Kindergartners	46,597	2,233	4.8%	494	1.1%	1.00		Reference		1.00		Reference	
Primary school pupils in the 1st and 2nd grades	41,216	1,935	4.7%	381	0.9%	0.98	0.91	1.04	0.458	0.86	0.75	0.98	0.026
Junior high school pupils in the 1st and 2nd and 3rd grades	45,960	8,242	17.9%	2,660	5.8%	5.59	5.30	5.89	<0.01	6.66	6.03	7.36	<0.01
High school pupils in the 1st and 2nd and 3rd grades	51,104	7,882	15.4%	2,263	4.4%	4.75	4.51	5.01	<0.01	5.14	4.65	5.69	<0.01
							P for trend of odds		<0.01		P for trend of odds		<0.01
Daily use of leukotriene receptor antagonist													
No	179,614	18,060	10.1%	5,098	2.8%	1.00		Reference		1.00		Reference	
Yes	5,263	2,232	42.4%	700	13.3%	6.39	5.90	6.91	<.001	3.85	3.40	4.37	<0.01
Daily use of inhaled medication													
No	179,940	17,772	9.9%	4,919	2.7%	1.00		Reference		1.00		Reference	
Yes	4,937	2,520	51.0%	879	17.8%	5.09	4.73	5.47	<.001	4.25	3.81	4.74	<0.01

*Excluded were subjects with a missing value for severity of current asthma. **Defined if EIW occurred ≥ 1 /week. [†]Adjusted for other variables in Table and prefecture (Northern (20 prefectures) and Southern (27) Japan).

Table 3 Relation between exercise-induced wheezing (EIW) and severity of asthma among kindergartners with current asthma referring to daily use of leukotriene receptor antagonist, a nation-wide survey in Japan: multivariate analysis

Severity of asthma	EIW				Severe EIW*			
	Adjusted odds ratio**	95% confidence interval		P value	Adjusted odds ratio**	95% confidence interval		P value
		Lower limit	Upper limit			Lower limit	Upper limit	
	P for interaction with daily use of leukotriene receptor antagonist: 0.071				P for interaction with daily use of leukotriene receptor antagonist: 0.037			
	No daily use of leukotriene receptor antagonist							
Intermittent	1.00	Reference			1.00	Reference		
Mild	2.84	2.47	3.28	<0.01	2.50	1.69	3.69	<0.01
Moderate	4.87	3.98	5.96	<0.01	14.81	10.34	21.21	<0.01
Severe	7.49	4.53	12.38	<0.01	32.31	17.40	59.98	<0.01
	P for trend of odds			<0.01	P for trend of odds			<0.01
	Daily use of leukotriene receptor antagonist							
Intermittent	1.00	Reference			1.00	Reference		
Mild	2.28	1.83	2.84	<0.01	3.96	1.88	8.32	<0.01
Moderate	4.15	3.17	5.43	<0.01	33.24	16.55	66.76	<0.01
Severe	2.88	1.55	5.34	<0.01	23.97	9.09	63.19	<0.01
	P for trend of odds			<0.01	P for trend of odds			<0.01

Excluded were subjects with a missing value for severity of current asthma. *Defined if EIW occurred ≥ 1 /week. **Adjusted for sex, age, daily use of inhaled medication and prefecture (Northern (20 prefectures) and Southern (27) Japan).

Supplementary Table 1 Distribution of severity of exercise-induced wheezing (EIW) among current asthmatics by age, a nation-wide survey in Japan

