Field Study

Occupational Allergy in Medical Doctors

Kazuhiro SATO¹, Yukinori KUSAKA¹, Narufumi SUGANUMA¹, Sumio NAGASAWA¹ and Yoji DEGUCHI²

¹Department of Environmental Health, School of Medicine and ²Department of Community Health Nursing, School of Nursing, University of Fukui, Japan

Abstract: Occupational Allergy in Medical Doctors: Kazuhiro SATO, et al. Department of Environmental Health, School of Medicine, University of Fukui—

Allergic diseases have increased in many developed countries including Japan. Doctors are also at risk for allergic diseases from exposure to allergens in working conditions and hospital environments. We investigated the factors relating to occupational allergy in doctors. Self-administered questionnaires were mailed to all doctors (n=895) who had previously graduated from School of Medicine, Fukui Medical University. Data from 307 responders (response rate: 34.3%, male 241, female 66, mean age $\pm$ S.D., 30.8 ± 4.2) were analyzed. Eighty-nine doctors stated that they had occupational allergy including contact dermatitis, allergic rhinitis and/or asthma. Fifty-four had contact dermatitis caused by surgical gloves; 77 had contact dermatitis from disinfectants, e.g. 23 from chlorhexidine gluconate; 21 from povidone iodine; and 15 from ethanol. Fifteen doctors experienced allergic rhinitis and/or asthma caused by handling laboratory animals. Univariate analysis showed that profession (surgical doctors) and past histories of allergic diseases (rhinitis, sinusitis, or atopic dermatitis) were significantly related to occupational allergy in doctors, but that gender, smoking or physical exercise were not significantly related to it. A logistic regression analysis showed that past histories of allergic diseases and the profession of surgical doctors were significantly related to occupational allergy, but that gender, age or smoking were not significantly related to it. The results of the present study suggest that past history of allergic diseases is a factor predisposing to occupational allergy in doctors. It is necessary and possible to extend more prophylactic measures for doctors, especially for surgeons, because exposure to responsible agents and materials for them can be more frequent.

(*J Occup Health* 2004; 46: 165–170)

Key words: Doctor, Occupational allergy, Rhinitis, Asthma, Contact dermatitis, Surgical glove, Disinfectant

In Europe, some studies have described occupational allergy in hospital employees^{1–5}. Contact dermatitis of the hands was the major occupational skin disease among occupational allergies in these employees. The distribution and severity of the problem varies between countries and regions¹. In Japan, occupational allergies caused by medicine used in the hospital environment is becoming a problem^{6,7}. Surgeons and surgical nurses have often experienced work-related hand dermatitis⁷. Chlorhexidine gluconate, povidone iodine, disinfectants for hand cleaning in operating rooms, and surgical rubber gloves have been reported to be causative agents for occupational allergies. In addition, brushing hands for surgery is predisposing to contact dermatitis.

Our previous studies^{8,9} showed that medical students who would become doctors have also experienced allergic diseases, not only type I allergy including allergic rhinitis and bronchial asthma caused by cryptomeria pollen or dermatophagoides, but also type IV allergy including contact dermatitis caused by mercury, nickel and dyes. Predisposing and risk factors, e.g. dental amalgam and mercurochrome were also suggested for these manifestations.

These medical students come to be physicians and start being exposed to occupational allergens at hospitals. To protect them from occupational allergies in the hospital environment, it is necessary to make a risk assessment of prevalent risk factors.

Up to date, epidemiological studies identifying risk factors other than hazardous substances have been quite rare among hospital employees¹⁰. In Japan, as far as we know, there has been no epidemiological study which described occupational allergies in the hospital environment. In the present study, their prevalences and risk factors were studied and preventive measures are discussed.

