

Home allergies among 5th–9th grade schoolchildren in Vilnius, Lithuania

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Allergic diseases are common in children worldwide. The study aimed at investigating the prevalence of house allergies among 5th–9th grade schoolchildren in Vilnius. Anonymous questionnaires were filled in by 540 respondents – schoolchildren aged 10 to 15. 18.4% prevalence of home allergies was revealed in the survey. The prevalence in boys was higher than in girls (19.9% versus 16.9%) without a significant difference. The highest prevalence of home allergies was observed among 15- and 14-year-old respondents. One third of all surveyed families involved other family members suffering from allergies. Schoolchildren with allergies manifested a lower estimation of their health rather than those without. In most cases, children suffering from home allergies complained of common cold (coryza) (40.4% of respondents), watery eyes and itching (20.2%), difficulty in breathing (19.2%), body rash (16.2%). We observed more children with home allergies in houses with black-spotted bathroom walls and the rather than in those without (7.1% and 1.4% respectively).

Key words: schoolchildren, prevalence, home allergies, health

INTRODUCTION

Allergic diseases are an increasingly growing threat to children's health worldwide. The causes of their clinical diversity and modification as well as their growing prevalence have so far received little investigation. The increasing number of allergic diseases is definitely related to environmental pollution, application of chemicals in households and to our lifestyle. According to the scientific data, diverse prevalence of allergic diseases is common not only to different countries, but also to different locations countrywide (Beasley et al., 1998; Broberg et al., 2000; Mortz et al., 2004; ISAAC Phase...; Global Burden...). The differences are likely to depend on social, economic, genetic and other factors (Alfven et al., 2005;

Braback et al., 2004; Demir et al., 2004; Dotterud et al., 2004; Girolomoni et al., 2005).

Their home environment is the place where schoolchildren spend most of their time. Most common home allergens include house dust mites (*Dermatophagoides pteronyssinus*), epidermic allergens of pets, i. e. cats and dogs, domestic chemical substances. These factors have a huge impact on the increasing number of allergic diseases (Alfven et al., 2005; Chung et al., 2003; Ronmark et al., 2002). Apart from that, over the last 20 years people all over the world have improved their living conditions: the insulation of their houses and the tightness of their windows have improved. These conditions have triggered formation of a warm and in many cases damp, poorly ventilated environment which ideally suits for producing house dust mites (Custovic et al., 1998; Dubakienė et al., 2004). Furthermore, the growing number of allergens

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is also related to carpet-fitted floors and air conditioners, introduced in the home environment. Evidence has been found that damp house microclimate and moulds increase the likelihood of developing asthma, allergic rhinitis and other respiratory tract infections (Koskiner et al., 2005).

Taking into account the evidence that the prevalence of allergies is diverse even in towns and villages within a country ((Beasley et al., 1998; Broberg et al., 2000; Mortz et al., 2004; ISAAC Phase...; Global Burden...), we focused on investigating the prevalence of home allergies among schoolchildren of secondary schools of Vilnius, the largest Lithuanian city hosting diverse nationalities with a variety of lifestyles.

METHODS

A survey on the prevalence of home allergies was conducted in November 2005 – December 2006 in Vilnius.

The expected prevalence of home allergies was 15%, maximum error being 3%. The survey sample size was calculated using EpiInfo Version 6; 540 schoolchildren of 5th–9th grades were surveyed for a representative survey; 710 questionnaires were circulated; 540 of them were filled in and found appropriate for the analysis (response rate 76.1%).

A modified WHO questionnaire with additional questions about home conditions was used to evaluate the prevalence of home allergies among schoolchildren. The questionnaire covered 44 items with questions about demographic characteristics, urticaria and atopic dermatitis symptoms (sneezing, common cold, watery and itching eyes, shortness of breath, etc.), home characteristics (house dust, microscopic fungi or moulds, pollen, insect venom, pet fur, domestic chemicals, medicines, etc.).

