

ORIGINAL**Prevalence of allergic rhinitis based on the SACRA questionnaire among Japanese nursing professionals with asthma**

Masanari Watanabe¹, Jun Kurai¹, Hiroyuki Sano², Saeko Torai³, Hirokazu Yanase⁴, Tomoaki Funakoshi⁴, Atsuko Fukada⁴, Sachiko Hayakawa⁵, Hiroya Kitano⁶, and Eiji Shimizu¹

¹Department of Respiratory Medicine and Rheumatology, Tottori University Faculty of Medicine, Yonago, Japan, ²Department of Respiratory Medicine and Allergology, Kinki University Faculty of Medicine, Osakasayama, Japan, ³Tottori Nursing Association, Tottori, Japan, ⁴Division of Nursing, Tottori University Hospital, Yonago, Japan, ⁵Department of Public Relations, Tottori University Hospital, Yonago, Japan, ⁶The Board of Directors, Tottori University, Tottori, Japan

Abstract : Although adult asthma is attributable to occupational factors and asthma and rhinitis are related, relatively few studies have investigated the prevalence of occupational rhinitis based on occupation, and knowledge of occupational rhinitis in Japan is currently limited. The objective of this cross-sectional study was to estimate the prevalence of allergic rhinitis among Japanese nursing professionals with asthma. A postal survey was conducted from October to December 2013 using translated versions of the European Community Respiratory Health Survey for the prevalence of asthma and State of the Impact of Allergic Rhinitis on Asthma Control questionnaire for the prevalence of rhinitis. Of 4,634 Japanese nursing professionals, 497 subjects had asthma, and 270 of these 497 subjects had allergic rhinitis (54.3% ; 95% confidence interval [CI], 49.7-58.7). Latex allergy was significantly associated with allergic rhinitis (odds ratio, 1.77 ; 95% CI, 1.21-2.60). There was no relationship between employment period and prevalent allergic rhinitis. The results of this study provide fundamental information regarding occupational health among Japanese nursing professionals, including the prevalence of allergic rhinitis among Japanese nursing professionals with asthma and latex allergy as a potential risk factor for prevalent allergic rhinitis. *J. Med. Invest.* 63 : 108-113, February, 2016

Keywords : allergic rhinitis, ECRHS questionnaire, latex allergy, nursing professionals, SACRA questionnaire

INTRODUCTION

The airways are the entryway and primary target for a variety of environmental airborne substances. As a result, the airway mucosa is continuously exposed to a variety of dust, gases, fumes, and vapors. Depending on the amount and property of inhaled airborne substances, these substances can cause irritation, corrosive changes, or sensitization of the respiratory mucosa (1, 2). The nasal and bronchial mucosa share similarities, and one of the most important concepts of nose-lung interactions is the functional complementarity (3). Numerous epidemiological and clinical studies have found a close relationship between asthma and allergic rhinitis (4, 5), which has led to the concept of "one airway one disease" (6).

Certain occupational exposures are associated with some types of asthma that are referred to as occupational asthma (OA) (7, 8). Similarly, occupational exposures account for a substantial proportion of occupational rhinitis (OR) (2, 9). The link between rhinitis and asthma also appears to apply to both OA and OR (2, 9). Karjalainen *et al.* found that the relative risk of asthma was 4.8% in workers with OR (10). Conversely, as many as 90% of patients with OA reported having work-related rhinitis symptoms (9, 11, 12). In a separate study, OR was found in 76% of workers with

confirmed OA due to a variety of agents (9, 13). Mechanisms explaining the observed correlations between OR and OA continue to be actively investigated. One prevalent hypothesis involves the unified airway model in which both diseases could be secondary to the same inflammatory responses occurring throughout the upper and lower respiratory tract (9). Therefore, when patients with OR remain exposed to the causal agent, they may progress to asthma (10).