Received Aug 15, 2003; Accepted Dec 15, 2003

Correspondence to: K. Sato, Department of Environmental Health, School of Medicine, University of Fukui, Matsuoka-cho, Fukui 910-1193, Japan (e-mail: satokazu@fmsrsa.fukui-med.ac.jp)

Subjects and Methods

Subjects

In the present study, we investigated factors relating to occupational allergies in doctors who had graduated from School of Medicine, Fukui Medical University. Since the subjects are physicians, it is conceivable that they can state their allergic disease history and its etiologic factors. The subjects were 895 doctors who had graduated from School of Medicine, Fukui Medical University between 1986 and 1995. Two-hundred and fifty-three had graduated between 1986 and 1993 and were living in Fukui Prefecture at the time of this study. Six-hundred and forty-two had graduated between 1986 and 1995 and were living outside Fukui Prefecture. Self-administered questionnaire studies were performed in March, 1994, for subjects in Fukui Prefecture and in April, 1996, for subjects outside Fukui Prefecture.

Questionnaire

The self-administered questionnaire consisted of inquiries regarding present departments within hospitals and clinics, allergic diseases, family histories, occupational allergy in hospital environments, relevant allergenic agents and substances, life-styles i.e. smoking, physical exercise.

Since the present subjects were qualified doctors, their responses to these items were considered to be valid. The criteria for past and family history of bronchial asthma, allergic rhinitis, sinusitis, eczema, urticaria, allergic conjunctivitis and atopic dermatitis were as follows:

In cases positive for one of these items concerning a past or family history in the questionnaire, the subjects were considered to have that condition. A past history of allergic diseases was regarded as present before starting medical practices. When they stated that they had at least one family member who suffered from a corresponding allergic disease, they were considered to have a family history of the allergic disease.

We defined occupational allergy in doctors as follows: any allergic disease including rhinitis, dermatitis, asthma and conjunctivitis induced by a medicine or handling a laboratory animal in a hospital or at an experimental facility within a medical school; if a responder indicated positiveness to a corresponding item, the responder chose the name of the allergen from the list of allergenic medicines and laboratory animals⁽¹⁾ enrolled in the questionnaire. If there were no relevant allergens listed, he or she wrote down the name of the allergen in the questionnaire space. Because the subjects were physicians, they were considered to be able exactly to indicate their allergic past or present history and their etiologic factors. The appendix shows the questionnaire items used.

Statistical analysis

The doctors reporting occupational allergies and the others without occupational allergies were compared. The data were analyzed for uni-variate by the Chi-square test with Yates' correction for professions (Surgeon or Internist), for past history of allergic disease (bronchial asthma, allergic rhinitis, atopic dermatitis or sinusitis), for lifestyle factors, i.e., smoking and physical exercise. Thereafter, a logistic regression analysis of any occupational allergy was performed for identify risk factors by using SPSS 9.0J. The covariates included in the model were gender (male=1, female=0), age ($\geq 30=1$, $<30=0$), past histories of any allergic diseases (yes=1, no=0), smoking (current smoker=1, non- or ex-smoker=0) and professions ("internist"=0, "surgeon"=1). These factors were entered. Significance was accepted at $p<0.05$.

Results

1. Response rate to the questionnaire and characteristics of the responders

The response rate to the questionnaires in doctors who were living in Fukui Prefecture was 37.9% (96/253), and that of those outside Fukui Prefecture was 32.9% (211/642). The overall response rate was 34.3% (307/895). Altogether, we analyzed 307 doctors in this study, 241 males and 66 females. The mean age was 30.8 ± 4.2 year (mean $\pm$ S.D.). At the time of this study, eighty-eight of 307 doctors were internists, 30 were orthopedic surgeons, 27 surgeons and so on (Table 1).

Others of all (n=895) included those whose addresses were unknown.

Table 1. Prevalences and classification of 307 and 895 doctors according to department

Department	Responder (n=307)	All (n=895)
International Medicine	88	205
Orthopedics	30	64
Surgery	27	88
Anesthesiology	18	35
Otorhinolaryngology	18	51
Radiology	17	35
Ophthalmology	16	44
Gynecology	16	39
Pediatrics	13	44
Dermatology	12	28
Neurosurgery	10	23
Urology	8	20
Psychiatry	7	21
Basic Medicine*	5	18
Others	22	180

*includes pathology, biochemistry and environmental health.

