Case-Control study for the Association Between Indoor Environmental Factors and Children's Health Problems in Japan-Part1 a nationwide questionnaire study among 1664 primary school students.

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Abstract

Recent studies show the number of people affected by biological contaminants have increased every year in Japan. An epidemiological investigation on 4th and 5th grade primary school students was conducted in order to clarify the relationship between indoor environment and children's health problems. A case-control study adopted ATS-DLD-American Thoracic Society-Division of Lung Diseases- questionnaire for evaluation of respiratory symptoms and allergies was conducted for 2574 primary school students (1664 responded) across Japan. The visible presence of mold both living room and children's bedroom excluding window (such as wall, floor or closet) was observed to be significantly associated with bronchial hypersensitivity (OR=3.05 95% Cl: 1.38-6.73). Also, the occurrence of respiratory symptoms and allergic symptoms were significantly associated in homes using humidifier.

These results showed that home environmental factors had serious risk factors for allergic symptoms. In particular, indoor mold and water stain were strongly influence on respiratory symptoms among children in Japan.

Keywords: Allergic diseases, Indoor environmental factors, Case-Control study, Mold or dampness

Introduction

A large number of epidemiological studies reveal that there has been an increase of allergic diseases over the past 40 year worldwide [1]. As for Japan, recent studies show that the number of people affected by biological contaminants has increased every year [2]. The Ministry of Health, Labor and Welfare reported that about 36% of children up to 14 years old had some allergic symptoms [3]. This fact cannot be explained by genetic predisposition, because the time interval was too short to change the genetic factor. Therefore environmental factors including housing characteristics or indoor environmental conditions were considered as risk factors. Since people spend more than 90% of their time in an indoor environment, especially at their own homes [4], the indoor environmental conditions might be a possible risk factor for allergic symptoms.

Nowadays building dampness is one of the indoor environmental problems. Fisk showed that exposure to dampness and mold raises the risk for various respiratory symptoms by 30-50% [5]. A resent report in 2009 by the World Health Organization (WHO) concluded that excess level of dampness problems in indoor environment is a potential health hazard [6]. Also, a large number of epidemiological studies in many countries have revealed an association between home dampness and respiratory symptoms [7] [8] [9]. On the other hand,

epidemiological evidence between indoor environmental factors and children's adverse health is still very low in Japan.

In order to clarify the association between indoor biological contaminant exposure and health problems such as respiratory symptoms and allergic diseases, a nationwide epidemiological investigation has been conducted for 4th and 5th grade primary school children in Japan from 2007 to 2009.The investigation had three phases. This paper reports the outcomes from the case-control study by a questionnaire survey (Phase2). The survey was analyzed to make clear the effect of the dampness and residential factors on children health problems.

Methods

Study Design

This nationwide epidemiological study was divided into three phases (Figure1). The objects of this survey were 4th and 5th grade primary school children in Japan, because children have a higher incidence of allergies due to environmental factors than adults. In Phase 1, a questionnaire survey using postcards was conducted to grasp the prevalence of health problems and its causal factors among 7401 children. Phase 2 was a case-control study through a questionnaire survey to clarify the association between indoor environmental factors and adverse health effects. Phase 3 was a case-control study including house inspections and field measurements.

Number of Respondents and Contents of Questionnaire

The questionnaire survey was carried out from the winter of 2008 to April 2009. Firstly, in Phase 1, school teachers were asked to cooperate for this survey. When school teachers agreed, parents were requested to reply to the questions showed in postcards from August 2007 to January 2009. About 26400 parents were asked to join this survey, and 7401 parents out of them agreed to do it. Out of them, 2625 parents replied to participate in phase 2, and a second questionnaire was distributed to all or them. The completed questionnaires were returned by posted mail within one to three weeks. As shown in Figure 2, this study distributed questionnaires in six areas including 64 cities all over Japan. The total number of respondents was 1,664. The response ratio was 63.2%. The response ratios in the six individual areas were 55.2% (Hokkaido), 63.7% (Tohoku), 63.9% (Tokyo), 68.4% (Tokai), 62.1% (Kansai and Cyugoku) and 43.3% (Kyusyu and Okinawa).

