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*Allergy to house dust mites in primary health care subjects
with chronic or recurrent inflammatory states of respiratory system*

Chronic and recurrent respiratory tract disorders are a frequent problem in family doctors' practice. Many cases of infectious-like recurrent inflammatory airway diseases are due to sensitivity to indoor inhalant allergens. A number of studies indicate that the prevalence of airway allergy has been increasing over recent decades. Sensitization to house dust mites has been demonstrated to be especially important. House dust mites are common sources of indoor allergens and play a major role as triggers of allergic conditions. They occur in various parts of the world. In European dwellings *Dermatophagoides pteronyssinus* and *Dermatophagoides farinae* are predominant mites species.

The purpose of the study was to evaluate the frequency of unrecognised allergy to house dust mites as a reason of chronic or recurrent respiratory tract diseases in general practitioners' patients. The influence of several individual and environmental factors exposure on the development of allergic conditions was also investigated. Simple diagnostic methods were used in the study to show their usefulness for primary health care.

METHODS

Patients with at least one of the following disorders were recruited to the study: chronic or recurrent rhinitis, sinusitis, pharyngitis, laryngitis, recurrent bronchitis, cough, wheezing or dyspnoea. They had no previous diagnosis of allergy and were treated from recurrent respiratory tract infections mainly. General practitioners were requested to refer those patients to our department to carry out allergy tests. Eighty-nine patients aged 3–47 were examined (study population).

All subjects responded to a questionnaire focused on history of symptoms, diseases in the past and family history of atopic conditions. Exposure to several indoor environmental factors was also assessed. The following information regarding the conditions of the house was collected: type and age of the building, type of heating, number of people sharing the bedroom, m²/person, dampness in the flat, age of the bed, type of bedding, smoking status, presence of pets. In children additional data were obtained from parents as to the birth order, time and course of delivery, Apgar score, diseases and feeding in infancy. All subjects from the study population underwent skin prick testing with common inhalant allergens: mixed pollens of grasses, trees, pollens of mugwort, *Dermatophagoides pteronyssinus*, *Dermatophagoides farinae*, moulds *Alternaria alternata*, *Aspergillus fumigatus*, *Cladosporium herbarum*, dog and cat dander with positive (histamine) and negative controls (diagnostic extracts Soluprick Alk Denmark). To avoid false results each allergen was tested in duplicate at the same time. A mean skin wheal diameter of 3.5 mm or more was considered a positive response and indicative of allergy. Afterwards first-degree relatives of the patients were invited to take part in the study (parents, siblings, children). 30 complete families – two generations living together were examined. In patients from the study population whose families were involved in the study (n=30) blood samples were taken. Total serum IgE and specific IgE antibodies to *D. pteronyssinus* and *D. farinae* were determined to verify skin tests results. Total and specific IgE were measured with disc quantitative enzymimmunoassay (AT-plus allergy test EAST Analco GBG Poland). For total IgE antibody concentration higher than 100 IU/ml was indicative of sensitization. Specific IgE levels higher than 0.7 IU/ml (IgE class 2) were considered positive (class 0 0.35 IU/ml, class 1 >0.35-3.5 IU/ml, class 3 >3.5-17.5 IU/ml, class 4 >17.5 IU/ml). Those subjects were also requested to bring domestic dust samples to measure mites allergens levels. Dust samples were collected by patients themselves with their own vacuum-cleaners to new paper dust bags. They were instructed to vacuum for 3 min 1m² areas of bedroom carpet and mattress separately. The samples were kept at 4°C until analysis. The contents of mites allergens were determined by using semi-quantitative, quinin calorimetric test (Acarex test Allergopharma Germany). The results were expressed in mites allergens concentration class: class 0 <2 mg/mg, class 1 2-10 mg/mg, class 2-3 >10 mg/mg. In order to detect allergy all family members (n=96) both responded questionnaire, underwent skin prick tests and their blood samples had been taken for determination of total serum IgE. If any allergy-like symptoms and/or positive skin tests results were present specific IgE to *D. pteronyssinus* and *D. farinae* were determined as well. In the study population the results were compared between nonsensitive and sensitive to house dust mites patients. Differences in prevalence of several symptoms, family history of atopy, living conditions including exposure to mites allergens, obstetrician history and history of infancy in both groups were tested by Pearson's chi square test. The relationships between different variables were investigated by using logistic regression. Results were considered significant if the p value was less than 0.05.