The questionnaire was tested by a pilot study. The Kappa Coefficient was calculated using Medcalc. Its value ranged from 0.3 to 1.0. Questions that by the Kappa Coefficient were evaluated below 0.4, were estimated as changing their wording. After that, the questionnaires were circulated among the respondents.

Data analysis was conducted applying EpiData 2.1, SPSS statistical packages for Windows 11.0 and WinPepi 1.55. The prevalence of home allergies was expressed in percentage. The 95% confidence interval (CI) was chosen. The χ^2 -test and Fisher's exact test were applied for categorical data analysis. To evaluate the accuracy of rating, 95% PI was estimated, whereas the χ^2 test and Fisher's exact test were applied to

evaluate the correlation between the indices. The correlation level ($\alpha = 0.05$; $p < 0.05$) was statistically significant (Armitage et al., 2002; Čekanavičius, Murauskas, 2003).

RESULTS AND DISCUSSION

The questionnaires were completed by 267 girls (49.4%) and 271 boys (50.6%). The average age of respondents was 13.4 ± 1.23 years.

The majority of respondents (55.2%) evaluated their health as good, 23.7% as very good, 19.1% as satisfactory, 1.7% as bad and 0.3% as very bad.

The prevalence of home allergies found in boys was 19.9% and in girls 16.9% (Table 1), however, the difference was statistically not significant.

Table 1. Prevalence of home allergies among Vilnius schoolchildren

Gender	Home allergy positive	
	%	95% CI
Boys (n = 271)	19.9	15.34–24.88
Girls (n = 267)	16.9	12.57–21.56

$\chi^2 = 0.589$, $p = 0.443$.

The prevalence of home allergies among schoolchildren aged 15 and 14 was 25.0% and 21.8%, respectively ($p = 0.215$).

It is worth noting that home allergy is related to the self-evaluation of health ($p = 0.002$). Schoolchildren without house allergies showed a better estimation of their health state (Table 2).

Data of researchers investigating the respondents' concern about their health revealed a correlation between the self-evaluation of health state and being sick with a number of diseases (Fernandez-Caldas et al., 2005). In spite of our respondents' immaturity, we can assume that the reason why the sick children evaluated their health worse than the healthy ones was their suffering from home allergies.

Almost 80% of schoolchildren with house allergies referred to other members of their family who were suffering from house allergies. However, the percentage of healthy children was 24.4 ($p < 0.001$). The researchers provide evidence that allergy is inherited. The discovered allergy gene is the proof of it. Consequently, children are likely to develop this disease if their parents are allergic (Girolomoni et al., 2005;

Table 2. Subjective estimation of health by schoolchildren

Self estimation of health state	Home allergy (positive)		Home allergy (negative)	
	%	95% CI	%	95% CI
Very good	12.1*	6.42–19.2	26.4	22.36–30.64
Good	55.6	45.22–65.17	55.1	50.34–59.75
Median	26.3*	17.93–35.31	17.5	14.10–21.23
Bad	5.1	1.66–10.12	0.9	0.25–1.99
Very bad	1.0	0.03–3.69	–	–

* $p < 0.05$.

Chung et al., 2003; Van Cauwenberge, 2006; O'Connel, 2003). In most cases, more than one symptom is characteristic of allergic diseases. In fact, a complex of symptoms typical of allergic diseases is displayed (Berger, 2003; Vignola et al., 2001). Van Cauwenberge et al. (2003) notify that even 95% of people suffering from bronchial asthma complain of the symptoms common to allergic rhinitis. Schoolchildren that had complaints indicated common cold (coryza) (40.4% of respondents), occurrence of watery eyes and itching (20.2% of respondents), difficulty in breathing (19.2%), body rash (16.2%), fits of sneezing (16.2%), shortness of breath (6.1%). A number of symptoms exhibit a similarity to those typical of other diseases in children. Our study revealed a distinction in the symptoms indicated by those with home allergies and those without: shortness of breath ($p = 0.04$), difficulty in breathing ($p < 0.001$), frequent common cold (coryza) ($p = 0.008$), fits of sneezing ($p = 0.002$), watery and itching eyes ($p = 0.001$), body rash ($p = 0.001$). The distribution of these ailments was higher in those with house allergies rather than in those without.