The questionnaire contained 78 questions about building information, installed equipment, lifestyle, building performance, occupant characteristics and health problems. Three questions about dampness indicators regarding to ‘condensation’, ‘visible mold growth’ and ‘water stains’ were asked. Also, the location where the damages occurred (e.g. wall, closet, windowpane or window glass, floor, selling) was asked. Based on this information, a

dampness index was calculated for estimating the association between dampness damage levels and allergic symptoms.

Symptoms of children's adverse health effects were determined by the American Thoracic Society-Division of Lung Diseases (ATS-DLD) questionnaire [10], which considered different allergic symptoms by a combination of positive answers to specific questions. In this paper, three allergic symptoms such as bronchial hypersensitivity, current asthma and allergic rhinitis are analyzed with the influencing factors including age, breastfeeding, parent's smoking habits, pets, cleaning habits, living area and so on. Parents' allergic symptoms were defined as the parent's history of asthma, atopy, allergy, hey fever and hives.

Statistical Analysis Methods

The association between each of the three symptoms (bronchial hypersensitivity, current asthma and allergic rhinitis) and housing characteristics including mold and condensation was analyzed by logistic regression models. The data was initially analyzed by binary logistic regression. After that, adjusted odds ratios (OR) with 95% confidence intervals (95% Cl) were calculated for each of the housing characteristics by using the multivariate logistic regression models, which controlled potentially confounding factors. The analyses were

considered to be statistically significant when $p<0.05$. All analyses were conducted with SPSS software for Windows (SPSS, Chicago, IL, USA)

Results

Allergic Symptoms and Gender

Figure 3 presented the allergic symptoms of children and parents. The percentage of boys and girls were almost equal. Almost half of the children have at least one of allergic symptom. The prevalence of bronchial hypersensitivity, current asthma and allergic rhinitis were 12.1%, 5.1% and 58.5%, respectively. Except for current asthma the prevalence of bronchial hypersensitivity and allergic rhinitis among boys was significantly higher than that of girls.

Housing Characteristics and Occupant's Behavior

Housing characteristics and occupant's behaviors were given in Figure 4. Most of the houses in each area were located in residential areas. Detached houses in each area accounted for more than half of the investigated dwellings. The percentage of houses which were over five years old was 82.3% and majority was aged from 10 to 20 years. In Hokkaido and Tohoku areas, double panes were installed in more than half of the houses. In other areas, single panes were more popular. Mechanical ventilation systems were installed in about 40% of the houses. The ratio of houses where the mechanical ventilation was always in operation was less than 40%.

Figure 5 showed the regional differences in condensation, visible mold and visible water stains among the six areas. More than 90% of the families reported at least one dampness problem in either living room or children's bedroom. The occurrence of condensation, visible mold and visible water stains in both rooms was 58.1%, 31.1% and 14.4%, respectively. Such dampness problems were found in the children's bedrooms more frequently than the living rooms. Condensation or mold growth was found most frequently on window panes. Mean values of the dampness index, which integrated occurrence of condensation, visible mold growth and visible water stains for living rooms and children's bedrooms were 1.32 and 1.39, respectively. In Tohoku area, the value was 1.51. Humidifiers were used in 23.1% of the living rooms. In Hokkaido and Tohoku areas, the ratio of houses where the laundry was dried by hanging in the rooms was higher than that of other areas.

Association Between Indoor Environmental Factors and children's Allergic Symptoms

Table 1 shows the multivariate relationship between dampness indicators and children's allergic symptoms. After OR was adjusted for potential confounders, it was found that condensation occurrence on walls, floors, ceilings or closets in both living rooms and children's bedrooms excluding windows was significantly associated with current rhinitis (OR: 2.26 95%Cl: 1.29-3.95). Also, visible presence of mold growth in both living rooms and children's bedrooms excluding windows was strongly associated with current asthma (OR:

3.05 95%Cl 1.38-6.73) and bronchial hypersensitivity (OR: 1.99 95%Cl: 1.10-3.59). Occurrence of water stains was more strongly associated with allergic symptoms than condensation or visible mold. As the values of the dampness index increased (Table2), OR for bronchial hypersensitivity and current asthma increased. Statistically significant OR was found in houses with the occurrence of all three dampness indicators. For bronchial hypersensitivity and current asthma, the OR of children's bedrooms was higher than that of living rooms.