RESULTS

The results of the assays (positive skin tests and/or elevated levels of specific IgE) showed allergy to house dust mites in 24 of 89 study population patients from general practitioners surgeries (27%). The prevalence of chronic rhinitis, recurrent bronchitis, chronic or recurrent cough, wheezing, dyspnoea was higher in allergic than in nonallergic subjects (Table 1). On the basis of the history sensitized subjects had more frequent posi-

Table 1. Prevalence of respiratory symptoms in sensitized and nonsensitized to house dust mites subjects

Respiratory symptom	Prevalence		P value
	sensitized n=24 (%)	nonsensitized n=65 (%)	
Chronic rhinitis	10 (41.7)	17 (26.2)	0.16
Recurrent rhinitis	13 (54.2)	40 (61.5)	0.53
Recurrent sinusitis	1 (4.2)	4 (6.2)	0.72
Recurrent pharyngitis	9 (37.5)	31 (47.7)	0.39
Recurrent laryngitis	3 (12.5)	17 (26.2)	0.17
Recurrent bronchitis	13 (54.2)	30 (46.2)	0.50
Chronic cough	12 (50.0)	23 (35.4)	0.21
Recurrent cough	8 (33.3)	10 (15.4)	0.06
Wheezing	5 (20.8)	4 (6.2)	0.04
Dyspnoea attacks	5 (20.8)	7 (10.8)	0.22

tive family history of atopic conditions (25%) as compared with nonsensitized subjects (13.8%). After laboratory assays (skin tests, serum IgE) new cases of allergy (undiagnosed or latent) were detected and the number of atopy in families double increased (53% and 26.7% respectively). Finally, mean number of allergic family members was higher in allergic patients (1.44 and 0.53 respectively $p < 0.05$). The exposure to several environmental factors was analysed (Fig. 1). Patients with diagnosis of allergy to house dust mites had usually worse dwelling conditions. They lived in older buildings (above 40 years), damp flats, slept in older beds (above 8 years), used pillows and quilts with feathers (results not significant statistically). Smoking status and the presence of pets were studied. Especially the influence of dampness in flats on several respiratory symptoms was observed (Fig. 2). Recurrent bronchitis ($p < 0.05$), chronic or recurrent cough ($p < 0.05$), wheezing or dyspnoea attacks ($p < 0.05$) were more prevalent in damp dwellings. Our findings demonstrate that the presence of dampness at homes was associated with old buildings, coal heating, sharing bedrooms (Table 2) due to less square meters

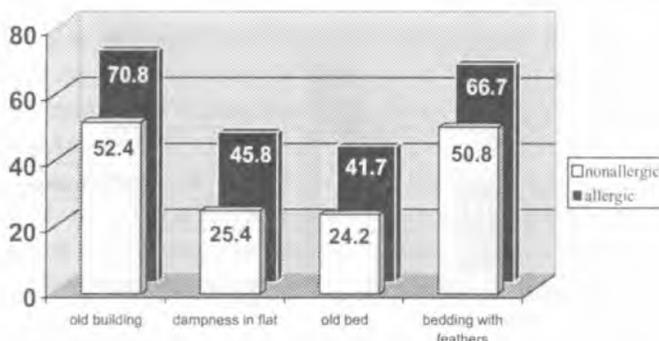


Fig. 1. Dwelling conditions in allergic and nonallergic patients (%)

Tab. 2. Prevalence of dampness in flats in dependence on dwelling conditions

	Dump flat	Dry flat	P value
Old building (%)	88.9	43.3	<0.05
Coal heating (%)	66.7	18.3	<0.05
Sharing rooms and bedrooms (%)	77.8	53.3	<0.05

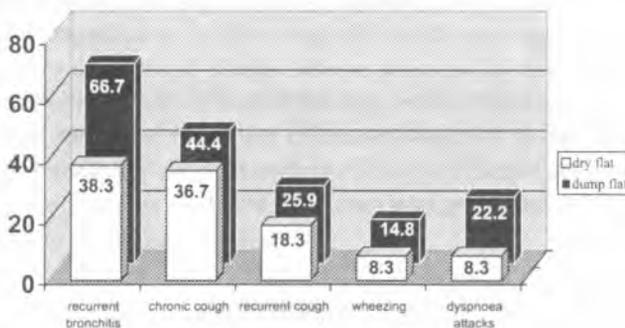


Fig. 2. Influence of dampness in flat on prevalence of several airway symptoms (%)

per person (odds ratio 5.9 $p < 0.05$, 95% CI 3.3-8.5). Subjects who had been found to be allergic were more frequently exposed to higher concentrations of house dust mites allergens in bedroom carpets ($p = 0.06$) and in mattresses ($p = 0.15$) (Fig. 3). In allergic children the early introducing of sensitizing components into the diet in infancy related to shorter breast feeding was observed (Fig. 4). They had been earlier exposed to cow milk before 6th, whole egg before 11th and wheat before 10th month of life (results not significant statistically). The differences in birth order, time and course of delivery, Apgar score, were not observed.

