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小学生の湿度環境、食習慣、シックビル症候群の症状
(Dampness, food habits, and sick building syndrome symptoms in elementary school pupils)

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Dampness, Food Habits, and Sick Building Syndrome Symptoms among Elementary School Pupils

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Abstract

Objective We investigated the dampness/mold in schools and dwellings, food habits, and subjective symptoms among elementary school pupils in order to clarify the relationship between dampness and food habits on subjective symptoms in elementary school pupils.

Methods Questionnaires were used to investigate the dampness in classrooms and dwellings in Hokkaido, Japan, and its effect on subjective symptoms involving 1,077 pupils in 8 elementary schools. A dampness index for both the home and classroom was the sum of the presence of four dampness indicators: (1) visible mold, (2) moldy odor, (3) water leakage, and (4) condensation on windowpanes. The questionnaire contained queries about food habits as follows: the frequency of eating breakfast, whether the energy provided by school lunch was sufficient, and whether too many snacks and/or sweets were consumed. Adjusted logistic regression was used to determine whether dampness and food habits were related to symptoms.

Results The home dampness index was significantly related to cough, general symptoms, and having at least one of symptoms; the classroom dampness index was significantly related to nose symptoms in fully adjusted models. In addition, usually not eating breakfast was significantly related to eye symptoms, and too many snacks and/or sweets was significantly related to eye, nose, and general symptoms.

Conclusions Both home and classroom dampness can affect pupils' health. Home

dampness, in particular, was significantly related to cough and general symptoms, and classroom dampness was significantly related to nose symptoms. Furthermore, favorable food habits have a positive effect on pupils' subjective symptoms.

Keywords Dampness, Mold, Sick Building Syndrome, School Pupils, Food Habits

Introduction

There has been much concern about the effect of indoor environment on residents' health. Many studies have demonstrated that building dampness and mold have adverse health effects on residents. [1-3]

The school environment affects children's health. Adverse health effects of dampness and mold in school buildings on school children have been reported. [4-7] Moreover, an interventional study, in which a moisture-damaged school was repaired, showed a positive effect on school children's health. [8] Meanwhile, home dampness and mold have adverse health effects on children, [9-11] and home remediation against moisture sources has a protective effect in asthmatic children. [12]

The dampness index is the sum of the presence of several dampness indicators. [13] Its relation to sick building syndrome (SBS) symptoms and asthmatic symptoms was initially reported in Swedish multifamily building studies. [13,14] We also have reported its significant relation to SBS symptoms in newly build dwellings [15-17] and public apartment houses. [18] However, to our knowledge, there has been no report on simultaneous evaluation of home and school dampness and their association with children's health.

It has been reported that psychosocial factors are associated with SBS. [19] Lifestyle factors—such as work time, sleep time, and alcohol consumption—are also related to SBS. [20]

Among children, the relationship of unhealthy eating patterns to unfavorable overall school performance has been reported, [21] though its relation to SBS has not been reported. Thus, lifestyle factors including food habits may affect children's subjective symptoms.

From the point of view of improving children's health and their overall school performance, it is important to clarify improvable environmental and lifestyle risk factors for children's subjective symptoms including SBS. In this study, we explored dampness in schools and dwellings, food habits and subjective symptoms among elementary school pupils in Hokkaido Prefecture (north island of Japan) to clarify the relationship between home dampness, classroom dampness or food habits and subjective symptoms.

Methods

Study Population

Nayoro city and Asahikawa city are located in Hokkaido, the north island of Japan. The eight elementary schools under study included all 7 municipal elementary schools in the Nayoro district of Nayoro city (the other district, Furen, had five) and one elementary school affiliated with the university in Asahikawa city. Nayoro is located near Asahikawa (60 kilometer apart), and both cities have a similar inland climate.

