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PRE-EMPLOYMENT EVALUATION OF ATOPY AND CONTACT SENSITISATION IN THE PREVENTION OF ALLERGY-RELATED DISEASES

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The aim of this study was to determine the prevalence of markers of atopy and contact sensitisation in asymptomatic young adults and to assess their role in pre-employment screening. The study included 351 subjects, of whom 166 women (mean age 28.0 ± 6.4 years) and 185 men (mean age 26.3 ± 5.4 years). The pre-employment examination commissioned by a pharmaceutical company included a questionnaire, the patch test with the European standard series of contact allergens, prick test with common inhalatory allergens, and the serum-specific IgE measurement. According to the medical history 115/166 (69.3%) women and 142/185 (76.8%) men were asymptomatic, but 28 (24.3%) asymptomatic women and 40 (28.2%) asymptomatic men showed atopy and/or contact sensitisation. Pre-employment allergy examination can be considered a reliable detection procedure for the majority of asymptomatic persons with atopy and contact sensitisation. The knowledge of these conditions gives the opportunity for secondary prevention and better diagnostic validation of occupational allergic diseases.

KEY WORDS: *patch test, pre-employment examination, prevention, prick test, risk factors, specific IgE*

Allergic diseases and occupational allergies are a permanent and increasing public health problem, especially in the industrially developed countries. Due to a substantial increase in the number of allergic patients throughout the world in the last 30 years, particular scientific attention has been given to the investigation of allergic diseases. Scientific interest has greatly focused on the definition of the markers of susceptibility, of persons at risk of developing allergic diseases, of markers of severity and the course of the disease, as well as of exposure to various allergens and new possibilities for their prevention (1, 2). The significance of positive markers of IgE-mediated sensitisation, i.e. atopy (positive skin tests, increased level of IgE) and contact

sensitisation (positive patch test) in adults with or without clinical symptoms is still controversial (3, 4), particularly in pre-employment examination. Most authors consider medical history and clinical examination in screening for atopy and other allergic diseases sufficient for pre-employment evaluation, even for risk occupations (5, 6). However, various studies find the atopy-related risk of sensitising to high-molecular substances, particularly enzymes, platinum salts, animal dander, latex and flour (4, 7, 8) purely individual. On the other hand, it is known that atopics have 13.5 times greater potential of developing occupational skin disease than non-atopics (9, 10).

The aim of this study was to determine the

prevalence of markers of atopy and contact sensitisation (positive prick test and specific IgE level, positive patch test) in asymptomatic young adults who underwent pre-employment examination and to assess their role in pre-employment screening for persons at risk of developing allergic diseases.

SUBJECTS AND METHODS

The study included 351 subjects, of whom 166 women (mean age 28.0 ± 6.4 years) and 185 men (mean age 26.3 ± 5.4 years). All subjects were examined during pre-employment screening for a job in production of pharmaceuticals which is considered to bear the risk of developing respiratory or skin sensitisation. At the time of examination all subjects had a normal physical status of the respiratory system and skin.

The pre-employment allergy examination, which included all subjects, consisted of a questionnaire, patch and prick tests, and specific IgE measurement.

All subjects were required to answer an allergy questionnaire designed by the Institute for Medical Research and Occupational Health in Zagreb, Croatia. Particular attention was given to skin symptoms (itching, erythema, rash, urticaria, and eczema) and respiratory symptoms of the upper and the lower airways. Nasal itching, congestion, rhinorrhea and sneezing were taken as important symptoms of the upper airways, while cough, phlegm, dyspnoea and wheezing were taken as important symptoms of the lower airways. Subjects without respiratory and/or skin symptoms in medical history were considered asymptomatic.

Our standard skin prick testing (SPT) (11) included common inhalatory allergens (Institute of Immunology, Zagreb) including grass, tree, and weed pollens (w/v 1:100) and the mite *Dermatophagoides pteronyssinus* (0.2%). The results of the SPT were evaluated 20 minutes after the testing. A wheal with a mean diameter $(D+d)/2$ of 3 mm or over was considered a positive reaction. Positive and negative skin reactions were controlled with histamine hydrochloride (1mg/ml) and buffer solution for all subjects.

The levels of specific IgE in venous blood

samples were analysed using the enzyme-immunomethod (UNICAP 100, Pharmacia AB Diagnostics, Uppsala, Sweden) for grass, tree, and weed pollens, as well as for *Dermatophagoides pteronyssinus* in all subjects who showed positive prick reactions. Increased were considered values that surpassed 0.35 kU/L (12). Subjects who were positive in SPT and showed increased specific IgE to one or more inhalatory allergens were considered atopic.