The adjusted OR for occupant's characteristics are shown in Table 3. The use of humidifiers in children's bedrooms was related to bronchial hypersensitivity (OR: 1.76 95%Cl: 1.15-2.70) and current asthma (OR: 2.07 95%Cl: 1.14-3.76). The association between dehumidifiers used in bedrooms and allergic symptoms was found in the crude analysis, but there was no association in the multivariate logistic regression analysis. For allergic rhinitis, these characteristics did not appear.

Discussion

Prevalence of Allergic Symptoms and Dampness Indicators

This survey tried to clarify the association between indoor environments and children's health problems among 4th and 5th grade primary school children in Japan. As a result of statistical analysis, significant relations were found between moisture and mold growth, and allergic

symptoms. For instance, the presence of indoor dampness in children's bedrooms was significantly associated with airway symptoms. More importantly, there was a strong relationship between the high prevalence of respiratory symptoms and the value of the dampness indicator. Also the use of humidifiers in children's bedrooms was an important risk factor for increasing the prevalence of allergic symptoms.

The prevalence of bronchial hypersensitivity, current asthma and allergic rhinitis were 12.1%, 5.1% and 58.5%, respectively. These trends are similar to the findings of a survey in Miyagi and Akita Prefecture in Japan, which are defined for allergic symptoms through ATS-DLD questionnaire [11][12]. Compared to other countries, 12 southern Californian communities in U.S. reported a prevalence of current asthma of 7.3-9.5% [13].

The prevalence of reported condensation, visible mold and visible water stains at any place in both living room and children's bedroom was 58.1%, 31.1% and 14.4%, respectively. Parents reported such contamination occurred often in the children's bedrooms compared to the living rooms. It is estimated that reported prevalence rates of home dampness problems ranged widely (typical range 10-50%).

Similar findings were reported in other Japanese studies, in which condensation on window panes and/or walls occurred in 51.8% of the detached houses and visible mold growth accounted for 39.8% of residences [14]. The reason why the dampness contamination

occurred more often in children's bedrooms compared to living rooms was not clear. But one possible reason is that ventilation rates are low in the bedrooms due to small window areas and high moisture environments more easily created in the bedrooms compared to the living rooms.

The Indoor Environmental Factors Influenced to Allergic Symptoms

Self-reported dampness indicators are significantly associated with self-reported respiratory symptoms, with OR ranging from 1.73 to 3.03. The association between 'dampness' and various symptoms was reported by a large number of other studies. In many countries, the number of people susceptible to the effects of dampness and mold in homes has been increasing. In the USA, about 4.6million cases were estimated to be attributable to dampness and mold exposure. The annual economic cost of asthma attributed to those reasons was estimated to be $3.5 billion [15]. Furthermore, exposure to dampness and mold raises the risk of various respiratory symptoms by 30-50% [4]. Actually, the high air humidity may cause microbial growth, which may result in a greater occurrence of spores, allergens, volatile organic compounds [16], and endotoxins [17] in indoor environments. High air humidity has attributed to the increase of house dust mite. The other study showed that moisture-related structural damage combined with polyvinyl chloride materials may lead to chemical emissions and affected the higher prevalence of symptoms among children [18]. Our study

showed that a dose-response relationship between the occurrence of symptoms and the increasing number of dampness indicators was observed in both livings room and bedrooms. A similar trend was identified from the building related symptoms [19]. Our study concluded that reported visible mold or water damage in houses has strong correlation to occurrence of respiratory symptoms.

It was found in this Study that the presence of humidifiers installed in children's bedrooms was associated with both bronchial hypersensitivity and current asthma among children. Another parent-reported study identified that humidifier use increased the risk of wheezing (OR: 1.41 95%Cl 1.11-1.79) [20]. Some microorganisms can grow in air humidifiers, which caused respiratory symptoms [21]. Humidifier usage could especially be related to the increases of fungi concentration [22]. It is also a possibility for the cause of rising concentrations of the dust mite allergen. Therefore if not properly maintained and operated, it could trigger some dampness problems and then effect health.