Analysis of these ailments in boys and girls suffering from home allergies has revealed that boys show a more frequent shortness of breath, difficulty in breathing, phlegm production and skin itching (Figure).

Data on the distribution of allergies and their symptoms among boys and girls differ. In a report of Japanese researchers, allergic rhinitis was observed in 12.4% of 3–15 aged boys and in 8.0% of girls (Okubo et al., 2004). Montefort and co-authors (2002) found more cases of bronchial asthma in boys than in girls. Meanwhile, Selnes et al. (2005) reported no significant difference in the gender distribution of atopic dermatitis and allergic rhinitis.

Nearly half (49.5%) of schoolchildren with home allergy indicated the occurrence of bothering ailments in particular seasonal months, whereas 34.2% ($p = 0.006$) schoolchildren without home allergy reported the occurrence of ailments at certain seasonal months (Table 3). Scientific literature provides evidence that seasonal characteristics are common to one kind of home allergies – bronchial asthma, triggered by

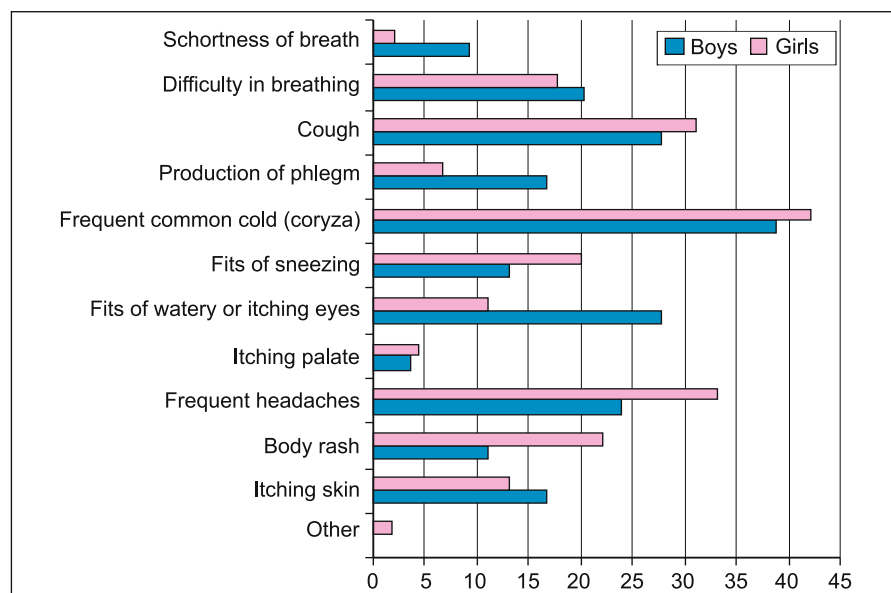


Figure. Distribution (%) of symptoms (ailments) by gender among schoolchildren with home allergy

Table 3. The number of schoolchildren relating their ailments to seasons

Month	Home allergy (positive)		Home allergy (negative)	
	%	95% CI	%	95% CI
January	30.6	18.25–44.06	42.7	34.64–50.64
February	18.4	8.76–30.22	23.3	16.82–30.40
March	22.4	11.77–34.99	14.7	9.43–20.73
April*	22.4	11.77–34.99	9.3	5.2–14.46
May*	36.7	23.42–50.54	4.0	1.48–7.66
June*	24.5	13.34–37.31	7.3	3.72–12.00
July*	24.5	13.34–37.31	8.0	4.2–12.83
August	8.2	2.27–17.20	7.3	3.72–12.00
September	28.6	16.58–41.85	28.0	20.98–35.43
October	28.6	16.58–41.85	36.7	28.96–44.51
November	36.7	23.42–50.54	52.7	44.36–60.59
December	42.9	28.82–56.79	70.0	61.99–77.04

* $p < 0.05$.