Table 2. Association between past history and family history of allergic diseases

Allergic disease	<i>p</i> value*
Bronchial Asthma	N.S.
Allergic Rhinitis	<0.005
Sinusitis	<0.005
Eczema	<0.005
Urticaria	<0.005
Allergic Conjunctivitis	<0.005
Atopic Dermatitis	N.S.

*by Chi-square test

2. Past and family histories of allergic diseases

The number of doctors reporting past history of bronchial asthma was 20, that of allergic rhinitis was 129, sinusitis 29, eczema 36, urticaria 54, allergic conjunctivitis 49 and atopic dermatitis 22. The number of doctors reporting family history of bronchial asthma was 36, that of allergic conjunctivitis was 18, allergic rhinitis was 80, sinusitis 30, atopic dermatitis 34, urticaria 31, eczema 26. There were significant associations between the past histories and the family histories in allergic rhinitis, sinusitis, eczema, urticaria and allergic conjunctivitis for each (Table 2), which was similar to that of medical students shown in our previous reports^{8,9)}.

3. Occupational allergy in 307 doctors

89 out of 307 reported the presence of occupational allergy. The prevalences of occupational allergies among the responders (n=307) reported are shown in Table 3. The number of doctors reporting contact dermatitis was the largest, i.e. 77. The most prevalent inducer was the surgical rubber glove (Table 4); the second potential inducers were chlorhexidine gluconate, povidone iodine and ethanol. All of these are used in operating rooms. Thirteen doctors experienced allergic rhinitis caused by laboratory animals. Some of these cases had two or more of these allergic diseases. The number of doctors with an occupational allergy was 18/88 in Internal Medicine, 13/30 in Orthopedics, 9/27 in Surgery, 5/18 in Anesthesiology, 5/18 in Otorhinolaryngology, 3/17 in Radiology, 8/16 in Ophthalmology, 7/16 in Gynecology, 4/13 in Pediatrics, 3/12 in Dermatology, 1/10 in Neurosurgery, 5/8 in Urology, 2/7 in Psychiatry. We divided all the 307 responders into two groups, Internists and Surgeons. The Internist group (n=137) included internists, radiologists, pediatricians, dermatologists and psychiatrists. The Surgeon group (n=144) included orthopedic surgeons, surgeons, neurosurgeons, ophthalmologists, anesthesiologists, urologists, otorhinolaryngologists and gynecologists. The Surgeon

Table 3. Prevalence of occupational allergies including overlaps in doctors

Disease	number	%
Contact Dermatitis	77	25.1
Allergic Rhinitis	19	6.2
Bronchial Asthma	3	1.0

Table 4. Substances inducing occupational allergy with overlaps in doctors

Inducer	number
Surgical Gloves	54
Chlorhexidine Gluconate	23
Povidone Iodine	17
Ethanol	15
Laboratory Animals	15

group (56/144) had occupational allergies more than the Internist group (27/137).

4. Factors relating to occupational allergies in doctors shown from comparison with the non-allergic doctors

It was shown from the univariate analysis that past histories of allergic diseases (bronchial asthma, allergic rhinitis, atopic dermatitis or sinusitis) were significantly associated with occupational allergy in doctors. There was no significant difference in gender for occupational allergy. Neither smoking nor physical exercise was associated with occupational allergies (data were not shown). The occupational allergy doctors included more surgeons than internists ($p<0.01$ by Chi-square test, relative odds; 2.6 Table 5).

A Logistic regression analysis showed that the past histories of allergic diseases and the surgical profession were significantly associated with occupational allergy in doctors (Table 6).

Discussion

The response rate in the mailed questionnaire study was quite low. The overall response was 34.3% (307/895). Prevalences and classification according to departments were not much different (Table 1). Thus, a selection bias (for instance, only doctors who were interested in allergies responded to the questionnaires¹²⁾ might be a little. The judgement of 'Occupational allergy in doctors' might be biased for self-administered questionnaires. A verification study would be necessary in future.