Several Biases in Statistical Study

This survey has some limitations. First, the influence of selection bias had already been included in Phase 1. In Phase 2, non-responders accounted for more than 30% of dwellings. It was estimated that the real prevalence rate would be lower than the results. The second limitation of this study was dependence on self-reported questionnaires for both health

outcomes and independent variables. Thus, it included potential recall bias, which leaded to overestimate or underestimate the environmental exposures among symptomatic subjects. Parents who have experienced asthma or allergic symptoms are likely to report mold or dampness problems more often compared to those without such health problems in family members. Furthermore, parents living in damp buildings concerned about health problems are possibly over-reporting symptoms. However, it was found by other researchers that the tendency to overestimate dampness in houses was independent of whether asthmatic children were present or not [23].

Conclusions

This study documented that mold and water stains in living rooms and children's bedrooms were strongly associated with the risk of rhinitis and airway symptoms in Japan. It was found that dampness and Indoor mold were important risk factors for allergic symptoms among young children. Also, homes installed with humidifiers were harmful for children's health and the evidence of association was found more in children's bedrooms than in living rooms.

The survey provides this information as further measurement for the next step of this study, which reveals the relationship between allergic symptoms and indoor environmental pollutant in detail.

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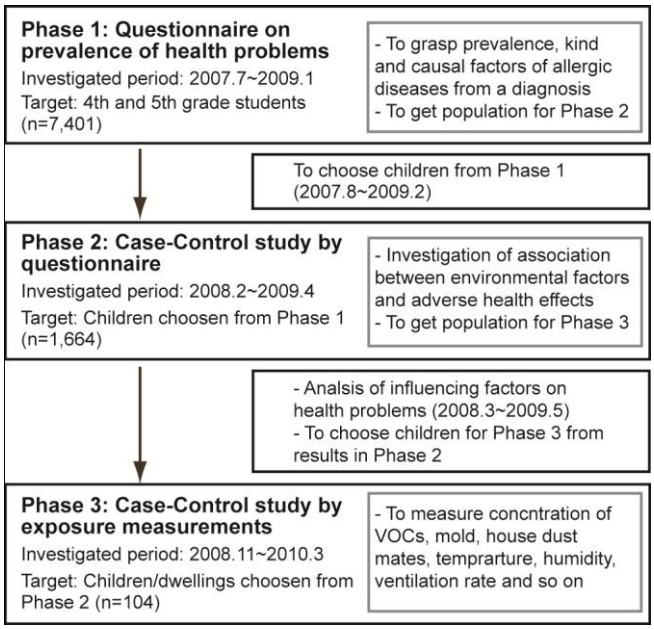