Age (years)	Severity (frequency of attack)* of EIW							
	No in recent 4 wk		≥1/mo and <1/wk		≥1/wk		Every day	
	n	%**	n	%	n	%	n	%
Kindergartners								
3	76	31.7%	92	38.3%	51	21.3%	13	5.4%
4	258	35.8%	291	40.4%	119	16.5%	38	5.3%
5	403	35.6%	474	41.8%	185	16.3%	58	5.1%
6	54	38.8%	54	38.8%	22	15.8%	8	5.8%
Total	791	35.4%	911	40.8%	377	16.9%	117	5.2%
P for trend of severity by age among subjects with EIW								0.18
Primary school pupils in the 1st and 2nd grades								
6	333	40.4%	322	39.1%	117	14.2%	28	3.4%
7	387	40.6%	339	35.6%	168	17.6%	38	4.0%
8	65	41.1%	62	39.2%	25	15.8%	5	3.2%
Total	785	40.6%	723	37.4%	310	16.0%	71	3.7%
P for trend of severity by age among subjects with EIW								0.54
Junior high school pupils in the 1st and 2nd and 3rd grades								
13	1,091	31.7%	1,202	34.9%	919	26.7%	179	5.2%
14	1,307	32.1%	1,386	34.1%	1,043	25.6%	286	7.0%
15	229	31.3%	265	36.3%	176	24.1%	57	7.8%
Total	2,627	31.9%	2,853	34.6%	2,138	25.9%	522	6.3%
P for trend of severity by age among subjects with EIW								0.51
High school pupils in the 1st and 2nd and 3rd grades								
16	1,263	35.7%	1,219	34.4%	790	22.3%	227	6.4%
17	1,388	37.0%	1,258	33.6%	830	22.1%	230	6.1%
18	217	36.5%	190	31.9%	152	25.5%	34	5.7%
Total	2,868	36.4%	2,667	33.8%	1,772	22.5%	491	6.2%
P for trend of severity by age among subjects with EIW								0.69

wk: week, mo: month. *Sum of subjects with different degree of severity of EIW is not equal to the number of all subjects with EIW as shown in Table 1 due to missing values. ** Proportion to all subjects with EIW.

Supplementary Table 2 Relation between exercise-induced wheezing (EIW) and severity of asthma among current asthmatics, a nation-wide survey in Japan

Severity of asthma	Total (n)	EIW (n)	%	severe EIW (n)*		EIW				Severe EIW			
						Odds ratio	95% confidence interval		P value	Odds ratio	95% confidence interval		P value
							Lower limit	Upper limit			Lower limit	Upper limit	
Kindergartners													
Intermittent	5,844	732	12.5%	66	1.1%	1.00	Reference			1.00	Reference		
Mild	2,485	766	30.8%	82	3.3%	3.11	2.77	3.50	<0.01	2.99	2.15	4.15	<0.01
Moderate	881	404	45.9%	181	20.5%	5.91	5.04	6.95	<0.01	22.64	16.57	30.93	<0.01
Severe	109	52	47.7%	27	24.8%	6.37	4.32	40.07	<0.01	28.83	17.22	48.25	<0.01
						P for trend of odds			<0.01	P for trend of odds			<0.01
Primary school pupils in the 1st and 2nd grades													
Intermittent	3,776	739	19.6%	51	1.4%	1.00	Reference			1.00	Reference		
Mild	1,471	617	41.9%	55	3.7%	2.97	2.59	3.40	<0.01	2.84	1.93	4.18	0.17
Moderate	486	269	55.3%	137	28.2%	5.09	4.16	6.24	<0.01	28.67	19.74	41.65	<0.01
Severe	66	35	53.0%	23	34.8%	4.64	2.83	7.60	<0.01	39.07	21.27	71.77	<0.01
						P for trend of odds			<0.01	P for trend of odds			<0.01
Junior high school pupils in the 1st and 2nd and 3rd grades													
Intermittent	2,424	1,630	67.2%	223	9.2%	1.00	Reference			1.00	Reference		
Mild	1,322	1,123	84.9%	263	19.9%	2.75	2.30	3.28	<0.01	2.45	2.02	2.98	<0.01
Moderate	625	565	90.4%	420	67.2%	4.59	3.45	6.10	<0.01	20.22	15.52	26.34	<0.01
Severe	123	110	89.4%	87	70.7%	4.12	2.30	7.39	<0.01	23.85	15.20	37.43	<0.01
						P for trend of odds			<0.01	P for trend of odds			<0.01
High school pupils in the 1st and 2nd and 3rd grades													
Intermittent	2,413	1,610	66.7%	182	7.5%	1.00	Reference			1.00	Reference		
Mild	1,268	1,008	79.5%	216	17.0%	1.93	1.64	2.27	<0.01	2.52	2.03	3.11	<0.01
Moderate	543	472	86.9%	336	61.9%	3.32	2.54	4.33	<0.01	19.90	15.10	26.22	<0.01
Severe	107	98	91.6%	71	66.4%	5.43	2.72	10.85	<0.01	24.18	15.16	38.55	<0.01
						P for trend of odds			<0.01	P for trend of odds			<0.01

