**Introduction: the purpose of this study**

Work-related allergy is one of the important occupational health problems among medical doctors. At present, about 287,000 doctors work in Japan. Decline of work efficiency and of QOL caused by work-related allergies is not only a personal problem but can also contribute a substantially to loss of human resources for community health.

For the last few decades, latex allergy have been a major occupational health concern in the hospital environment. In addition, chemical substances like disinfectants, aerosolized medications, adhesive solvents, and cleaning products have been identified as risk factors associated with allergy among nurses, nursing-related professionals.

Despite the great variety of allergens in hospital and laboratory environments, as far as we know, there are few such studies on medical students', and work-related allergies among medical doctors are usually reported along with hospital workers.

The present study aimed to investigate predictive risk factors for work-related allergy in medical doctors.

**Subjects and Methods: Baseline questionnaire items 1/2**

Demographic Information: ID, Name, Gender, Birth of date, Age

Health status: Personal history of allergic diseases & physician diagnosed age

- Bronchial asthma (BA), Allergic rhinitis and/or Pollen allergy (AR/PA),
- Sinusitis, Eczema, Urticaria, Allergic conjunctivitis (AC), Atopic dermatitis (AD)

Height and Weight

Family history:

- Bronchial asthma (BA), Allergic rhinitis and/or Pollen allergy (AR/PA),
- Sinusitis, Eczema, Urticaria, Allergic conjunctivitis (AC), Atopic dermatitis (AD)

Life-style: Smoking habit

- Living environment ...... Domestic animals, living location
- Physical activity
- Eating habits ...... Frequency of prepared foods, eggs, milk, bananas, manges and avocados, Breast-fed, Breakfast

Hobby: Hobby, Tools and materials

**Subjects and Methods: Baseline questionnaire items 2/2**

History of allergy-like symptoms:

Respiratory: Age of first attack, Symptom severity change, Most frequent season

- Wheezing and Whistling: BA-like symptoms
- Question was based on ISAAC questionnaire for wheezing and asthma.

Dermal: Age of first attack, Symptoms severity change, History of eczema caused by rubber gloves, metallic accessories and cosmetics.

- Reddish skin, itching, and Oozing ...... AD, Eczema, Urticaria-like symptoms

Question was based on ISAAC questionnaire for eczema.

Nasal: Age of first attack, Symptom severity change, Most frequent months

- Sneezing, Nasal discharge, and Nasal obstruction ...... AR/PA-like symptoms

Question was based on ISAAC questionnaire for rhinitis.

Ocular: Age of first attack, Symptom severity change, Most frequent months

- Eye itching, Reddish eyes, and Watery eyes ...... AC, PA-like symptoms

**Subjects and Methods: Follow-up questionnaire items**

Demographic Information: ID, Name, Year of entrance into/graduate from school

Lifestyle: Smoking habit

History of allergy-like symptoms:

- Questionnaire for allergy-like symptoms were same as Baseline.
- Changes in symptom severity after graduation
- Whether the symptoms seemed to be work-related?
- Symptom appearance by work-related items: chemical substances, medical tools, medical materials, laboratory animals, and others

Symptoms appeared on the workplace, and decreased or disappeared at home.

Symptoms appeared at the days off duty, decreased or disappeared during the days off duty.

Symptoms disappeared after workplace/profession change.

Work-relatedness !

Occupational history as a medical doctor: Department, Duration, Job contents
Table 3: Characteristics of Baseline and Follow-up respondents

| Age: 21-40, mean ± SD = 23.2 ± 2.9 | Male 352, Female 196 Baseline | range 24-44, mean ± SD = 30.3 ± 3.5 | Male 162, Female 99 Follow-up |

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<tr>
<th>Smoking status:</th>
<th>Current smoker (%)</th>
<th>Ex-smoker (%)</th>
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<tbody>
<tr>
<td>Male</td>
<td>24.4%</td>
<td>9.1%</td>
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<td>Female</td>
<td>4.6%</td>
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<th>History of Allergic Diseases: Baseline study</th>
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<td>Dermal symptoms:</td>
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<td>Male</td>
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<th>Respiratory symptoms: Baseline survey</th>
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<th>Nasal symptoms: Baseline survey</th>
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<th>Any allergy-like symptoms: Baseline survey</th>
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<td>Male</td>
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Discussion:

1. Work-related respiratory allergy-like symptom was very few in the number. Work-related dermal allergy-like symptoms represented the vast majority of all types of work-related symptoms. Some cases of work-related dermal symptoms, e.g. caused by hand washing in the operating room, from ethanol, povidone-iodine, surgical gloves and powder of latex gloves, may be not allergy but irritation. Even if the prevalence of work-related dermal allergy-like symptoms may be overestimated for this reason, dermal symptoms would still be the most frequent.

Discussion:

2. From the multiple logistic regression analysis results, any types of work-related allergy-like symptoms were significantly related to:
   (1) personal history of personal history of atopic diseases (BA, AR/PA, or AD) at the baseline study. Adjusted OR = 2.30
   This strongly suggests that atopy is a concrete predictor of work-related allergy-like symptoms.
   (2) histories of eczema caused by rubber gloves, metallic accessories, and cosmetics at the baseline study. Adjusted OR = 1.36
   Our subjects of baseline study were 4\textsuperscript{th} grade medical students, and they had already been exposed to surgical gloves allergen and a variety of chemical substances during the experiments of medical school classes, and the practice of human anatomy, besides allergens in daily use goods.
   Based on pre-existing sensitisation, the work-related allergy-like symptoms may frequently appear among doctors exposed to allergens in the work place.

Discussion: Limitations

(1) This was a questionnaire-based study, all the data concerning the medical history were founded on self-reported contents. Since the findings can be perceived to be advantageous to the study population, the quality of answers in terms of accuracy was expected to be uniformly higher than general population.

(2) Response rate to the follow-up questionnaire was low (47.6%). Possible reasons: doctors are busy and tend to change address frequently. Compared with the respondents, a percentage of current or ex-smoker of non-respondents was significantly higher. For this reason, smoking status might not be related to work-related allergy-like symptoms in our results. With respect to other variables, there were no significant differences between respondent group and non-respondent group. Thus, ‘loss to follow-up bias’ and ‘non-respondent bias’ are likely minimal.

Discussion: Limitations

(3) Many respondents were excluded from the current multiple logistic regression analysis due to incomplete answers to follow-up questionnaire. Therefore, our results might be affected by the bias.

Gender, age, smoking status, profession, personal history of allergic diseases, and so on were no significant differences between the included group and the excluded group. Therefore, selection bias is minimal.

(4) Respondents with long work duration were few in number. Among eligible respondents, 65 of 259 (25.2\%) were doctor-in-training and 114 of 259 (44.5\%) were with less than 3 years of experience.

We assume that this partly leads to a comparatively low prevalence of work-related allergy-like symptoms as a whole.

Conclusion:

The present study provides new information on the risk factors associated with work-related allergy-like symptoms in medical doctors. We shed light on the significant associations between work-related allergy-like symptoms and atopy, personal history of eczema caused by common goods, history of keeping domestic animals, and employment in the surgical profession.

Thorough risk management is warranted for doctors in the medical work place, in living environment, and their lifestyle from school days.
The authors are grateful to all participants for their cooperation. We also thank the presidents of the Graduates’ Association of Faculty of Medical Sciences, University of Fukui (Dr. N. Honda, the president) for helping us with mailing the follow-up questionnaires and Ms. K. Yamada and Mr. Y. Yamamoto, student affairs division, University of Fukui, for their clerical support on data acquisition.