

Original

Health Problems Related to Drug Compounding of Pharmacists in Dispensing Pharmacies

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(Received: May 16, 2011)

Abstract

The objective of this study was to clarify the characteristic health problems of pharmacists, which they consider to be related to drug compounding. This study was a cross-sectional survey. We sent self-administered questionnaires concerned with 1) symptoms of health problems which pharmacists believed to be related to drug compounding, 2) compounding processes and drugs which they believed to be related to those health problems, 3) compounding processes and working environment, and 4) self-rated life satisfaction to all managing pharmacists of dispensing pharmacies. Of 899 mailed questionnaires, 391 (43.5%) were completed and returned. Health problems which pharmacists believed to be related to drug compounding were reported from 60.3% of males and 71.3% of females. Most of these problems were allergic or irritation symptoms of the eyes, nose, oral cavity and throat. These symptoms related to tablet crushing, opening capsules and pharmacists' past history of allergies ($p < 0.05$). General fatigue was related to low satisfaction with work ($p < 0.01$). Personal protections to reduce exposure to drug dust should be strengthened and the factors of these health problems should be assessed by additional surveys. The recognition of this issue by prescribing physicians and their cooperation are also important.

(JJOMT, 60: 23—31, 2012)

—Key words—

Subjective symptom, Occupational exposure, Drug compounding

Introduction

The number of dispensing pharmacies in Japan has increased as a result of a government policy that promotes the separation of drug dispensing and prescribing duties¹⁾. The number of dispensed drugs per patient is increasing due to an increasingly older population whose consultation rate for medical care is high and because the number of prescribed medicines increases with age²⁾. One-dose packaging apportionment of powders, granules, tablets, and capsules are performed in order to improve medication compliance and to prevent incorrect drug ingestion³⁾. Alteration of dosage forms, such as crushing tablets and opening capsules, has been adopted for small or various dose prescriptions and for patients with swallowing difficulties⁴⁾⁵⁾. In a previous Japanese report, the frequency of dosage form alteration by clinical department was higher in pediatrics, psychiatry, and internal medicine⁴⁾ in descending order. From these situations, many pharmacists, even in small-scale dispensing pharmacies, may be exposed to various drugs.

Health problems of pharmacists related to occupational exposure to drugs have been reported previously. Concerns regarding allergic diseases have been raised as early as the 1970s and more recently, especially among hospital pharmacists^{6)~11)}. Furthermore, relationships of occupational exposure to antineoplastic drugs with acute adverse effects¹²⁾¹³⁾, infertility¹⁴⁾, miscarriages, and stillbirths¹⁵⁾ were reported. As many antineoplastic agents have a potential to cause mutagenicity, teratogenicity, or carcinogenicity, prevention of occupational exposure to such drugs is needed^{16)~18)}. Although the preparation of infused antineoplastic drugs may be restricted to hospital pharmacies, health problems resulting from antineoplastic drugs for internal use are also probable

in dispensing pharmacies.

The amount of drugs absorbed through an occupational exposure may be small for pharmacists in small-scale dispensing pharmacies; however, unexpected health problems may occur because of repeated and continuous occupational exposure; drugs absorbed via trans-airway or transdermally are not metabolized in the liver; and drug interactions may occur. In a separated system of drug dispensing and prescribing functions, health problems among dispensing pharmacy pharmacists related to drug compounding are hardly collected compared to hospital pharmacy. There are no recent studies, to our knowledge, that have investigated health problems of dispensing pharmacy pharmacists in Japan.

We conducted a questionnaire survey to assess the prevalence of subjective health problems among dispensing pharmacy pharmacists and to investigate suspicious occupational risk factors of pharmacists related to drug compounding.

Methods

We conducted a cross-sectional study by mailing self-administered questionnaires to all managing pharmacists of health insurance pharmacies who were members of a prefecture pharmacist association in the Tokai region of Japan from June through July, 2009. Of 899 managing pharmacists, 391 (43.5%) completed a questionnaire on their own health problems.

Questionnaire

The questionnaire included 1) symptoms of health problems which the respondents believed to be related to drug compounding, 2) compounding processes and drugs which they believed to be related to those symptoms, 3) procedures for crushing tablets, 4) frequency of opening capsules, 5) use of masks and gloves during drug compounding and the reasons for non-use, 6) dust collector setting, 7) three chief clinical departments dispensing for, 8) history of drug dispensing, 9) past and present history of diseases (allergies and another diseases), 10) countermeasures against the above-mentioned symptoms and effectiveness of those measures, and 11) self-rated satisfaction with work and family life.