Nevertheless, a confounding bias may be adjusted at the stage of analysis¹²⁾. Thus a logistic regression analysis

Table 5. Significant association of doctor groups with regard to occupational allergies ($p<0.01$)

Group	Occupational allergy in doctors		Total
	+	–	
'Surgical'*	56 (39%)	88 (61%)	144 (100%)
'Internal'	27 (20%)	110 (80%)	137 (100%)
	83	198	281

*'Surgical' includes orthopedic surgeons, surgeons, neurosurgeons, ophthalmologists, anesthesiologists, urologists, otorhinolaryngologists and gynecologists. 'Internal' includes internists, radiologists, pediatricians, dermatologists and psychiatrists.

Table 6. Significant risk factors for occupational allergy in doctors shown by a logistic regression analysis

Variables	Significance	Exp (β) (95% CI)
age ($\geq 30=1$, $<30=0$)	0.662	1.133 0.646–1.988)
gender (male=1, female=0)	0.572	0.823 (0.418–1.619)
Smoking (current smoker=1, non-or ex-smoker=0)	0.675	0.868 (0.448–1.682)
Past history of allergic diseases* (yes=1, no=0)	0.003**	2.255 (1.308–3.888)
Profession (surgical=1, internal=0)	0.001**	2.683 (1.533–4.696)

*allergic diseases are bronchial asthma, allergic rhinitis, atopic dermatitis or sinusitis. ** $p<0.05$

was used to identify the predictors of occupational allergy in doctors. We must be careful to interpret the prevalences from the present study. Anyhow, descriptive data from the study are valuable and can be analyzed by means of the comparison between occupational allergic doctors and non-occupational allergic doctors.

89/307 doctors in our study have experienced occupational allergy in doctors in our study. Stingen *et al.*¹⁾ reported that 21.2% (276/1301) have experienced occupational hand dermatitis in hospital environments and that women have it more frequently than men. Lammintausta *et al.*⁵⁾ reported that 44.2% (57/129) of hospital workers had current hand dermatitis. Our sample size ($n=307$) was big enough to compare with these previous results. Our prevalence was similar to theirs, but there was no significant difference in occupational allergy between women (20/66) and men (69/241) in our study. The most prevalent symptom among the occupational allergies in doctors was contact dermatitis (77/89). Surgical rubber gloves and the three disinfectants,

i.e. chlorhexidine gluconate, povidone iodine and ethanol, inducers of occupational allergies in the present subjects, are actually and often used in operating rooms. Some doctors had experienced occupational allergies caused by one disinfectant, but not by others; other doctors were affected by two or more of them.

On the other hand, most cases with hand dermatitis in hospital employees were considered to be from not allergy, but irritation^{3, 10)} except for latex allergy. Thus, doctors should choose not only non-allergy-inducing but also non-irritating disinfectant.

Fifteen doctors had reported allergic rhinitis or asthma caused by laboratory animals (Table 4). Their allergens are considered to be epidermis of animal skins or dermatophagoides hosted by laboratory animals. Wearing gauze mask can protect from these allergies in experimental facilities to some extent.

Doctors who had past histories of allergic rhinitis, sinusitis and atopic dermatitis as a whole had significantly more often experienced occupational allergies than those

without past histories. Lammintausta *et al.*⁵⁾ reported that an atopic constitution appeared to predispose people to development of permanent or recurrent hand dermatitis. In the present study, past histories of these allergic diseases as a whole were predisposing factors to occupational allergies. There were significant associations between past and family histories of allergic rhinitis, sinusitis, eczema, urticaria and allergic conjunctivitis (Table 2). A genetic factor behind the family history plays an important role in allergic diseases. Even if there is no past history of allergic diseases, doctors who have a family history of allergic diseases may have to take prophylactic measures against occupational allergies.

Lyfesyles, i.e. smoking and physical exercise, were not associated with occupational allergies in doctors as in other studies¹⁰⁾.

In a comparison with internists, surgeons were found to have a significantly greater risk of occupational allergy in doctors ($p < 0.01$, Chi-square test, 2.6, relative odds, Table 5). Moreover, the logistic analysis suggested that the surgical group and past history of allergy were related to occupational allergy (Table 6). As a matter of fact, surgical gloves and disinfectants were the most affective causative agents to occupational allergy in doctors. Thus surgeons need to be provided with more prophylactic measures.