OR remains a poorly researched area, especially in Japan. Previous studies of occupational exposures among various groups of workers have suggested that asthma prevalence may be notably high among nursing professionals (14, 15). Therefore, in order to determine how work affects rhinitis, it may be useful to conduct a study of the relationship between rhinitis and asthma among nursing professionals. In this cross-sectional study, a standardized questionnaire was used to investigate the prevalence of asthma among Japanese nursing professionals. At the same time, to assess the prevalence of rhinitis among Japanese nursing professionals with asthma, we conducted an extended survey using the State of the Impact of Allergic Rhinitis on Asthma Control (SACRA) questionnaire, which involves self-assessment of allergic rhinitis and asthma (16).

MATERIALS AND METHODS*Study design*

The primary outcome variable was the prevalence of rhinitis among nursing professionals with asthma in the neighboring

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Address correspondence and reprint requests to Masanari Watanabe, M.D., Ph.D., Department of Respiratory Medicine and Rheumatology, Tottori University Faculty of Medicine, 36-1 Nishichou, Yonago 683-8504, Japan and Fax : +81-859-38-6539.

Tottori and Shimane Prefectures, which are located in Southwest Japan. We asked the Nursing Association for assistance and received approval to submit the survey to the hospitals, clinics, and health care centers; 45 hospitals, 10 clinics, and 28 health care centers agreed to participate in the survey, and the nursing staff was asked to participate in the study. A survey was mailed to the nursing professionals who provided written consent. This study was conducted from October to December 2013. The study was approved by the institutional ethics committee of Tottori University (Ethics Committee of the Faculty of Medicine, Tottori University; Approval Number 2250).

Questionnaire

The presence of asthma in the nursing professionals was identified using the Japanese version of the European Community Respiratory Health Survey (ECRHS) questionnaire (17, 18). The validity of this questionnaire was established by translating the Japanese version back into English (19). If a respondent had been diagnosed with asthma by a physician and experienced positive asthma-related symptoms in the last 12 months, he or she was defined as currently having asthma.

The prevalence of rhinitis was determined in those with current asthma based on the rhinitis symptoms reported on the Japanese version of the SACRA questionnaire (16, 20). Although the SACRA questionnaire is intended for patients with asthma, there is no other validated questionnaire in Japanese to diagnose allergic rhinitis. Moreover, the SACRA questionnaire was recently used in a population-based cross-sectional study of the prevalence of allergic rhinitis among Japanese asthma patients (16).

If a respondent experienced positive rhinitis-related symptoms for more than one hour almost every day, he or she was diagnosed with rhinitis. The severity of rhinitis was determined based on the limitation of activities owing to rhinitis-related symptoms; positive responses to difficulty sleeping and limitations in daily life, while studying, and during work were defined as moderate/severe rhinitis. With negative responses to all of these difficulties, the severity of rhinitis based on these symptoms was assessed using a visual analog scale (VAS), which ranged from not at all bothersome (0) to extremely bothersome (10) (16, 20). When the response to the VAS exceeded 5, the severity was also defined as moderate/severe; otherwise, the rhinitis was considered mild. Rhinitis was classified as intermittent or persistent; when an answer was not provided, it was classified as other.

The SACRA questionnaire included additional questions on age, sex, height, weight, smoking history, presence of latex allergy (self-reported), total duration of employment as a nursing professional, total duration of shift work, and total duration of employment involving bed-making tasks in a medical setting. Total duration of employment as a nursing professional, total duration of shift work, and duration of employment involving bed-making tasks in a medical setting were categorized as < 1 year, 1-4 years, 5-9 years, 10-19 years, and \geq 20 years.

Statistical analysis

Results are reported as mean \pm standard deviation (SD). SPSS (Japanese version 21.0 for Windows; IBM Japan, Tokyo, Japan) was used for all statistical analyses. The prevalence of current asthma and the associated 95% confidence interval (CI) were estimated for all participants aged 20-69 years. Fisher's exact tests were performed to assess differences in the prevalence between men and women, both for the overall sample and within each age group. The differences in the prevalence of allergic rhinitis among those with current asthma were also evaluated according to the total duration of employment as a nursing professional, total duration of shift work, and duration of employment involving bed-making tasks in a medical setting. In addition, logistic regression

analysis was conducted to determine the odds ratios and associated 95% CIs for allergic rhinitis based on total duration of employment as a nursing professional, total duration of shift work, total duration of employment involving bed-making tasks in a medical setting, and latex allergy. For the employment durations, a \leq 1-year period was used for the comparisons. All P-values are two-sided, and the significance level was set to 0.05.