We distributed anonymous parent-administered questionnaires to 1,753 pupils through classroom teachers between November and December 2007. The questionnaires included questions about subjective symptoms, food habits, and dwelling characteristics. Each classroom teacher retrieved the questionnaires of his or her pupils. The classroom teachers were also asked to answer a questionnaire about classroom dampness. School characteristics were gathered from the vice principal of each school. Of the 1,753 pupils, 1,141 (65.1%) answered the questionnaires. We finally analyzed 1,077 (61.4%) questionnaires, after excluding questionnaires that had any missing information. All classroom characteristics questionnaires were answered by the classroom teachers (n = 61). This study was conducted after obtaining informed consent from all subjects and approval from the institutional ethical board for epidemiological studies at Asahikawa Medical College.

Subjective Symptoms, Food Habits, and Dwelling Characteristics

We used a modified parent-administered questionnaire, MM080 for schools, designed for epidemiological assessment of SBS involving elementary school pupils. [22] We translated the English version of MM080 into Japanese for schools, based on the Japanese version of MM040EA, which is a validated self-administered questionnaire and also designed for epidemiological assessment of adults SBS. [23] We translated the English version of MM080 into Japanese for schools, based on the Japanese version of MM040EA. The questionnaire contained information on grade, sex, food habits, dwelling characteristics, and subjective symptoms.

Symptoms surveyed during the preceding three months were as follows: fatigue; headache; sleep problems; itching, burning, or irritation of the eyes; irritated, stuffy, or runny nose; cough; dry or flushed facial skin; scaling/itching of the scalp or ears; and dry, itching, or red-skinned hands. Each question had three alternative answers: *Yes, often* (every week); *Yes, sometimes*; and *No, never*. An additional query concerning the attribution of a symptom to the child's school environment, present in the original questionnaire, [22] was not used in this study.

Symptoms that occurred often (weekly) were defined as positive. For the analysis, symptoms were categorized as follow: general symptoms (fatigue, headache, and sleep problems) and symptoms involving the eyes, nose, cough, and skin. The questionnaires also contained queries about the history of asthma, hay fever, eczema, and food allergies in the previous year.

Queries about food habits concerned with the frequency of eating breakfast (always, almost always, 1–3 times per week, never : later two categories were defined as “usually not eating breakfast”), whether the energy provided by school lunch was sufficient or not (yes/no), and whether too many snacks and/or sweets were consumed (yes/no).

The self-administered questionnaire contained queries about the housing type (solitary or other), year of construction (before 1980, later, or unknown), heating (electric stove or other; gas, kerosene, or wood stove), ventilation (natural, mechanical, or unknown), wall-to-wall carpeting in a child’s room (yes/no), furry animals or birds in the home (yes/no), a smoker in the home (yes/no), anyone smoking indoors at home (yes/no), signs of moisture/mold damage (yes/no), and condensation on windowpanes (yes/no). In the original MM080 for schools, the year of construction of dwelling was categorized as *before 1960 or later*, but we revised it to *before 1980 or later* because the life span of Japanese buildings is relatively short. We considered that one of the original query, *Are there signs of moisture/mold damage*, was difficult for Japanese participants to understand. Therefore, we used queries about visible mold (yes/no), perception of moldy odor (yes/no), and episodes of water leakage during past 5 years (yes/no).

We constructed a home dampness index. The index considered four dampness indicators: (1) visible mold, (2) perception of moldy odor, (3) episodes of water leakage during past 5 years, and (4) condensation on windowpanes. The home dampness index was estimated by the sum of the

presence of these indicators.

Classroom Characteristics

We distributed the questionnaire about classroom characteristics to classroom teachers. It contained queries about the number of pupils, perception of visible mold (yes/no), moldy odor (yes/no), episodes of water leakage during past 5 years (yes/no), and condensation on windowpanes (yes/no). By using these results, we calculated a class dampness index. It was estimated by the sum of the presence of four dampness indicators in the classroom, the indicators are: (1) visible mold, (2) perception of moldy odor, (3) episodes of water leakage during past 5 years, and (4) condensation on windowpanes.