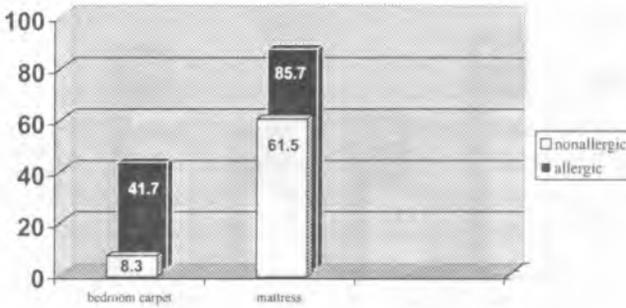


Fig. 3. Exposure to house dust mites allergens higher than $10\mu\text{g}/\text{mg}$ of dust (%)

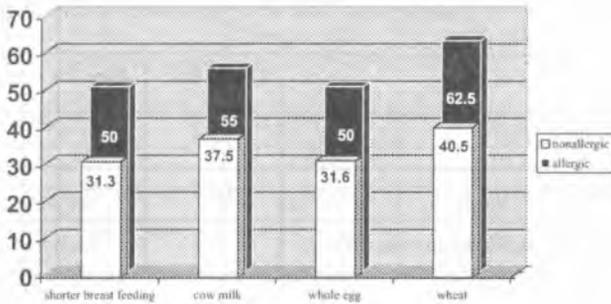


Fig. 4. Early exposure to food allergens in infancy (%)

The skin prick tests to house dust mites in 25% of patients were negative with high serum specific IgE levels (sensitivity 75%) and in 14% patients were positive with low specific IgE (specificity 86%). In 12% of patients with high specific IgE levels and negative skin tests we found low total IgE levels either.

DISCUSSION

The results of our study indicate that unrecognized allergy to house dust mites is the reason for a considerable number of various respiratory tract disorders (27%). Several symptoms from airways were more common in sensitive subjects. This suggests an assumption that diagnostic tests should be considered in patients with long-term airway problems. Allergy may occur in every individual but these with positive family history of atopy are in higher risk group (8). On the other hand 50-70% allergic patients have positive history of atopic conditions in the first degree relatives as compared with 35% nonsensitized patients (8). Results of our study are consistent with these data. The development of allergic disease is related to both genetic predispositions and various environ-

mental factors. This is supported by the fact that induction of sensitization to indoor allergens is related to domestic allergens exposure (1, 10, 14). The concentration of house dust mites depends on indoor climate conditions and it is especially related to higher temperature (above 20°C) and increased humidity at homes (7, 8). Our findings demonstrate the association of low standard of living with incidence of sensitization. Sensitive patients lived more often in old buildings with coal heating, household shared rooms and bedrooms due to small dwelling area. Such conditions were associated with the presence of indoor humidity and related to that increased mites allergens concentration. Sleeping in old beds and using of bedding with feathers stimulates mites allergens exposure as well. The risk of sensitization increases with increasing mites allergens exposure (4, 5, 11). Several authors proposed mites allergens exposure thresholds for sensitization. It has been suggested that mites allergens concentration greater than 2 µg/g of dust should be regarded as a risk for sensitization and the one greater than 10 µg/g of dust highly increases the risk of clinically apparent allergy symptoms (2, 8, 12). Our data show that allergic patients were more often exposed to higher than 10 µg/g of dust mites allergens levels. Early exposure to food allergens in infancy is related to higher risk of food sensitisation (3). It is reasonable to assume that prolonged breast feeding and avoidance of allergizing foods in infancy may play a significant role in later airway sensitivity to inhalant allergens prevention (8). Our findings appear to support this assumption.

We validated the skin tests results with serum specific IgE measurements. 75% sensitivity and 86% specificity of skin tests were obtained. Similar skin tests diagnostic value was reported in other studies: sensitivity 78-97%, specificity 41-91% (9). Thus skin tests results alone cannot be regarded as the final diagnosis. But by very suggestive history and highly positive skin tests diagnosis of allergic disease seems to be very likely. Total IgE measurement is a supportive assay but cannot be the predictor of atopic condition. Both low and high total IgE levels alone have not conclusive value (2). Specific IgE measurements and provocative challenge are final but expensive specialistic diagnostic assays.

Although apparent differences were observed, several results were not significant statistically probably due to small study groups.

CONCLUSIONS

1. Unrecognized allergy to house dust mites is a frequent reason of chronic or recurrent respiratory disorders. General practitioner should be aware of this fact and consider diagnostic tests in long-term management of these patients.

2. Performing of skin tests with total IgE measurements with suggestive medical history may be the screening for majority of allergic conditions in primary health care patients.

3. Family history of atopy and exposure to various environmental risk factors should be evaluated in the course of qualifications for further diagnosis of allergy.

4. Although genetically linked markers are very important positive family history of atopy should not be the only predictor of allergy. About half of allergic patients have not positive history of atopic conditions in the first degree relatives.