RESULTS

Of the 5,463 nursing professionals that provided written consent, 4,761 nursing professionals answered the questionnaire before the deadline for submission. Owing to inadequate responses to Q1 of the ECRHS questionnaire, 127 of the 4,761 subjects were excluded, resulting in 4,634 subjects in the analysis, for an overall response rate of 84.8%. Current asthma was present in 497 (10.7%; 95% CI, 9.9-11.7) subjects (Table 1). Of the 497 subjects, 270 subjects had allergic rhinitis, resulting in a prevalence of 54.3% (95% CI, 49.7-58.7) (Table 2). The prevalence was not significantly different between male and female nurses. Table 3 shows the prevalence, classification, and severity of rhinitis-related symptoms. The prevalence of rhinitis-related symptoms was also not significantly different between male and female nurses. The durations of employment as a nursing professional, involving bed-making tasks, and with shift work were not associated with the prevalence of allergic rhinitis (Table 4). Latex allergy was significantly associated with the prevalence of allergic rhinitis among nursing professionals with asthma (Table 5).

DISCUSSION

To the best of our knowledge, this cross-sectional study is the first study to investigate the prevalence of allergic rhinitis among Japanese nursing professionals with asthma, resulting in a prevalence of 54.3% using the SACRA questionnaire. This study provides fundamental data for occupational health management in Japan.

The prevalence of asthma is suggested to be notably high among nursing professionals (14, 15). The large, multicenter European Community Respiratory Health Survey II (ECRHS II) study showed that nursing professionals had more than twice the risk of asthma (odds ratio = 2.22; 95% CI, 1.25-3.96), as compared with a reference group of professional, clerical, and administrative occupations (21). In addition, using the ECRHS questionnaire, a recent population-based, cross-sectional study in Japan demonstrated prevalences of asthma and wheezing among Japanese adults aged 27-79 years of 4.2% (95% CI, 9.7-10.5) and 10.1% (95% CI, 9.7-10.5), respectively (17). Therefore, the prevalence of asthma among Japanese nursing professionals in the present study was higher than that in the adult population of Japan. The present results also suggest that occupational exposures during nursing may account for a substantial proportion of asthma cases among Japanese nursing professionals. Several studies have indicated that the risk of asthma among nursing professionals is associated with chemical and cleaning-related tasks, as well as biological contaminants (14, 15, 22-24); nursing professionals perform various patient care activities that potentially involve exposure to occupational hazards that increase the risks of asthma, including drawing blood, mixing and administering medications, providing wound and respiratory care, cleaning surgical and non-surgical instruments, mopping floors, assisting with invasive and other medical procedures, and assisting with anesthesia (22).

Furthermore, 44-68% of Japanese patients with asthma also have allergic rhinitis (23, 24), and up to 90% of patients with OA also experience work-related rhinitis symptoms (9, 11, 12). Several

Table 1. Descriptive characteristics of the nursing professionals with current asthma