Statistical Analysis

The prevalence of subjective symptoms in boys and girls were compared by the χ^2 test. Odds ratios (ORs) for each subjective symptom were analyzed using logistic regression. To obtain multivariate adjusted ORs for each subjective symptoms of home and classroom dampness indicators, their dampness indexes, and food habits, we controlled the possible confounders, including age, sex, 1-year history of allergic diseases, housing type (solitary or other), construction year of dwelling (≤1980, >1980, or unknown), type of heating of dwelling (electric or other),

ventilation of dwelling (mechanical, natural, or unknown), construction year of school, ventilation of school, and number of pupils in class (<20, 21–30, or >31), and each dampness indicator and food habit was introduced separately in the model. Dampness indicators, dampness indexes, and food habits were introduced separately in the model. Moreover, to estimate statistical dose-response relationships, *P* values for trends of home and classroom dampness indexes were analyzed.

Finally, fully adjusted model analyses were performed to obtain the ORs of home and classroom dampness indexes and food habits after adjustment of age, sex, 1-year history of allergic diseases, housing type (solitary or other), construction year of dwelling (≤1980, >1980, or unknown), type of heating of dwelling (electric or other), ventilation of dwelling (mechanical, natural, or unknown), construction year of school, ventilation of school, and number of pupils in class (category).

For all statistical analyses, a 5% level of significance was applied. All statistical analyses were conducted using SPSS for Windows version 17.0 (SPSS, Inc., Chicago, U.S.A.).

Results

Table 1 shows the characteristics of pupils and their homes. The status of home dampness was as follow: 29.0% had visible mold, 8.3% had moldy odor, 16.6% had water leakage, and 55.2% had condensation on windowpanes. Food habits were as follows: 2.6% usually did not eat breakfast (1–3 times per week or never), 9.0% had no sufficient energy following a school lunch, and 22.7% had too many snacks and/or sweets.

Table 2 shows the characteristics of schools and classrooms. The status of classroom dampness was as follow: 37.5% had visible mold, 25.0% had moldy odor, 37.5% had water leakage, and 37.5% had condensation on windowpanes.

Table 3 shows subjective symptoms observed in this survey. Eye symptoms, nose symptoms, cough, skin symptoms, and general symptoms were found in 4.4%, 14.0%, 4.8%, 11.3%, and 4.8% of children, respectively. Any symptoms (at least one of skin, eye, nose, throat, or general symptoms) were found in 25.2% of children. Boys had a significantly higher prevalence of nose symptoms and any symptoms compared to girls.

Table 4 shows the ORs of the dampness indicator and food habits for subjective symptoms adjusted by age, sex, allergy, construction year of dwelling, housing type (solitary or other), ventilation of dwelling, type of heating of dwelling, construction year of school, ventilation of school, and number of pupils per class. Usually not eating breakfast had significantly higher ORs

for eye symptoms. Too many snacks and/or sweets had significantly higher ORs for eye, nose, general symptoms, and any symptoms. Water leakage of dwelling had significantly higher ORs for cough, general symptoms, and any symptoms. The home dampness index had significantly higher ORs for cough, general symptoms, and any symptoms. The classroom dampness index had significantly lower ORs for general symptoms and marginally significantly higher ORs for cough.

Table 5 shows fully adjusted ORs of home and classroom dampness indexes and food habits for subjective symptoms. Usually not eating breakfast had a significantly higher OR for eye symptoms. Too many snacks and sweets had significantly higher ORs for eye, nose, and general symptoms. The home dampness index had significantly higher ORs for cough (*P* for trend = 0.007; dampness index 4 vs. 0: OR 5.43, 95% CI: 1.41–20.9); general symptoms (dampness index 4 vs. 0: OR 3.57, 95% CI: 1.51–12.5); and any symptoms (*P* for trend = 0.016, dampness index 4 vs. 0: OR 2.92, 95% CI: 1.22–6.99). Classroom dampness index had a significantly higher OR for nose symptoms (*P* for trend = 0.040).

Discussion

In this study, we found significant relationships between both home and classroom dampness and subjective symptoms. In fully adjusted models, home dampness index was significantly related to cough, general symptoms, and any symptoms, and classroom dampness index was significantly related to nasal symptoms. In addition, usually not eating breakfast was significantly related to eye symptoms, and too many snacks and/or sweets was significantly related to eye, nose, and general symptoms. To our knowledge, this is the first report on the relationship between both home and classroom dampness and subjective symptoms of pupils with simultaneous evaluation of home and classroom dampness.