Symptoms of health problems listed in the questionnaire were: uncomfortable feeling, itching, or pain in eyes; sneezing, nasal discharge, or nasal obstruction; uncomfortable feeling, itching, or pain in oral cavity; uncomfortable feeling, itching, or pain in throat; feeling of airway obstruction or dyspnea; skin irritation, itching, or flare; headache; nausea, vomiting, abdominal pain, or diarrhea; arthralgia; edema in extremities; fever; anxiety or helplessness; general fatigue; palpitation or chest discomfort; numbness or dimmed vision; and "others."

Compounding processes which the respondents believed to be related to the above symptoms were classified as: powder drug compounding; tablet crushing or capsule opening; ointment preparation; "other operations;" and "unknown." Drugs which they believed to be related to symptoms were categorized as antibiotics; antineoplastic drugs; antirheumatic drugs; antipyretics; metabolic disease drugs; gastrointestinal drugs; cardiovascular or respiratory drugs; psycho-neurological drugs; Kampo preparations; decoctions; "other drugs;" and "unknown."

For the procedure of crushing tablets, a tablet crusher for exclusive use, mortar, tablet cutter, coffee mill for family use, and "others" were listed. The frequency of opening capsules had a selection of three options (often, sometimes, and scarcely).

Past and present history of disease were queried regarding food allergies, asthma, atopic dermatitis, urticaria, eczema, hay fever, drug eruption, hypertension, heart diseases, peptic ulcer, diabetes mellitus, liver diseases, kidney diseases, and "other diseases."

Countermeasures against symptoms were queried regarding the use of a mask; job replacement; change of working place; improvement of equipment; "other measures;" and "nothing done."

Self-rated satisfaction with work and family life were assessed by selecting one of four options: dissatisfied, somewhat dissatisfied, somewhat satisfied, and satisfied.

Statistical analysis

Differences in continuous variables were assessed by *t*-test. Proportions were compared using the chi-square test or Mantel-Haenszel procedure for significance between women and men or between those with

Table 1 Characteristics of respondents by sex and presence of symptoms of health problems which they believed to be related to drug compounding

	All subjects	Men		Women	
		With symptoms	Without symptoms	With symptoms	Without symptoms
n	391	141 (60.3%)	93 (39.7%)	111 (71.3%)*	45 (28.7%)
Mean ages	47.3 (13.2)	46.7 (13.5)	50.6 (13.9) [†]	45.7 (11.9)	46.5 (13.4)
Mean of past dispensing work years	14.6 (9.3)	14.3 (9.4)	14.1 (9.8)	15.3 (8.8)	15.0 (9.5)
Mean working hours per day	6.9 (2.4)	7.2 (2.3)	6.6 (2.2)	7.0 (2.4)	6.3 (2.6)
Mean working days per month	22.2 (3.6)	22.5 (3.4)	22.4 (3.5)	21.9 (3.4)	21.3 (4.8)
Mean sleeping hours per day	6.5 (0.9)	6.5 (0.9)	6.7 (0.9)	6.4 (0.9)	6.7 (0.8)

* $P=0.025$ by chi-square test between men and women, however, $p=0.073$ by Mantel-Haenszel procedure adjusted for age in decades.

[†] $P=0.036$ by unpaired t -test for mean value between those with symptoms and those without symptoms. Standard deviations in parentheses.

Table 2 Proportion of symptoms which respondents believed to be related to drug compounding

	Men (n = 234)	Women (n = 157)	All subjects (n = 391)
Sneezing, nasal discharge, nasal obstruction	44.0%	47.8%	45.5%
Uncomfortable feeling, itching or pain in throat	26.5%	26.1%	26.3%
Uncomfortable feeling, itching or pain in eyes	21.4%	15.3%	18.9%
Uncomfortable feeling, itching or pain in oral cavity	9.8%	14.0%	11.5%
Skin irritation, itching, flare	6.4%	8.9%	7.4%
General fatigue	7.7%	7.0%	7.4%
Headache	6.0%	5.7%	5.9%
Anxiety, helplessness	5.6%	5.1%	5.4%
Arthralgia	4.7%	5.1%	4.9%
Feeling of airway obstruction, dyspnea	2.6%	3.2%	2.8%
Nausea, vomiting, abdominal pain, diarrhea	2.6%	2.5%	2.6%
Edema in extremities	1.7%	1.9%	1.8%
Palpitation, chest discomfort	1.7%	1.3%	1.5%
Numbness, dimmed vision	1.3%	0.6%	1.0%
Other symptoms	5.2%	7.6%	6.1%
Without any symptoms	39.7%	28.7%	35.3%

Not significantly different between men and women by Mantel-Haenszel procedure adjusted for age in decades.

and without corresponding symptoms separately. The α value was set at 0.05. Univariate and multivariate logistic regression analyses were used to explore the factors that related to self-rated satisfaction with work. In the multivariate model, self-rated satisfaction with work (satisfied, dissatisfied) was dependent variable and sex (men = 1, women = 2), age (years), major symptoms, use of mask (yes, no), use of gloves (yes, no), dust collector setting (yes, no) and statistically selected present illness (with, without; food allergy, urticaria, eczema) by univariate model were included as independent variables. Statistical analysis was conducted with the SPSS software, version 12 (SPSS, Inc., Chicago, IL).