	Total (n=497)	Male (n=27)	Female (n=470)
Age (year)	39.5 ± 10.5	30.8 ± 5.3	40.0 ± 10.6
Smoking history (number, %)			
Never smoker	385 (77.8)	13 (48.1)	372 (79.5)
Past smoker	44 (8.9)	1 (3.7)	43 (9.2)
Current smoker	66 (13.3)	13 (48.1)	53 (11.3)
Presence of latex allergy (number, %)	166 (33.5)	5 (18.5)	161 (34.3)
Employment period as nursing professional in life (number, %)			
<1 year	10 (2.0)	1 (3.7)	9 (1.9)
1-4 years	70 (14.1)	14 (51.9)	56 (11.9)
5-9 years	89 (17.9)	8 (29.6)	81 (17.2)
10-19 years	160 (32.2)	4 (14.8)	156 (33.2)
20≤	168 (33.8)	0 (0)	168 (35.7)
Period of bed making tasks in the medical fields (number, %)			
<1 year	33 (6.6)	4 (14.8)	29 (6.2)
1-4 years	91 (18.3)	14 (51.9)	77 (16.4)
5-9 years	112 (22.5)	6 (22.2)	106 (22.6)
10-19 years	158 (31.8)	3 (11.1)	155 (33.0)
20≤	103 (20.7)	0 (0)	103 (21.9)
Experienced period of night shift (number, %)			
<1 year	34 (6.8)	4 (14.8)	30 (6.4)
1-4 years	93 (18.7)	13 (48.1)	80 (17.0)
5-9 years	123 (24.7)	7 (25.9)	116 (24.7)
10-19 years	143 (28.8)	3 (11.1)	140 (29.8)
20≤	104 (20.9)	0 (0)	104 (22.1)

Data are shown as the mean ± SD in age or the number (%).

Table 2. Prevalence of allergic rhinitis among Japanese nursing professionals with current asthma

Variables	Nursing professionals (n=497)					
	Total		Male		Female	
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)
Presence of rhinitis	270	54.3 (49.7-58.7)	15	55.6 (35.3-74.5)	255	54.3 (49.5-58.8)

CI : confidence interval.

Table 3. Prevalence, classification, and severity of rhinitis-related symptoms in nursing professionals with current asthma

Variables	Nursing professionals (n=497)					
	Total		Male		Female	
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)
Rhinitis symptom						
Watery rhinorrhea	194	39.3 (34.9-43.7)	13	48.1 (28.7-68.1)	181	38.8 (34.3-43.3)
Sneezing	163	33.0 (28.9-37.3)	11	40.7 (22.4-61.2)	152	32.5 (28.3-37.0)
Nasal obstruction	134	27.1 (23.3-31.3)	10	37.0 (19.4-57.6)	124	26.6 (22.6-30.8)
Itchy nose	169	34.2 (30.0-38.6)	9	33.3 (16.5-54.0)	160	34.3 (30.0-38.8)
Watery, red and itchy eyes	174	35.2 (31.0-39.6)	8	29.6 (13.8-50.2)	166	35.5 (31.2-40.1)
Classification						
Persistent	102	20.6 (17.2-24.5)	5	18.5 (6.3-38.1)	97	20.8 (17.2-24.7)
Intermittent	284	57.5 (53.0-61.9)	15	55.6 (35.3-74.5)	269	57.6 (53.0-62.1)
Others	108	21.9 (18.3-25.8)	7	25.9 (11.1-46.3)	101	21.6 (18.0-25.6)
Severity						
Moderate/severe	310	62.9 (58.4-67.2)	16	59.3 (38.8-77.6)	294	63.1 (58.5-67.5)
Mild	183	37.1 (32.8-41.6)	11	40.7 (22.4-61.2)	172	36.9 (32.5-41.5)

CI : confidence interval.

The other classification was used when an answer was not provided for the classification.

Table 4. Prevalence of allergic rhinitis based on durations of employment in nursing professionals with current asthma (n=497)

Variables	<1 year		1-4 years		5-9 years		10-19 years		20≤		P value
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	
Total duration of employment as a nursing professional	5	50.0 (18.7-81.3)	40	57.1 (44.7-68.9)	47	52.8 (41.9-63.5)	83	52.5 (44.4-60.5)	93	55.7 (47.8-63.4)	0.950
Total duration of employment involving bed-making tasks in a medical setting	21	63.6 (45.1-79.6)	53	58.2 (47.4-68.5)	56	50.0 (40.4-59.6)	80	51.3 (43.2-59.4)	58	56.9 (46.7-66.6)	0.492
Total duration of shift work	21	61.8 (43.6-77.8)	58	62.4 (51.7-72.2)	59	48.0 (38.9-57.2)	72	51.1 (42.5-59.6)	58	56.3 (46.2-66.1)	0.203

CI: confidence interval.