For the difference between sexes, boys had more symptoms than girls in this study. In a previous study, no significant difference in the prevalence of atopic dermatitis between boys and girls in Japan has been reported. [24] Meanwhile, the prevalence of asthma and rhinitis in boys is greater than that in girls. [25-27] Similar to previous studies, our study showed a higher symptom prevalence among boys than girls.

We used the MM080 questionnaire. [22] There has been no report on the prevalence of symptoms in pupils using the MM080 for schools in Japan. The MM080 developers reported that the prevalence rate of each symptom was 2–7% (http://www.orebroll.se/uso/page____17918.aspx). The prevalence of nasal symptoms found in this study was rather high. The reason for this was

probably because allergic rhinitis has been the most prevalent allergic disease and its prevalence has been increasing in Japan. [25]

In a previous study of newly built dwellings in Hokkaido, Japan, visible mold and condensation on windowpanes and/or walls was 15.6% and 41.7%, respectively. [16] Another study of newly built dwellings in Japan (including six prefectures), found visible mold, moldy odor, water leakage, and condensation on windowpanes and/or walls in 39.8%, 7.8%, 4.7%, and 51.8% of dwellings, respectively. [15] A study of old apartment houses in Hokkaido, Japan, found visible mold, moldy odor, water leakage, and condensation on windowpanes in 59.5%, 62.1%, 20.8%, and 81.8% of dwellings, respectively. [18] Meanwhile, in a Swedish multifamily dwellings study, moldy odor, water leakage, and condensation on windowpanes, was 12.4%, 12.7%, and 9.0%, respectively. [13] Moreover, in the Swedish dwellings study, water leakage (during a previous year), visible dampness (mold or damp spot), and condensation on windowpanes was seen in 17.8%, 1.5%, and 14.3% [9] of dwellings, respectively. Thus, Japanese dwellings have higher dampness rates. Meanwhile, the annual average of outdoor temperature and relative humidity in Asahikawa and Stockholm were 6.7°C and 76% and 6.7°C and 76%, respectively (World Meteorological Organization; Japan Meteorological Agency). However, inadequate waterproofing of the constructions, water leakage, and moisture from humans and indoor activities are important contributors to building dampness, [2] and those differences between Japan and Nordic countries

are little investigated. One possible explanation of these differences is that many Japanese people regard low humidity as a risk factor for respiratory infections, such as influenza virus infection in winter [28] and adenovirus infection in summer, [29] and may prefer high humidity, especially in winter. However, further studies will be needed to clarify the cause of these differences in dampness and preferable constructions and indoor activities.

The home dampness index was significantly associated with cough (3 and 4 vs. 0; *P* for trend), general symptoms (4 vs. 0), and any symptoms (4 vs. 0; *P* for trend), and the classroom dampness index was significantly associated with increased nasal symptoms (*P* for trend) in fully adjusted models. Because the significances of *P* for trend possibly indicated the dose-response of dampness exposure, those significances may reflect the effect of dampness on the symptoms.

A meta-analysis showed that home dampness was significantly associated with children's asthma and cough. [3] Home dampness reflects on evening and night exposure, and nocturnal cough is common in asthmatic patients. [30] The adverse effect of school dampness on respiratory symptoms has also been reported. [31] However, we saw no significant relationships between classroom dampness and cough. This may be attributed to shorter time in the school and/or inadequate statistical power.

Dampness relates to general symptoms in adults [1,13] and children. [31,32] In this study, only the home dampness index was significantly related to general symptoms. This also may be due

to the longer time in home and/or inadequate statistical power. Classroom dampness, not home dampness, was significantly related to nasal symptoms. Since nasal symptoms are the strongest just after waking up in the morning, [33] exposure to home dampness seems to be important. These nasal symptoms remain strong until noon; [33] therefore, the classroom dampness can possibly affect the late circadian peak of nasal symptoms.