Fig. 1 Design of Epidemiological Survey

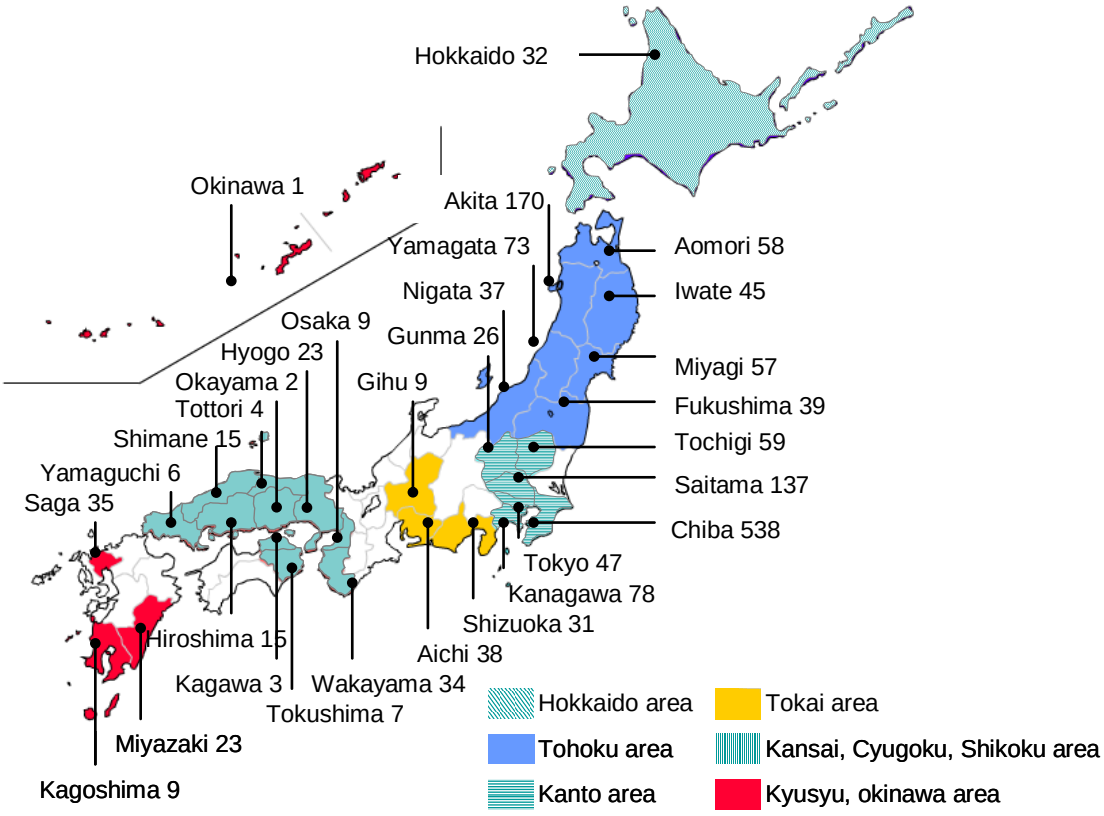


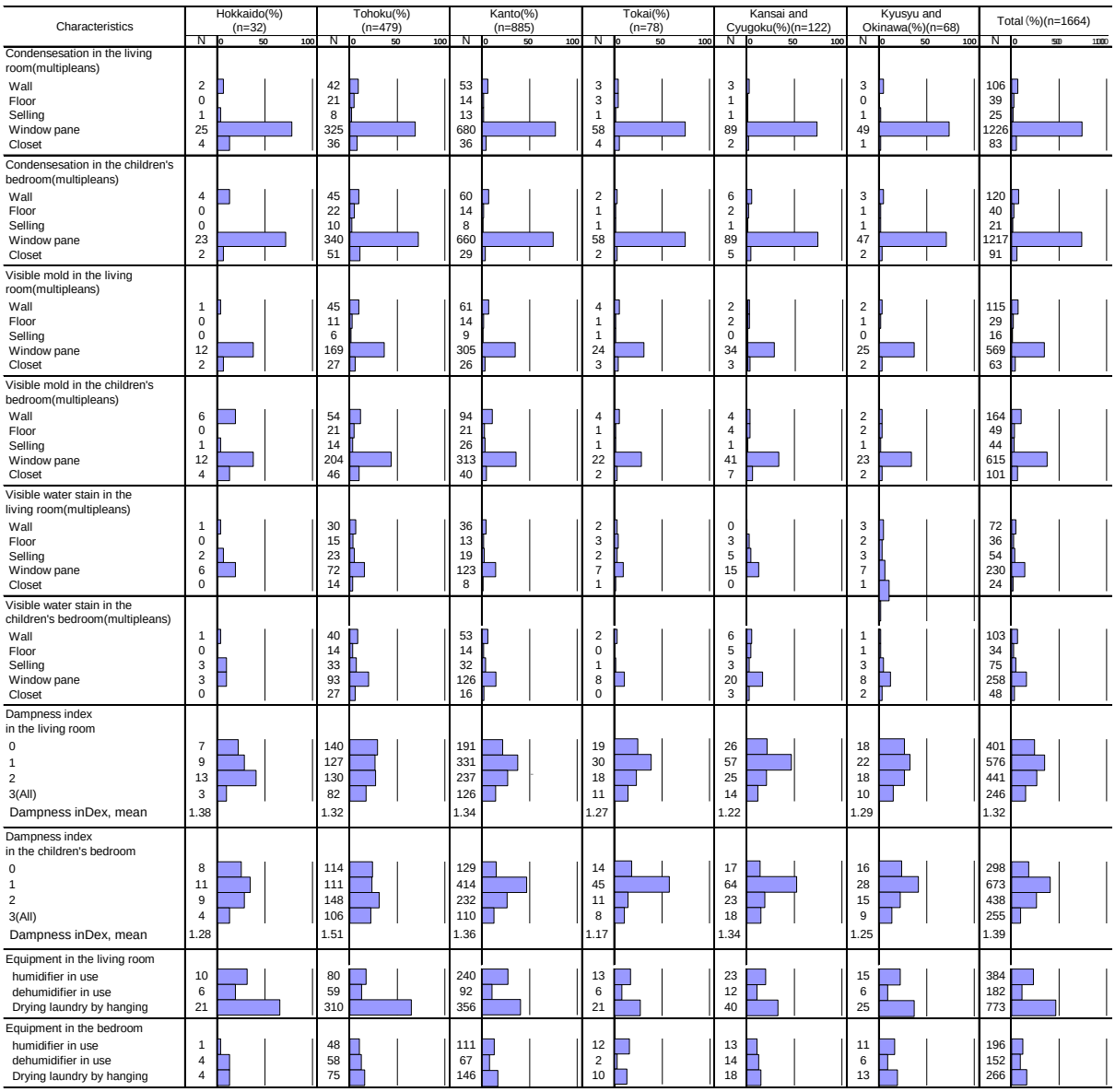
Fig. 2 Investigated locations and number of questionnaires respondents