Table 5. Logistic regression analysis for the prevalence of allergic rhinitis in nursing professionals with current asthma

Variables	Odds ratio (95% CI)	
	Total	
Total duration of employment as a nursing professional		
≤ 1 year	1.190	(0.340-4.164)
Total employment duration working the night shift		
≤ 1 year	0.718	(0.351-1.468)
Duration of employment involving bed-making tasks in a medical setting		
≤ 1 year	0.660	(0.317-1.372)
Latex allergy	1.771	(1.207-2.601)

CI: confidence interval.

studies of occupational exposures among various groups of workers have suggested that approximately 0.2-16.1% of cases of allergic rhinitis are attributable to occupational factors (25-28), and the incidence of OR among all allergic rhinitis cases in Japan is reportedly 0.6-3.0% (29). Therefore, we hypothesized that occupational exposures during nursing work may account for a substantial proportion of allergic rhinitis cases among Japanese nursing professionals with asthma.

The current study estimated that the prevalence of allergic rhinitis among Japanese nursing professionals with asthma was 54.3%, which is not high compared with previous studies conducted in Japan (16, 30, 31). For example, Ohta *et al.* estimated that the prevalence of allergic rhinitis among Japanese asthma patients older than 15 years was 68.5% (95% CI, 67.6-69.2%) using the SACRA questionnaire (16).

Hay fever in Japan is most commonly caused by pollen from Japanese cedar and cypress, which is dispersed from February to April. In order to estimate the prevalence of allergic rhinitis among Japanese nursing professionals at a time with the least effect on asthma, this study was conducted from October to December because less pollen is dispersed in late autumn than in other seasons, whereas the study by Ohta *et al.* was performed from March to August (16). The self-administered SACRA questionnaire results in a diagnosis of allergic rhinitis based on symptoms. Therefore, the proportion of asthma subjects with upper airway tract symptoms in the present study might be lower than in previous Japanese studies. Furthermore, the prevalence of allergic rhinitis might have been underestimated because a diagnosis by a physician was not required to identify allergic rhinitis; therefore, if a subject had received treatment from a physician that improved the allergic rhinitis symptoms, they were not diagnosed with allergic rhinitis in the present study.

Importantly, sensitization to natural rubber latex in atopic individuals has become the most common occupational disease among nursing professionals who use latex gloves (14). A change from powdered to non-powdered latex gloves could decrease latex-related symptoms (32). In the current study, we also found a significant

association between latex allergy and allergic rhinitis. Therefore, for Japanese nursing professionals, the prevention of sensitization to latex might be important to reduce the prevalence of allergic rhinitis.

One limitation of this study is that current asthma was determined using the ECRHS questionnaire, which might have overestimated the asthma prevalence. However, the ECRHS questionnaire has been extensively validated in previous studies (17, 33). Similarly, the diagnosis of latex allergy was self-reported.

CONCLUSION

This cross-sectional study used a Japanese version of the SACRA questionnaire to determine the prevalence of allergic rhinitis among Japanese nursing professionals with asthma. We hypothesized that occupational exposures during nursing work might account for a substantial proportion of allergic rhinitis, as well as asthma, cases among nursing professionals. However, the prevalence of allergic rhinitis among Japanese nursing professionals with asthma was lower than among Japanese adult patients with asthma. In contrast, latex allergy and concomitant allergic rhinitis were present among nursing professionals with asthma.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interests regarding the publication of this paper.

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AUTHOR CONTRIBUTIONS

MW, JK, HS, ES, and HK conceived the study. JK, MW, HS, ST, and SH participated in the study design. MW, JK, ST, HY, TF, and AF collected the data. MW and JK performed the analysis. MW, JK, and HK drafted the manuscript. All authors had full access to all data in the study and take full responsibility for the integrity of all data and the accuracy of the data analysis.

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