As for the dampness index, the index consisting of condensation on windows, high air humidity in the bathroom, moldy odor, and water leakage had significantly increased ORs for SBS symptoms in Swedish multiresident houses. [13] In Taipei office buildings, the dampness index had significantly increased ORs for eye irritation, cough, and lethargy/fatigue. [34] Moreover, several studies of Japanese dwellings reported that the dampness index had significantly increased ORs for SBS symptoms. [15-18]

As previously mentioned, it has been reported that lifestyle can affect SBS symptoms. [20] In this study, usually not eating breakfast had significantly higher ORs for eye symptoms, and too many snacks and/or sweets had higher ORs for eye, nose, general symptoms, and any symptoms. Thus, favorable food habits probably have a positive effect on subjective symptoms. However, there is a possibility that favorable food habits are related to lower ORs for subjective symptoms via other favorable lifestyle factors.

This study had several limitations. First, if participants knew that dampness was a risk factor

for the subjective symptoms, people whose houses had dampness problems might tend to report subjective symptoms, which might could have caused a bias. However, exposure to chemicals has been spotlighted in Japan, and many Japanese may prefer higher humidity in winter. Besides, classroom dampness was estimated by classroom teachers who did not know pupils' symptoms. Therefore, such bias seems to have occurred rarely in this study. If nonrespondents were prone to have no subjective symptoms, the symptom prevalence rate may have been overestimated. Secondly, a lower response rate may also affect the significant relationship between dampness and subjective symptoms because the statistical power was reduced. Thus, in each dampness indicator, only water leakage of dwellings had significantly higher ORs for cough and general symptoms in multivariate adjustment analyses. Secondly, in fully adjusted analyses, *P* for trends of dampness index was not necessarily consistent with *P* of each dampness index number (OR of home dampness index for general symptoms; OR of class dampness index for nasal symptoms). This may also have been caused due to reduced statistical power. A seasonal variation of SBS symptoms—an increase in mucosal and skin symptoms during winter and spring—has been reported. [35] Fourthly, the season of this study may have affected the prevalence of subjective symptoms. Regarding the symptom part of the MM040 questionnaire, several studies have defined positive symptoms as those occurring often, but "whether the symptoms were attributed to the work environment or not" was not included in the definition of SBS symptoms. [13,23] FIfthy, the MM080 includes queries about

"whether the symptoms were attributed to the school environment or not." Because our study focused on both the home and school environment, "whether the symptoms were attributed to the school environment or not" was not used in our subjective symptom definition. The Japanese version of MM080 was not validated by another Japanese study. However, the queries of subjective symptoms contain common SBS symptoms that are included in the MM040. Therefore, we believe that we were able to estimate the SBS symptoms properly. Finally, This study was conducted in two cities of Hokkaido, Japan. Therefore, generalization of this study to other districts in Japan and in other countries is difficult. But many studies have reported the effect of dampness on pupils' health.

In conclusion, both home and classroom dampness can affect pupils' health. Home dampness, in particular, was significantly related to cough and general symptoms, and classroom dampness was significantly related to nose symptoms. Furthermore, favorable food habits have a positive effect on pupils' subjective symptoms. Thus, to improve both home and school dampness, pupils' food habits is one of the measures that can be used to protect pupils' health, especially in the case of SBS. However, further studies are required to investigate the dampness environment and lifestyle factors for improving pupils' health.

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Table 1 Characteristics of Pupils and their Homes (n = 1,077)

	n	%
Grade		
1st	190	17.6
2nd	165	15.3
3rd	198	18.4
4th	156	14.5
5th	179	16.6
6th	189	17.5
Sex		
Boys	516	47.9
Girls	561	52.1
Allergy within 1 yr	379	35.2
Type of housing		
Solitary house	791	73.4
Year of construction		
≤1980	250	23.2
>1980	730	67.8
Unknown	97	9.0
Heating		
Electric	129	12.0
Ventilation		
Natural	553	51.3
Mechanical	456	42.3
Unknown	68	6.3
Wall-to-wall carpeting in a child's room	523	48.6
Furry animals or birds in the home	263	24.4
Smoke indoors at home	557	51.7
Visible mold	312	29.0
Moldy odor	89	8.3
Water leakage	179	16.6
Condensation on windowpanes	595	55.2
Usually not eating breakfast (1–3 times per week, never)	28	2.6
No sufficient energy at school lunch	97	9.0
Too many snacks and/or sweets	245	22.7