*Defined if EIW occurred ≥ 1 /week. Sum of subjects with current asthma is not equal to the number of all subjects with current asthma due to missing value.

Supplementary Table 3 Relation between exercise-induced wheezing (EIW) and daily use of leukotriene receptor antagonist and inhaled medication by educational facility type, a nation-wide survey in Japan: multivariate analysis

Variables	Total* (n)	EIW (n)	%	Severe EIW (n)**	%	EIW			Severe EIW				
						Adjusted odds ratio [†]	95% confidence interval		P value	Adjusted odds ratio [†]	95% confidence interval		P value
							Lower limit	Upper limit			Lower limit	Upper limit	
Kindergarteners													
Daily use of leukotriene receptor antagonist													
No	44,257	1,458	3.3%	329	0.7%	1.00		Reference		1.00		Reference	
Yes	2,340	775	33.1%	165	7.1%	9.81	8.71	11.05	<0.01	6.89	5.41	8.77	<0.01
Daily use of inhaled medication													
No	45,465	1,826	4.0%	399	0.9%	1.00		Reference		1.00		Reference	
Yes	1,132	407	36.0%	95	8.4%	2.87	2.44	3.38	<0.01	2.58	1.92	3.46	<0.01
Primary school pupils in the 1st and 2nd grades													
Daily use of leukotriene receptor antagonist													
No	39,529	1,364	3.5%	263	0.7%	1.00		Reference		1.00		Reference	
Yes	1,687	571	33.8%	118	7.0%	6.27	5.39	7.30	<0.01	5.64	4.07	7.81	<0.01
Daily use of inhaled medication													
No	39,967	1,456	3.6%	284	0.7%	1.00		Reference		1.00		Reference	
Yes	1,249	479	38.4%	97	7.8%	5.12	4.33	6.05	<0.01	3.50	2.47	4.95	<0.01
Junior high school pupils in the 1st and 2nd and 3rd grades													
Daily use of leukotriene receptor antagonist													
No	45,250	7,749	17.1%	2,443	5.4%	1.00		Reference		1.00		Reference	
Yes	710	493	69.4%	217	30.6%	3.49	2.88	4.23	<0.01	2.50	2.01	3.10	<0.01
Daily use of inhaled medication													
No	44,609	7,380	16.5%	2,305	5.2%	1.00		Reference		1.00		Reference	
Yes	1,351	862	63.8%	355	26.3%	5.99	5.27	6.82	<0.01	4.41	3.74	5.21	<0.01
High school pupils in the 1st and 2nd and 3rd grades													
Daily use of leukotriene receptor antagonist													
No	50,578	7,489	14.8%	2,063	4.1%	1.00		Reference		1.00		Reference	
Yes	526	393	74.7%	200	38.0%	4.11	3.25	5.19	<0.01	3.40	2.67	4.33	<0.01
Daily use of inhaled medication													
No	49,899	7,110	14.2%	1,931	3.9%	1.00		Reference		1.00		Reference	
Yes	1,205	772	64.1%	332	27.6%	7.07	6.16	8.11	<0.01	5.58	4.67	6.68	<0.01

*Excluded were subjects with a missing value for severity of current asthma. **Defined if EIW occurred ≥ 1 /week. [†]Adjusted for other variable in Table, sex, age and prefecture (Northern (20 prefectures) and Southern (27) Japan).