Table 4. Distribution of symptoms in home allergy schoolchildren dependent on seasons

	Month	%	95% CI
April:	sneezing	45.5	16.7–73.76
	watery eyes	45.5	16.7–73.76
	itching skin	45.5	16.7–73.76
May:	frequent colds	38.9	17.3–61.67
	watery eyes	38.9	17.3–61.67
	cough	33.3	13.34–55.96
June:	watery eyes	50.0	21.09–76.62
	difficulty in breathing	41.7	15.17–69.21
	frequent colds	41.7	15.17–69.21
	sneezing	41.7	15.17–69.21
July:	watery eyes	50.0	21.09–76.62
	difficulty in breathing	33.3	9.92–60.97
	cough	33.3	9.92–60.97
	production of phlegm	33.3	9.92–60.97

house dust mites. The intensity of the symptoms increases during March, April, September, October and November (Arshad et al., 1992). Our findings reveal a similar trend.

In most cases, schoolchildren with home allergy complain of an aggravated condition related to seasons, i. e. during the months of April–July reported the occurrence of watery eyes, frequent cold and difficulty in breathing (Table 4).

In schoolchildren without home allergies, an aggravation of health state is observed also in December. In general, during December they complain of frequent colds (56.2% of respondents), cough (40.0%) and headache (19.0%). The occurrence of these ailments in December may be related to a colder season and more chances of getting cold.

In more than one third (28.3%) of respondents with home allergies, the symptoms occur in the morning. Unfortunately, we detected no available evidence from other authors on the correlation of the allergic symptoms and the time of the day.

The majority of our respondents (48.3%) were living in a certain panel house, 45.5% in a brick house and 6.2% in wooden houses. No correlation between the type of house and home allergy was determined. The reason could be a comparatively low number of the surveyed children who lived in wooden buildings. According to the study conducted in Vilnius (Dubakiene et al., 2004), the type of house influences the sensitivity to allergens caused by house dust mites. The greatest numbers of house dust mites are found in wooden and the least in brick houses.

The rooms of 62.6% of respondents with home allergies are wall-papered, 33.3% have painted and 4.0% mixed walls. The floor of one third of the respondents' flats is wooden, of another third parquet, of the rest laminated or covered with linoleum.

Over 60% of respondents suffering from allergy live in houses with plastic windows. Among them, less sick children were observed (52.4%); however, this difference was statistically not significant.

Taking into account that moulds in home environment are present in damp and poorly ventilated bathrooms, the respondents were asked to describe the walls and the ceiling of their bathrooms (black-spotted or clean). Even though clean bathroom walls and ceilings were indicated by the majority of our respondents, 7.1% of the sick respondents claimed spotted bathroom walls and ceilings. Of the rest with black-spotted bathroom walls and ceilings, 1.4% were found not suffering from home allergies ($p = 0.004$). A strong association between black spots and home allergy was estimated (prevalence rate 5.11; 95% CI 1.76–14.89; $p = 0.004$).

CONCLUSIONS

1. The prevalence of home allergies among schoolchildren in Vilnius comprised 18.4%. A similar prevalence of home allergies was observed among boys and girls. The age-dependent prevalence of home allergies was found in children aged 15 and 14 years.

2. Three times more children were found to have home allergies in families with other family members suffering from home allergy, rather than in families without allergy.

3. 40.4% of sick respondents indicated symptoms of common cold (coryza), 20.2% watery eyes and itching, 19.2% difficulty in breathing, 16.2% fits of sneezing, 16.2% body rash, 6.1% shortness of breath.