Characteristics	Hokkaido(%) (n=32)		Tohoku(%) (n=479)		Kanto(%) (n=885)		Tokai(%) (n=78)		Kansai and Cyugoku(%)(n=122)		Kyusyu and Okinawa(%)(n=68)		Total (%)(n=1664)	
	N	0 50 100	N	0 50 100	N	0 50 100	N	0 50 100	N	0 50 100	N	0 50 100	N	0 50 100
Gender														
Girls	17		247		415		34		56		42		811	
Boys	15		232		470		44		66		26		853	
Symptom														
Bronchial hypersensitivity	4		60		114		6		15		4		203	
Current asthma	4		22		49		2		7		1		85	
Allergic rhinitis	14		263		550		41		68		38		974	
At least one symptom	16		274		577		43		70		39		1019	
Father's allergic symptom														
Hey Fever	7		145		388		36		39		18		627	
Athma	2		29		70		2		10		8		119	
Hives	4		62		151		9		21		9		254	
Allergic symptom	8		70		134		8		22		6		240	
Atopy	3		22		54		3		9		3		93	
Mother's allergic symptom														
Hey Fever	3		181		477		42		42		28		773	
Athma	4		41		94		2		9		4		154	
Hives	11		143		221		20		35		24		454	
Allergic symptom	8		100		196		11		33		20		368	
Atopy	2		42		78		7		15		8		152	

Fig. 3 Prevalence of children and parents allergic symptoms and gender (n=1664)

Characteristics	Hokkaido(%) (n=32)		Tohoku(%) (n=479)		Kanto(%) (n=885)		Tokai(%) (n=78)		Kansai and Cyugoku(%)(n=122)		Kyusyu and Okinawa(%)(n=68)		Total (%)(n=1664)	
	N	0 50 100	N	0 50 100	N	0 50 100	N	0 50 100	N	0 50 100	N	0 50 100	N	0 50 100
Age(years)														
<1	0		11		16		2		1		2		32	
1-<3	1		19		58		4		7		6		95	
3-<5	2		48		83		3		9		4		149	
5-<10	9		110		230		19		33		22		423	
10-<20	14		135		324		32		43		19		567	
20≧	6		149		167		17		27		13		379	
No data	0		8		5		0		2		1		16	
Housing type														
Detached house	22		375		547		66		79		46		1135	
Apartment(Wood)	5		16		23		1		2		3		50	
Apartment(RC)	5		75		302		10		39		19		450	
Other	0		12		14		1		1		0		28	
Total floor spase														
<100㎡	11		113		403		16		47		23		613	
100-150㎡	15		125		249		32		29		23		473	
150-200㎡	2		86		84		16		16		9		213	
200㎡≧	0		63		32		5		11		1		112	
No data	4		92		117		9		19		12		253	
Window glass														
Single pane	6		169		593		51		94		43		956	
Double pane	19		176		241		24		23		17		500	
Double single pane	6		135		48		6		7		5		207	
Ventiration														
Mechanical exhaust	11		179		180		23		26		17		436	
Mechanical exhaust and supply	6		91		92		9		9		6		213	
No data	0		7		8		0		2		1		18	
Other	2		8		21		1		5		1		38	
Operation of mechanical ventilation system														
Always	6		117		124		12		14		6		279	
Only in daytime	6		19		30		6		3		2		66	
Only dining	0		12		12		0		2		2		28	
Don't operate	1		52		54		6		8		6		127	
Other	6		72		70		8		13		8		177	
Smoking habit														
Father	16		164		263		33		38		18		532	
Mother	1		47		64		8		9		2		131	
Pet keeping indoor														
Yes	7		112		251		20		33		18		441	
Cat	0		26		42		6		7		1		82	
Bird	0		10		22		0		3		4		39	
Dog	4		32		95		8		12		3		154	