Table 2 Characteristics of Schools (n = 8) and Classrooms (n = 61)

	School		Classroom	
	n	%	n	%
Year of construction				
>1995	3	37.5	24	39.3
<1987	5	62.5	37	60.7
Ventilation system				
Natural	4	50	29	47.5
Mechanical	4	50	32	52.5
Moldy odor	3	37.5	9	14.8
Visible mold	2	25	9	14.8
Water leakage	3	37.5	7	11.5
Condensation on windowpanes	3	37.5	22	36.1
Number of pupils per class				
≤20			8	14.8
21–30			23	37.7
≥31			29	47.5

Table 3 Prevalence of Subjective Symptoms* in Boys and Girls

	Boys (n = 516)		Girls (n = 561)		All pupils (n = 1077)		*P*
	n	%	n	%	n	%	(Boys vs. girls)
Eye	22	4.3	25	4.5	47	4.4	0.877
Nose	87	16.9	64	11.4	151	14.0	0.010
Cough	29	5.6	23	4.1	52	4.8	0.245
Skin	57	11.0	65	11.6	122	11.3	0.780
General	22	4.3	28	5.0	52	4.8	0.795
Any**	144	27.9	127	22.6	271	25.2	0.047

*occurred often (weekly)

** having at least one of above symptoms

Table 4 Multivariate Adjusted Odds Ratios of Dampness and Food Habits for Subjective Symptoms

	Eye		Nose		Cough		Skin		General		Any	
	OR [a] 95% CI	*P*	OR [a] 95% CI	*P*	OR [a] 95% CI	*P*	OR [a] 95% CI	*P*	OR [a] 95% CI	*P*	OR [a] 95% CI	*P*
Usually not eating breakfast	3.84 (1.22–12.5)	0.022	1.72 (0.68–1.34)	0.246	0.66 (0.08–5.00)	0.687	0.75 (0.21–2.70)	0.653	2.70 (0.85–8.33)	0.093	1.69 (0.75–3.85)	0.208
No sufficient energy following school lunch	1.17 (0.44–3.10)	0.755	1.69 (0.97–2.95)	0.065	1.86 (0.83–4.17)	0.134	1.59 (0.86–2.91)	0.137	0.75 (0.26–2.14)	0.586	1.28 (0.79–2.07)	0.310
Too many snacks and/or sweets	2.56 (1.38–4.75)	0.003	1.64 (1.09–2.45)	0.017	1.31 (0.69–2.48)	0.405	0.99 (0.62–1.58)	0.973	2.63 (1.46–4.76)	0.001	1.49 (1.07–2.08)	0.018
Home												
Visible mold	1.28 (0.66–2.48)	0.465	1.18 (0.79–1.77)	0.427	1.60 (0.87–2.95)	0.129	0.94 (0.60–1.47)	0.771	1.65 (0.90–3.03)	0.106	1.20 (0.87–1.66)	0.270
Moldy odor	1.06 (0.35–3.28)	0.915	1.00 (0.52–1.94)	0.998	1.78 (0.75–4.22)	0.192	0.97 (0.47–2.04)	0.943	2.05 (0.90–4.64)	0.086	1.37 (0.82–2.30)	0.229
Water leakage	0.79 (0.32–1.94)	0.604	1.28 (0.79–2.06)	0.315	2.54 (1.34–4.83)	0.004	1.19 (0.71–1.99)	0.506	2.42 (1.27–4.64)	0.008	1.42 (0.97–2.07)	0.073
Condensation on windowpanes	1.02 (0.52–2.00)	0.967	1.18 (0.78–1.78)	0.428	1.53 (0.77–3.03)	0.226	1.16 (0.74–1.81)	0.526	1.15 (0.59–2.23)	0.675	1.30 (0.94–1.81)	0.117
Dampness Index												
0	Reference		Reference		Reference		Reference		Reference		Reference	
1	0.63 (0.27–1.47)	0.283	0.96 (0.59–1.58)	0.881	0.92 (0.39–2.15)	0.847	1.13 (0.67–1.90)	0.653	0.63 (0.26–153)	0.309	1.12 (0.76–1.65)	0.577
2	1.11 (0.49–2.50)	0.807	1.33 (0.80–2.20)	0.279	1.08 (0.44–2.64)	0.871	1.08 (0.61–1.93)	0.787	1.18 (0.51–2.73)	0.697	1.32 (0.87–2.01)	0.189
3	0.92 (0.30–2.81)	0.807	1.22 (0.62–2.39)	0.567	2.74 (109–6.86)	0.032	0.90 (0.42–1.93)	0.782	1.73 (0.70–4.48)	0.258	1.27 (0.74–2.19)	0.390
4	1.03 (0.12–8.70)	0.982	1.35 (0.42–4.42)	0.615	4.94 (1.32–18.5)	0.018	1.98 (0.64–6.14)	0.238	4.82 (1.40–16.6)	0.012	3.20 (1.36–7.54)	0.008
P for trend	0.853		0.281		0.008		0.702		0.017		0.030	