The patch test was performed using a standard method (13) with the European standard series (14) of contact allergens (ALK-Abbelo, Copenhagen, Denmark) on Curatest (Lohmann, Germany) plaster strips. After a 2-day occlusion, skin reactions were read on the 2nd and the 3rd day following the application of the allergens. Erythema, induration and vesicles ("++" or "+++") were considered signs of a positive reaction. Subjects with a positive patch test reaction to one or more tested contact allergens were considered to have contact sensitisation.

The statistical analysis was performed using the SAS 6.12 computer programme (15). The chi-square test was used to determine the differences in the frequency of atopy and contact sensitisation in the examined groups. The value $P < 0.05$ was considered statistically significant.

RESULTS

The results of the patch tests and prick tests with specific IgE measuring in asymptomatic subjects were analysed separately for women and men. According to medical history, 115/166 (69.3%) women and 142/185 (76.8%) men were asymptomatic. Twenty-eight (24.3%) asymptomatic women and 40 (28.2%) asymptomatic men showed atopy and/or contact sensitisation.

The frequency of contact sensitisation was similar in asymptomatic women and men - 18/115 (15.7%) v. 19/142 (13.4%). Hard metal salts (nickel sulphate, cobalt chloride and potassium dichromate) were the most frequent contact allergens in both women (14/18) and men (11/19) (Figure 1). Positive patch test reactions were also observed to paraben mix, wood tars, fragrance mix, colophony and neomycin sulphate in asymptomatic women and to thiuram mix,

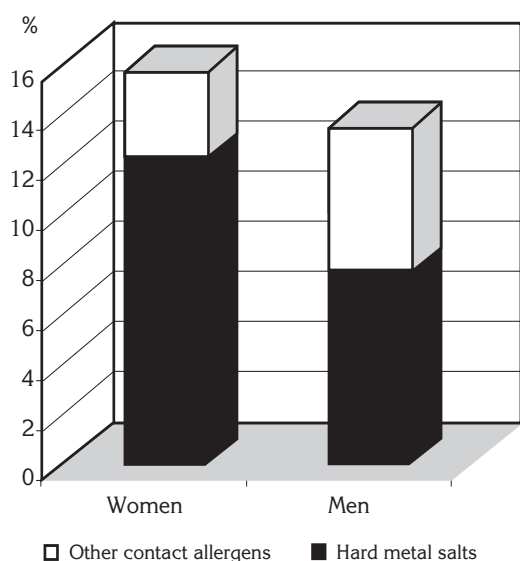


Figure 1 Asymptomatic subjects with contact sensitisation to hard metal salts and other contact allergens

colophony, balsam of Peru, IPPD, benzocaine, wool alcohols, epoxy resin, paraben mix, neomycin sulphate, formaldehyde and ethylenediamine dihydrochloride in asymptomatic men.

The frequency of atopy was greater in asymptomatic men than in women, although the difference was not statistically significant - 18/142 (12.7%) v. 7/115 (6.1%). The house dust mite *Dermatophagoides pteronyssinus* was the most frequent inhalatory allergen in both women (7/7) and men (12/18) (Figure 2). Two women and one man showed concurrent sensitisation to the house dust mite and grass pollens. Six men were

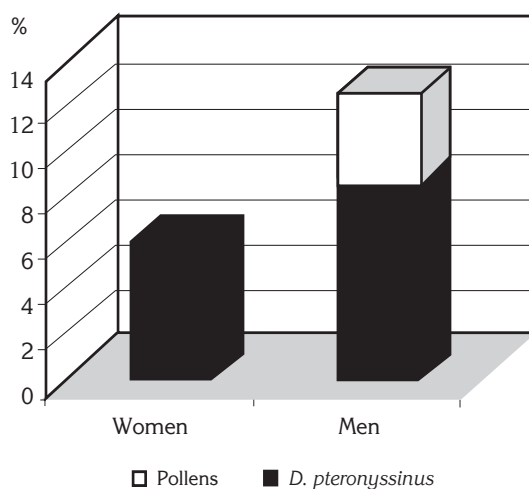


Figure 2 Asymptomatic subjects with sensitisation to *Dermatophagoides pteronyssinus* or to pollens only

sensitised to pollens only: two to weed pollens, two to grass pollens, one to tree pollens, and one to grass and weed pollens. Three asymptomatic women and three asymptomatic men showed both contact and IgE-mediated sensitisation.

DISCUSSION AND CONCLUSIONS

In this study, 257 of 351 subjects examined in a pre-employment screening procedure were healthy, according to their medical history and physical examination. Sixty-eight showed strong evidence of atopy and/or contact sensitisation. Contact sensitisation was comparable between asymptomatic women and men, but atopy prevailed in men, confirming the earlier studies of general population which showed higher prevalence of markers of atopy (increased total IgE level, positive skin tests to inhalatory allergens) in men than in women (16, 17).