5. Low dwelling conditions influence higher house dust mites concentration. Exposure to greater levels of these indoor allergens is associated with higher incidence of airway sensitization. Primary prevention should involve reduction of house dust mites allergens. Unfortunately such interventions like changing a flat or at least changing furniture and bedding, or even applying mites measures treatment are mostly impossible for economical reasons.

6. Early exposure to food allergens in infancy may increase the risk of sensitization to inhalant allergens as well. Avoidance of allergizing foods and prolonged breast feeding should be recommended by general practitioners.

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SUMMARY

Chronic and recurrent respiratory tract disorders are a frequent problem in general practice. The purpose of the study was to investigate the role of hypersensitivity to house dust mites in respiratory tract diseases in general practice patients. We tried to assess the influence of determined risk factors exposure on development of respiratory tract allergy.

Patients from family practitioners surgeries with chronic or recurrent respiratory tract symptoms who had no diagnosis of allergy were recruited to the study (n=89). All patients responded to a questionnaire focused on history of symptoms, atopic conditions in family and exposure to determined environmental factors like dwelling conditions, obstetrician history, diet in the first year of life. All patients underwent skin prick test with common inhalant allergens. Families of the patients were asked to participate in the study. Families who agreed to take part also responded to the questionnaire and underwent skin tests. In patients and their families blood samples were taken to determine total IgE and specific IgE antibodies to mites allergens. Dust samples were collected by vacuuming of patients' bedroom carpets and mattresses to determine house dust mites allergens concentration. Data on 30 complete patients family sets of their brotherhood, mother and father were collected. Total and specific serum IgE antibodies were determined by disc enzymeimmunoassay (Analco). Mites allergens concentration in dust was measured by simple Acarex strip test (Nexter). The results of the assays (positive skin tests and/or elevated levels of specific IgE) showed allergy to house dust mites in 24 of 89 study patients from general practitioners surgeries (27%). The prevalence of chronic rhinitis, recurrent bronchitis, chronic or recurrent cough, wheezing, dyspnoea was higher in allergic than in nonallergic subjects. Patients with the diagnosis of allergy to house

dust mites had usually worse dwelling conditions. Especially the influence of dampness in flats on several respiratory symptoms was observed. Subjects who had been found to be allergic were more frequently exposed to higher concentrations of house dust mites allergens in bedroom carpets and in mattresses. In allergic children early introducing of sensitizing components into the diet in infancy related to shorter breast feeding was observed.

Alergia na roztocza kurzu domowego u pacjentów podstawowej opieki zdrowotnej przewlekłymi i nawracającymi stanami zapalnymi układu oddechowego

Celem badania była ocena częstości występowania alergii na roztocza kurzu domowego jako przyczyny stanów zapalnych dróg oddechowych u pacjentów podstawowej opieki zdrowotnej. Przedmiotem obserwacji były również czynniki ryzyka alergii układu oddechowego. Zbadano 89 osób w wieku 3-47 lat. Na podstawie formularza ankietowego zbierany był wywiad alergologiczny, a w przypadku dzieci dodatkowo wywiad położniczy oraz informacje o przebytych chorobach i odżywianiu w pierwszym roku życia. U badanych osób wykonano uczuleniowe testy skórne z pospolitymi alergenami wziewnymi, pobierano krew celem oznaczenia poziomu IgE całkowitych i specyficznych na alergeny roztoczy oraz oznaczano stężenie alergenu roztoczy w próbkach kurzu dostarczonego z domu. Proponowano udział w badaniu krewnym pierwszego stopnia badanych osób. Zbadano 30 pełnych rodzin. U członków rodzin, oprócz wywiadu i testów skórnych, oznaczano poziom IgE całkowitych i w określonych przypadkach także poziom IgE specyficznych. W badanej grupie 89 pacjentów stwierdzono alergię na roztocza kurzu domowego u 24 osób (27%). Przewlekły nieżyt nosa, nawracające zapalenia oskrzeli, przewlekły i napadowy kaszel, napady świszczącego oddechu i duszności częściej występowały u osób z alergią. Na podstawie samego wywiadu stwierdzono prawie dwukrotnie częstsze występowanie alergii u krewnych pierwszego stopnia badanych alergików (25%) w porównaniu z osobami bez alergii (13,8%). Po przeprowadzeniu badań alergologicznych u członków rodzin dwukrotnie wzrósł odsetek alergików w rodzinach osób badanych. Zaobserwowano częstsze występowanie alergii u osób mieszkających w gorszych warunkach. Osoby z wykrytą alergią były narażone na większe stężenia alergenu roztoczy w środowisku domowym. W przypadku dzieci ze stwierdzoną alergią zaobserwowano krótszy czas karmienia piersią i wcześniejsze wprowadzanie do diety pokarmów alergizujących.