Acknowledgments: We thank the secretariat of the Graduates' Association of School of Medicine, Fukui Medical University (Dr. N. Honda, the president, and the colleagues) for helping us with mailing the questionnaires.

References

- 1) L Stingeni, V Lapomarda and P Lisi: Occupational hand dermatitis. In hospital environments. *Contact Dermatitis* 33, 172–176 (1995)
- 2) Hansen KS: Occupational dermatoses in hospital cleaning women. *Contact Dermatitis* 9, 343–351 (1983)
- 3) Kavli G, Angell E and Moseng D: Hospital employees and skin problems. *Contact Dermatitis* 17, 156–158 (1987)
- 4) K Lammintausta, K Kalimo and VK Havu: Occurrence of contact allergy and hand eczemas in hospital wet work. *Contact Dermatitis* 8, 84–90 (1982)
- 5) K Lammintausta, K Kalimo and S Aantaa: Course of hand dermatitis in hospital workers. *Contact Dermatitis* 8, 327–332 (1982)
- 6) H Kawade, H Aoyama and Y Izawa: Patch test with chlorhexidine: a six-year patch testing. *Hifu* 25, 613–616 (1983) (in Japanese with English abstract).
- 7) T Usuda, K Shibata, T Ohtu and Y Higuchi: Hand dermatitis in surgeons and nurses. *Nishinitihifu* 49, 483–487 (1987) (in Japanese with English abstract).
- 8) K Sato, Y Kusaka, M Yanagihara, K Ueda, T Mori and S Miyakoshi: An epidemiological study of factors relating to mercury sensitization. *Jpn J Allergy* 44, 86–92 (1995) (in Japanese with English abstract).
- 9) K Sato, Y Kusaka, Q Zhang, M Yanagihara, K Ueda, H Morihiro, Y Ishii, T Hirai, T Tomiyama and K Iida: An epidemiological study of the mercury sensitization. *Allergo Int* 46, 201–206 (1997)
- 10) Uveges RE, Grimwood RE, Slawsky LD, Marks JG. Epidemiology of hand dermatitis in dental personnel. *Military Medicine* 1995; 16: 335–338.
- 11) Kobayashi S, Nomura S eds. *Life and Allergy*. Ishiyaku Syuppan, Tokyo 1984 (in Japanese).
- 12) Greenberg RS, Ibrahim MA. The case-control study. In: *Oxford textbook of public health*. 2nd ed. Volume 2 *Methods of public health*. Holland WW, Detels R, Knox G eds. 1991: 121–143.

Appendix:

Questionnaire on occupational allergy in doctors

1) Health status

1. Have you ever experienced these diseases?

Bronchial asthma	1. Yes	2. No
Allergic rhinitis	1. Yes	2. No
Sinusitis	1. Yes	2. No
Eczema	1. Yes	2. No
Urticaria	1. Yes	2. No
Allergic conjunctivitis	1. Yes	2. No
Atopic dermatitis	1. Yes	2. No

2. Height and weight

height () cm
weight () kg

2) Family history

Do you have a family member who has already experienced these disease?

Bronchial asthma	1. Yes	2. No
Allergic conjunctivitis	1. Yes	2. No
Allergic rhinitis	1. Yes	2. No
Sinusitis	1. Yes	2. No
Atopic dermatitis	1. Yes	2. No
Urticaria	1. Yes	2. No
Eczema	1. Yes	2. No

3) Life-style

1. Have you ever been a smoker?

1. Yes 2. No 3. Ceased

2. Do you have a family member who has been a smoker?

1. Yes 2. No

3. Have you ever been feeding a pet? If yes, please indicate your pets.

1. Yes 2. No
indoor: 1. cat 2. dog 3. bird 4. fish
outdoor: 1. cat 2. dog 3. bird 4. fish

4. Please indicate your present residential location.

1. residence zone 2. business zone
3. industrial zone 4. agricultural zone

- *If you have experienced occupational allergy as a doctors, any allergy induced by a medicine or a laboratory animal in a hospital or at an experiment facility within a medical school, please write down the allergic symptoms in detail.
- ()