Classroom												
Visible mold	0.82 (0.30–2.26)	0.705	1.53 (0.87–2.68)	0.140	1.20 (0.48–2.98)	0.698	1.17 (0.62–2.21)	0.628	0.63 (0.25–1.64)	0.357	1.39 (0.88–2.20)	0.155
Moldy odor	1.35 (0.55–3.32)	0.520	1.46 (0.87–2.45)	0.148	1.63 (0.68–3.91)	0.275	1.82 (1.00–3.32)	0.052	0.58 (0.22–1.53)	0.272	1.32 (0.86–2.02)	0.211
Water leakage	0.55 (0.18–1.73)	0.309	1.24 (0.71–2.16)	0.442	1.42 (0.61–3.28)	0.414	1.02 (0.55–1.90)	0.940	0.24 (0.06–1.03)	0.055	0.94 (0.60–1.48)	0.790
Condensation on windowpanes	0.77 (0.28–2.13)	0.618	1.72 (0.90–3.29)	0.102	1.79 (0.61–5.30)	0.292	0.93 (0.48–1.82)	0.839	0.47 (0.19–1.17)	0.104	0.92 (0.57–1.48)	0.727
Dampness index												
0	Reference		Reference		Reference		Reference		Reference		Reference	
1	0.58 (0.17–1.98)	0.381	1.71 (0.90–3.25)	0.101	1.39 (0.48–4.05)	0.544	0.72 (0.34–1.51)	0.379	0.42 (0.13–1.33)	0.139	0.74 (0.44–1.26)	0.272
2	0.85 (0.25–2.89)	0.799	1.34 (0.65–2.77)	0.424	1.40 (0.44–4.46)	0.573	0.83 (0.37–1.86)	0.641	0.64 (0.23–1.74)	0.378	0.92 (0.53–1.61)	0.768
3	1.31 (0.32–5.30)	0.704	2.03 (0.86–4.80)	0.107	1.15 (0.25–5.28)	0.859	1.42 (0.56–3.61)	0.463	0.27 (0.05–1.49)	0.133	0.99 (0.49–2.00)	0.969
4	0.51 (0.09–2.81)	0.437	2.30 (0.99–5.38)	0.054	2.33 (0.67–8.14)	0.184	1.51 (0.61–3.74)	0.376	0.16 (0.02–1.41)	0.099	1.42 (0.72–2.77)	0.312
P for trend	0.675		0.050		0.244		0.401		0.042		0.443	

[a]Adjusted for age, sex, allergy, construction year of dwelling, housing type (solitary or other), ventilation of dwelling, type of heating of dwelling, construction year of school, ventilation of school, and number of pupils per class.
Each dampness indicator and food habit was introduced separately in the model.