Fig. 4 Housing Characteristic and occupant's behavior (n=1664)



Characteristics	Hokkaido(%) (n=32)	Tohoku(%) (n=479)	Kanto(%) (n=885)	Tokai(%) (n=78)	Kansai and Cyugoku(%)(n=122)	Kyusyu and Okinawa(%)(n=68)	Total (%)(n=1664)
	N	N	N	N	N	N	N
Condensesation in the living room(multipleans)							
Wall	2	42	53	3	3	3	106
Floor	0	21	14	3	1	0	39
Selling	1	8	13	1	1	1	25
Window pane	25	325	680	58	89	49	1226
Closet	4	36	36	4	2	1	83
Condensesation in the children's bedroom(multipleans)							
Wall	4	45	60	2	6	3	120
Floor	0	22	14	1	2	1	40
Selling	0	10	8	1	1	1	21
Window pane	23	340	660	58	89	47	1217
Closet	2	51	29	2	5	2	91
Visible mold in the living room(multipleans)							
Wall	1	45	61	4	2	2	115
Floor	0	11	14	1	2	1	29
Selling	0	6	9	1	0	0	16
Window pane	12	169	305	24	34	25	569
Closet	2	27	26	3	3	2	63
Visible mold in the children's bedroom(multipleans)							
Wall	6	54	94	4	4	2	164
Floor	0	21	21	1	4	2	49
Selling	1	14	26	1	1	1	44
Window pane	12	204	313	22	41	23	615
Closet	4	46	40	2	7	2	101
Visible water stain in the living room(multipleans)							
Wall	1	30	36	2	0	3	72
Floor	0	15	13	3	3	2	36
Selling	2	23	19	2	5	3	54
Window pane	6	72	123	7	15	7	230
Closet	0	14	8	1	0	1	24
Visible water stain in the children's bedroom(multipleans)							
Wall	1	40	53	2	6	1	103
Floor	0	14	14	0	5	1	34
Selling	3	33	32	1	3	3	75
Window pane	3	93	126	8	20	8	258
Closet	0	27	16	0	3	2	48
Dampness index in the living room							
0	7	140	191	19	26	18	401
1	9	127	331	30	57	22	576
2	13	130	237	18	25	18	441
3(All)	3	82	126	11	14	10	246
Dampness inDex, mean	1.38	1.32	1.34	1.27	1.22	1.29	1.32
Dampness index in the children's bedroom							
0	8	114	129	14	17	16	298
1	11	111	414	45	64	28	673
2	9	148	232	11	23	15	438
3(All)	4	106	110	8	18	9	255
Dampness inDex, mean	1.28	1.51	1.36	1.17	1.34	1.25	1.39
Equipment in the living room							
humidifier in use	10	80	240	13	23	15	384
dehumidifier in use	6	59	92	6	12	6	182
Drying laundry by hanging	21	310	356	21	40	25	773
Equipment in the bedroom							
humidifier in use	1	48	111	12	13	11	196
dehumidifier in use	4	58	67	2	14	6	152
Drying laundry by hanging	4	75	146	10	18	13	266

Fig. 5 Dampness indicator

Table 1 Adjusted odds ratio[a] and 95%Cl for the association between dampness indicator and children allergic symptoms.