Supplementary Table 4 Relation between exercise-induced wheezing (EIW) and daily use of leukotriene receptor antagonist and inhaled medication among current asthmatics, a nation-wide survey in Japan: multivariate analysis

Variables	Total* (n)	EIW (n)	%	Severe EIW (n)**	%	EIW			Severe EIW				
						Adjusted odds ratio†	95% confidence interval Lower limit	Upper limit	P value	Adjusted odds ratio†	95% confidence interval Lower limit	Upper limit	P value
All													
Daily use of leukotriene receptor antagonist													
No	20,027	8,283	41.4%	1,895	9.5%	1.00		Reference		1.00		Reference	
Yes	3,916	1,947	49.7%	525	13.4%	1.81	1.65	1.98	<0.01	1.40	1.20	1.62	<0.01
Daily use of inhaled medication													
No	20,641	8,140	39.4%	1,780	8.6%	1.00		Reference		1.00		Reference	
Yes	3,302	2,090	63.3%	640	19.4%	1.77	1.60	1.95	<0.01	1.29	1.13	1.48	<0.01
Kindergarteners													
Daily use of leukotriene receptor antagonist													
No	7,396	1,199	16.2%	199	2.7%	1.00		Reference		1.00		Reference	
Yes	1,923	755	39.3%	157	8.2%	2.08	1.83	2.36	<0.01	1.53	1.19	1.98	<0.01
Daily use of inhaled corticosteroid													
No	8,393	1,558	18.6%	267	3.2%	1.00		Reference		1.00		Reference	
Yes	926	396	42.8%	89	9.6%	1.75	1.48	2.06	<0.01	1.59	1.18	2.14	<0.01
Primary school pupils in the 1st and 2nd grades													
Daily use of leukotriene receptor antagonist													
No	4,528	1,109	24.5%	153	3.4%	1.00		Reference		1.00		Reference	
Yes	1,271	551	43.4%	113	8.9%	1.46	1.25	1.70	<0.01	1.57	1.14	2.15	<0.01
Daily use of inhaled corticosteroid													
No	4,844	1,198	24.7%	174	3.6%	1.00		Reference		1.00		Reference	
Yes	955	462	48.4%	92	9.6%	1.93	1.63	2.28	<0.01	1.37	0.98	1.91	0.063
High school pupils in the 1st and 2nd and 3rd grades													
Daily use of leukotriene receptor antagonist													
No	4,060	3,044	75.0%	840	20.7%	1.00		Reference		1.00		Reference	
Yes	434	384	88.5%	153	35.3%	1.56	1.10	2.21	0.012	1.24	0.92	1.66	0.160
Daily use of inhaled corticosteroid													
No	3,726	2,763	74.2%	744	20.0%	1.00		Reference		1.00		Reference	
Yes	768	665	86.6%	249	32.4%	1.54	1.20	1.99	<0.01	1.07	0.84	1.36	0.579
High school pupils in the 1st and 2nd and 3rd grades													
Daily use of leukotriene receptor antagonist													
No	4,043	2,931	72.5%	703	17.4%	1.00		Reference		1.00		Reference	
Yes	288	257	89.2%	102	35.4%	1.65	1.09	2.51	0.019	1.18	0.83	1.68	0.357
Daily use of inhaled corticosteroid													
No	3,678	2,621	71.3%	595	16.2%	1.00		Reference		1.00		Reference	
Yes	653	567	86.8%	210	32.2%	1.92	1.48	2.50	<0.01	1.44	1.12	1.86	<0.01

*Excluded were subjects with a missing value for severity of current asthma. **Defined if EIW occurred ≥ 1 /week. †Adjusted for other variables in Table, sex, age and prefecture (Northern (20 prefectures) and Southern (27) Japan).