4. Pupils with house allergy estimated their health worse than those without house allergy.

5. Home allergy occurrence depended on the month of a season.

6. Potential home allergens were present in the apartments of both sick and healthy respondents. Nevertheless, the number of allergic children living in houses with blackened bathroom walls and ceiling (a source of micromycetes) exceeded the number of those without allergy.

Received 5 January 2009

Accepted 12 August 2009

References

1. Armitage P., Berry G., Matthews J. N. S. 2002. *Statistical Methods in Medical Research*. 4th edn. 816 p.
2. Alfvén T., Braun-Fahrlander C., Brunekreef B., von Mutius E., Riedler J. 2005. Allergic diseases and atopic sensitization in children related to farming and anthroposophic lifestyle – the PARSIFAL study. *Allergy*. Vol. 5. P. 13–23.
3. Arshad S. H., Hide D. W. 1992. Effect of environmental factors on the development of allergic disorders in infancy. *Allergy & Clinical Immunology*. Vol. 90. P. 235–241.
4. Beasley R., Keil U., von Mutius E., Pearce N. 1998. Worldwide variation in prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and atopic eczema: ISAAC. *The Lancet*. Vol. 351. P. 9111–9117.
5. Berger W. E. 2003. Overview of allergic rhinitis. *Annals of Allergy, Asthma, and Immunology*. Vol. 90. P. 6–7.

6. Braback L., Hjern A., Rasmussen F. 2004. Trends in asthma, allergic rhinitis and eczema among Swedish conscripts from farming and non-farming environments. A nationwide study over three decades. *Clinical & Experimental Allergy*. Vol. 34. P. 38–43.
7. Broberg A., Svensson A., Borres M. P., Berg R. 2000. Atopic dermatitis in 5–6-year-old Swedish children: cumulative incidence, point prevalence, and severity scoring. *Allergy*. Vol. 55. P. 1025–1029.
8. Custovic A., Simpson A., Woodcock A. 1998. Importance of indoor allergens in the induction of allergy and elicitation of allergic disease. *Allergy*. Vol. 53(48 suppl.). P. 115–120.
9. Čekanaivičius V., Murauskas G. 2003. *Statistika ir jos taikymas*. I dalis. Vilnius. 238 p.
10. Chung F., Fabbri L. M. 2003. *European Respiratory Monograph of Asthma*. Vol. 23. P. 1–293.
11. Demir A. U., Karakaya G., Bozkurt B., Sekeler B. E., Kalyoncu A. F. 2004. Asthma and allergic diseases in schoolchildren: third cross-sectional survey in the same primary school in Ankara, Turkey. *Pediatric Allergy & Immunology*. Vol. 15. P. 531–538.
12. Dotterud L. K., Odland J. O., Falk E. S. 2004. Atopic dermatitis and respiratory symptoms in Russian and northern Norwegian schoolchildren: a comparison study in two arctic areas and the impact of environmental factors. *JEADV*. Vol. 18. P. 131–136.
13. Dubakienė R., Dautartienė A., Sliesoraitė I. 2004. Changes in house dust mite fauna in Lithuanians' dwellings and sensitization to Dpt among healthy young people. *Proceedings of the 2nd "WHO International Housing and Health Symposium"*, September 29 – October 1, 2004, Vilnius, Lithuania. P. 353–359.
14. Fernandez-Caldas E., Iraola Calvo V. 2005. Mite allergens. *Current Allergy & Asthma Reports*. Vol. 5(5). P. 402–410.
15. Girolomoni G., Abeni D., Masini C., Sera F., Ayala F. 2005. The epidemiology of atopic dermatitis in Italian schoolchildren. *Allergy*. Vol. 58. P. 420–425.
16. Global Burden of Asthma in Pocket Guide for Asthma Management and Prevention in Children. <http://www.ginasthma.org/ReportItem.asp?11=2&12=2&intId=94>
17. ISAAC Phase One Data. <http://isaac.auckland.ac.nz/PhaseOne/Data/Dataframe.php>
18. Koskinen O. M., Husman T. M. et al. 1996. The relationship between moisture observations in houses and inhabitants, state of health. Part II. *Children. Indoor Air*. Vol. 3. P. 417–430.
19. Montefort S., Muscat H. A., Caruana S., Lenicker H. 2002. Allergic conditions in 5–8-year-old Maltese schoolchildren: Prevalence, severity, and associated risk factors. *Pediatric Allergy & Immunology*. Vol. 13. P. 98–104.
20. Mortz C. G., Lauritsen J. M., Bindslev-Jensen C., Andersen K. E. 2004. Prevalence of atopic dermatitis, asthma, allergic rhinitis, and hand and contact dermatitis in adolescents. The Odense Adolescence Cohort Study on Atopic Diseases and Dermatitis. *British Journal of Dermatology*. Vol. 144. P. 523–532.
21. O'Connell E. J. 2003. Pediatric allergy: a brief review of risk factors associated with developing allergic disease in childhood. *Annals of Allergy, Asthma, and Immunology*. Vol. 90(6). P. 53–60.
22. Okubo K., Gotoh M., Okubo M. 2004. Prevalence of Japanese cedar pollinosis in children aged under 15 years throughout Japan. *Clinical & Experimental Allergy Reviews*. Vol. 4. P. 31–34.
23. Ronmark E., Perzanowski M., Platts-Mills T., Lundback B. 2002. Incidence rates and risk factors for asthma among schoolchildren: A 2-year follow-up report from the obstructive lung disease in Northern Sweden (OLIN) studies. *Respiratory Medicine*. Vol. 96. P. 1006–1013.
24. Selnes A., Nystad W., Bolle R., Lund E. 2005. Diverging prevalence trends of atopic disorders in Norwegian children. Results from three cross-sectional studies. *Allergy*. Vol. 60. P. 894–899.
25. Van Cauwenberge P., De Belder T., Vermeiren J., Kaplan A. 2003. Global Resources in Allergy (GLORIA): allergic rhinitis and allergic conjunctivitis. *Clinical & Experimental Allergy Reviews*. Vol. 3. P. 46–50.
26. Van Cauwenberge P. 2006. ARIA: impact of compliance. *Clinical & Experimental Allergy Reviews*. Vol. 5. P. 3–6.
27. Vignola M., Bousquet J. 2001. Rhinitis and asthma: a continuum of disease? *Clinical & Experimental Allergy*. Vol. 31. P. 674–677.