Characteristics	Adjusted OR(95%CI)[a]		
	Current asthma(N=85)	Bronchial hypersensitivity (N=203)	Current rhinitis(N=974)
Condensation			
No	1.0	1.0	1.0
Only occurance on window pane	0.86(0.42-1.73)	1.01(0.62-1.65)	1.32(0.97-1.80)
Living or bedroom excluding window[b]	1.80(0.73-4.43)	1.64(0.85-3.15)	1.33(0.83-2.13)
Both rooms excluding window[b]	0.90(0.29-2.85)	1.37(0.66-2.86)	**2.26(1.29-3.95)****
Visible mold			
No	1.0	1.0	1.0
Only occurance on window pane	1.21(0.69-2.11)	0.99(0.68-1.45)	1.27(0.98-1.64)
Living or bedroom excluding window[b]	1.26(0.62-2.56)	1.46(0.93-2.28)	1.13(0.81-1.58)
Both rooms excluding window[b]	**3.05(1.38-6.73)****	**1.99(1.10-3.59)***	1.30(0.80-2.11)
Visible water leakage			
No	1.0	1.0	1.0
Only occurance on window pane	1.33(0.65-2.71)	1.33(0.83-2.12)	1.37(0.96-1.95)
Living or bedroom excluding window[b]	**2.35(1.23-4.48)****	**1.73(1.08-2.76)***	1.26(0.88-1.81)
Both rooms excluding window[b]	**2.62(1.11-6.20)***	**2.48(1.36-4.50)****	1.02(0.61-1.71)

a: OR adjusted for gender, age, parental allergic symptoms, surrounding environment,parental smoking, pet, construction age, type of house, ventilation system and distributed area, and each dampness indicator was separately introduced in the model.
b: wall, floor, ceilling or closet
p-value: *** p<0.001, ** p<0.01, * p<0.05

Table 2 Adjusted odds ratio[a] and 95%Cl for the association between dampness index[b] and children allergic symptoms.

Characteristics	Adjusted OR(95%CI)[a]		
	Current asthma(N=85)	Bronchial hypersensitivity (N=203)	Current rhinitis(N=974)
Dampness index in the living room			
0	1.0	1.0	1.0
1	0.65(0.32-1.30)	0.96(0.61-1.52)	1.26(0.94-1.68)
2	1.21(0.61-2.41)	1.18(0.73-1.90)	**1.57(1.14-2.16)****
3	1.75(0.83-3.68)	**1.74(1.03-2.92)***	1.44(0.98-2.09)
Dampness index in the children's bedroom			
0	1.0	1.0	1.0
1	0.71(0.35-1.45)	0.89(0.54-1.45)	0.99(0.73-1.34)
2	0.96(0.46-2.02)	1.23(0.74-2.03)	**1.41(1.01-1.97)***
3	**2.12(1.00-4.51)***	**1.99(1.17-3.41)***	1.43(0.97-2.11)

a: OR adjusted for gender, age, parental allergic symptoms, surrounding environment, parental smoking, pet, construction age, type of house, ventilation system and distributed area, and each dampness index was separately introduced in the model.
b:Dampness index was calculated for estimating by summing the presence or absence of three dampness indicators in each room.
p-value: *** p<0.001, ** p<0.01, * p<0.05

Table 3 Adjusted odds ratio[a] and 95%Cl for the association between occupant's characteristics and children allergic symptoms.

Characteristics	Adjusted OR（95%CI）[a]		
	Current asthma（N=85）	Bronchial hypersensitivity（N＝203）	Current rhinitis（N=974）
Humidifier in the living room			
No	1.0	1.0	1.0
Yes	0.68（0.38-1.23）	0.99（0.69-1.43）	1.01（0.79-1.31）
Humidifier in the children's bedroom			
No	1.0	1.0	1.0
Yes	**2.07（1.14-3.76）***	**1.76（1.15-2.70）***	1.33（0.95-1.86）
dehumidifier in the living room			
No	1.0	1.0	1.0
Yes	0.84（0.40-1.75）	1.16（0.74-1.84）	1.09（0.77-1.53）
dehumidifier in the children's bedroom			
No	1.0	1.0	1.0
Yes	1.69（0.87-3.28）	1.53（0.95-2.45）	0.90（0.62-1.31）
Laundry inside the living room			
No	1.0	1.0	1.0
Yes	1.01（0.62-1.63）	0.94（0.68-1.30）	1.05（0.84-1.31）
Laundry inside the children's bedroom			
No	1.0	1.0	1.0
Yes	1.58（0.91-2.74）	0.95（0.62-1.44）	1.08（0.81-1.45）

a: OR adjusted for gender, age, parental allergic symptoms, surroundings,parental smoking, pet, construction age, type of house, ventilation system, distributed area and visible mold, and each indicator was separately introduced in the model.

b: OR did not calculate

p-value：*** p<0.001，** p<0.01，* p<0.05