Table 5 Fully Adjusted Odds Ratios of Dampness and Food Habits for Subjective Symptoms

	Eye		Nose		Cough		Skin		General		Any	
	OR [a] 95% CI	*P*	OR [a] 95% CI	*P*	OR [a] 95% CI	*P*	OR [a] 95% CI	*P*	OR [a] 95% CI	*P*	OR [a] 95% CI	*P*
Usually not eating breakfast	3.7 (1.11–12.5)	0.033	1.89 (0.72– 4.76)	0.200	0.61 (0.07–5.00)	0.642	0.71 (0.19–2.63)	0.593	2.12 (0.63–7.14)	0.223	1.59 (0.68–3.70)	0.286
No sufficient energy following school lunch	1.25 (0.47–3.38)	0.656	1.6 (0.91–2.81)	0.102	1.78 (0.78–4.06)	0.171	1.59 (0.86–2.94)	0.141	0.71 (0.24–2.11)	0.534	1.26 (0.77–2.05)	0.357
Too many snacks and/or sweets	2.43 (1.29–4.57)	0.006	1.57 (1.04–2.37)	0.034	1.28 (0.67–2.47)	0.454	0.96 (0.60–1.54)	0.865	2.45 (1.33–4.53)	0.004	1.4 (1.00–1.97)	0.051
Home												
Dampness index												
0	Reference		Reference		Reference		Reference		Reference		Reference	
1	0.6 (0.25–1.43)	0.249	0.96 (0.59–1.59)	0.874	0.93 (0.40–2.19)	0.867	1.15 (0.68–1.95)	0.593	0.62 (0.26–1.52)	0.298	1.12 (0.76–1.66)	0.578
2	1.01 (0.44–2.33)	0.988	1.31 (0.78–2.20)	0.316	1.04 (0.42–2.55)	0.934	1.09 (0.61–1.96)	0.778	0.93 (0.40–2.19)	0.871	1.27 (0.83–1.94)	0.278
3	0.95 (0.31–2.94)	0.927	1.27 (0.64–2.51)	0.498	2.8 (1.11–7.07)	0.029	0.92 (0.43–1.99)	0.833	1.65 (0.63–4.30)	0.309	1.29 (0.75–2.23)	0.365
4	0.67 (0.07–3.02)	0.72	1.3 (0.39–4.31)	0.67	5.43 (1.41–20.9)	0.014	2.08 (0.65–6.60)	0.215	3.57 (1.01–12.5)	0.047	2.92 (1.22–6.99)	0.016
P for trend	0.645		0.184		0.007		0.566		0.056		0.047	
Classroom												
Dampness Index												
0	Reference		Reference		Reference		Reference		Reference		Reference	
1	0.6 (0.17–2.11)	0.419	1.82 (0.95–3.49)	0.074	1.5 (0.50–4.48)	0.472	0.71 (0.34–1.50)	0.368	0.49 (0.15–1.62)	0.243	0.79 (0.46–1.34)	0.379
2	0.93 (0.27–3.21)	0.903	1.41 (0.68–2.92)	0.354	1.46 (0.45–4.77)	0.53	0.81 (0.36–1.83)	0.61	0.74 (0.26–2.08)	0.565	0.96 (0.55–1.70)	0.898

3	1.65 (0.39–6.92)	0.496	2.28 (0.95–5.44)	0.063	1.26 (0.27–5.94)	0.771	1.39 (0.54–3.55)	0.497	0.33 (0.06–1.85)	0.207	1.07 (0.53–2.19)	0.848
4	0.51 (0.09–2.98)	0.451	2.38 (1.00–5.66)	0.051	2.43 (0.67–8.85)	0.179	1.41 (0.56–3.54)	0.463	0.19 (0.02–1.70)	0.139	1.48 (0.75–2.94)	0.258
P for trend	0.763		0.04		0.232		0.469		0.09		0.348	

[a]Adjusted for age, sex, allergy, construction year of dwelling, housing type (solitary or other), ventilation of dwelling, type of heating of dwelling, construction year of school, ventilation of school, and number of pupils per class.
All above variables included in the model.