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VILNIAUS MOKYKLŲ 5–9 KLASIŲ MOKINIŲ BŪSTO ALERGIJOS

Santrauka

Alerginės ligos – aktuali viso pasaulio vaikų sveikatos problema. Aiškinantis būsto alergijų paplitimą tarp Vilniaus mokyklų 5–9 klasių mokinių anoniminės anketinės apklausos būdu apklausta 540 10–15 metų mokinių. Tyrimo duomenimis, būsto alergijų paplitimas siekia 18,4 %. Tarp berniukų būsto alergijų paplitimas didesnis nei tarp mergaičių (atitinkamai 19,9 ir 16,9 %), tačiau šis skirtumas nereikšmingas. Didžiausias būsto alergijų paplitimas tarp 14 ir 15 metų respondentų – atitinkamai 25,0 ir 21,8 %. Mokiniai, sergantys būsto alergijomis, savo sveikatą vertino blogiau nei nesergantys. Vaikai, sergantys būsto alergijomis, dažniausiai skundėsi dažnomis slogomis (40,4 % respondentų), akių ašarojimo ir niežėjimo priepuoliais (20,2 %), kvėpavimo sunkumu (19,2 %), kūno bėrimais (16, %). Būsto alergijomis sergančių vaikų, kurių vonios kambario sienos ir lubos su pajuodusiomis dėmėmis, buvo daugiau nei nesergančių (atitinkamai 7,1 ir 1,4 %).

Raktažodžiai: mokiniai, paplitimas, būsto alergijos, sveikata