The role of pre-employment examination in the prevention of occupational allergic diseases is not all too clear. In general, old concepts of pre-employment examination have remained unchanged for at least 15 years, in spite of great changes in the occurrence of allergic diseases (1, 5, 18). Recent reports indicate that the secondary prevention of allergic diseases is of great importance. It should include early identification of atopic individuals, educational programmes at all levels concerned, and the promotion of a healthy indoor environment (2). Allergic diseases have a chronic course and their symptoms develop and change with age. Relapses strongly depend on interactions with environment. In childhood, symptoms can be mild or moderate and can develop in more severe and chronic forms later in life. It is known that the natural history of allergic diseases follows certain patterns. For example, atopic dermatitis in childhood is considered a risk marker for the development of a respiratory allergic disease later in life; contact sensitisation commonly develops in adults, and the intensity of symptoms increases with the duration and intensity of exposure, as well as with age (1, 2). Many working environments contain different chemical and biological substances which can act as occupational allergens, modifying the natural history of allergic diseases

(19). Furthermore, modern lifestyle exposes us to many occupational allergens in everyday life (1). This is why it is difficult to distinguish whether exposure to an allergen and the resulting disease is general or occupational (3).

Our results confirm earlier opinions that medical history is an insufficient method for pre-employment screening of sensitised persons, as the sensitisation can be asymptomatic and as the job applicants are likely to withhold information (3, 20-22). This may explain why there were so many cases of asymptomatic sensitisation in our study. In some cases, subjects may be unaware that their mild respiratory or skin symptoms are of allergic origin.

To conclude, pre-employment allergy examination for risk occupations, which includes prick and/or patch testing and IgE measurement, should be considered a reliable procedure that can detect the majority of persons with atopy and contact sensitisation: Furthermore, it can be a valuable step in secondary prevention and better diagnostic validation of occupational allergic diseases. In terms of occupational medicine, secondary prevention should involve special education, early detection of specific allergy, and care for atopic and contact-sensitised workers. The extent of pre-employment allergy examination should correspond to occupational exposure. If we agree with the findings of *Hutchings and co-workers* (23) that occupational contact dermatitis has an appreciable impact on the quality of life, we should support *Liden's* (24) opinion that legislation must have an important role in preventing occupational allergic diseases.

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Sažetak

PROCJENA ATOPIJE I KONTAKTNE SENZIBILIZACIJE TIJEKOM PRETHODNIH PREGLEDA U PREVENCIJI ALERGIJSKIH BOLESTI

Cilj ovog rada bio je utvrditi učestalost pokazatelja atopije i kontaktne senzibilizacije u asimptomatske mlade odrasle populacije tijekom prethodnih pregleda te procijeniti njihovo značenje u otkrivanju rizičnih osoba za razvoj alergijskih bolesti prije zapošljavanja. Ispitivanje je obuhvatilo 351 ispitanika, od toga 166 žena (srednja dob 28,0±6,4 godine) i 185 muškaraca (srednja dob 26,3±5,4 godine). Svi ispitanici ispitani su tijekom prethodnih pregleda za farmaceutske industrije koja se smatra rizičnom za razvoj dišnih i kožnih bolesti. Za sve ispitanike ispunjen je alergološki upitnik, učinjeno je epikutano testiranje s europskom standardnom serijom kontaktnih alergena (Epipharm-ALK), prick-testiranje s najčešćim inhalacijskim alergenima (Imunološki zavod, Zagreb) i mjerenje serumskoga specifičnog IgE (UNICAP 100, Pharmacia). Ispitanici bez dišnih i/ili kožnih simptoma u anamnezi smatrani su asimptomatskima. Atopičarima su smatrani ispitanici s pozitivnim prick-testom i povišenim specifičnim IgE na jedan ili više inhalacijskih alergena. Ispitanici s pozitivnim epikutanim testom na jedan ili više kontaktnih alergena smatrani su osobama s kontaktnom senzibilizacijom. S obzirom na anamnestičke podatke, 115/166 (69,3%) žena i 142/185 (76,8%) muškaraca bili su asimptomatski. U 28 (24,3%) asimptomatskih žena i 40 (28,2%) asimptomatskih muškaraca utvrđeno je postojanje atopije i/ili kontaktne senzibilizacije. Prethodni alergološki pregledi mogu se smatrati pouzdanom metodom za otkrivanje većine asimptomatskih osoba s atopijom i kontaktnom senzibilizacijom. Znanje o postojanju ovih stanja kod radnika omogućuje provođenje sekundarne prevencije i bolju dijagnostičku procjenu profesionalnih alergijskih bolesti.

KLJUČNE RIJEČI: epikutani test, kontaktna senzibilizacija, prethodni pregled, prevencija, prick-test, rizični čimbenici, specifični IgE

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