Ethics

The study protocol was approved by the Ethics Committee of Gifu University Graduate School of Medicine in advance.

Results

Symptoms of health problems which respondents believed to be related to drug compounding were reported by 60.3% of men and 71.3% of women. Table 1 shows the characteristics of the respondents by sex and presence of symptoms. Overall, they averaged 47.3 (± 13.2 ; SD) years old and 14.6 (± 9.3) years on the job, with no significant difference between men and women. Men with symptoms were younger than those without symptoms ($p < 0.05$). Mean past dispensing work years, mean working hours per day, mean working days per month, and mean sleeping hours per day were not significantly different between those with symptoms and those without symptoms for both men and women. Internal medicine (94.6%), orthopedics (50.1%), and pediatrics (30.9%) were the three main clinical departments for which pharmacists dispensed therapeutics, psychia-

Table 3 Associations of each major symptom with compounding processes and drugs which respondents believed to be related to symptoms

	With symptoms (n = 253)	Symptoms in eyes (n = 74)	Symptoms in nose (n = 178)	Symptoms in oral cavity (n = 45)	Symptoms in throat (n = 103)	Symptoms in skin (n = 29)	Head-ach (n = 23)	Anxiety, helplessness (n = 21)	General fatigue (n = 29)
Compounding processes which respondents believed to be related to symptoms									
Powder drug compounding	68.0%	78.4% *	75.8% ***	80.0%	74.8%	82.8%	56.5%	61.9%	65.5%
Tablet crushing or capsule opening	51.0%	64.9% **	57.9% ***	80.0% ***	64.1% ***	58.6%	73.9% *	42.9%	58.6%
Ointment preparing	2.8%	2.7%	2.2%	2.2%	2.9%	13.8% **	4.3%	4.8%	6.9%
Other operations	15.4%	9.5%	11.2% **	6.7%	9.7% *	17.2%	26.1%	38.1% **	20.7%
Unknown	5.9%	10.8% *	5.1%	4.4%	7.8%	3.4%	17.4% *	33.3% ***	24.1% ***
Drugs which respondents believed to be related to symptoms									
Psycho-neurological drugs	27.7%	41.9% **	30.9%	46.7% **	38.8% **	31.0%	43.5%	38.1%	41.4%
Cardiovascular or respiratory drugs	20.6%	25.7%	21.9%	24.4%	27.2% *	27.6%	26.1%	14.3%	20.7%
Gastrointestinal drugs	17.0%	24.3% *	22.5% ***	35.6% ***	18.4%	10.3%	21.7%	23.8%	10.3%
Antibiotics	11.9%	14.9%	14.0%	20.0%	14.6%	20.7%	13.0%	4.8%	6.9%
Kampo preparations	8.7%	10.8%	11.2% *	15.6%	8.7%	3.4%	17.4%	9.5%	3.4%
Antipyretics	6.7%	14.9% ***	8.4%	15.6% **	11.7% *	13.8%	8.7%	4.8%	10.3%
Decoctions	4.3%	2.7%	5.1%	4.4%	3.9%	6.9%	4.3%	4.8%	0.0%
Metabolic disease drugs	4.0%	5.4%	5.6%	6.7%	6.8%	6.9%	8.7%	4.8%	0.0%
Antineoplastic drugs	1.2%	1.4%	1.7%	0.0%	1.9%	3.4%	4.3%	0.0%	3.4%
Antirheumatic drugs	0.4%	1.4%	0.6%	2.2%	1.0%	0.0%	0.0%	0.0%	0.0%
Other drugs	17.4%	18.9%	18.5%	20.0%	15.5%	17.2%	17.4%	9.5%	13.8%
Unknown	22.1%	23.0%	19.7%	13.3%	21.4%	31.0%	21.7%	23.8%	27.6%

Listed symptoms reported by 5% or more.

* $P < 0.05$, ** $p < 0.01$, *** $p < 0.001$ by chi-square test between respondents with and without corresponding symptoms.

try was 19.9%.

Table 2 presents the proportion of each symptom which respondents believed to be related to drug compounding. Nearly half of the respondents complained of nasal symptoms, with throat, eye, and oral cavity symptoms also frequent. As systemic symptoms, some complained of general fatigue and anxiety/helplessness. There were no differences between men and women in the proportion of each symptom.

Compounding processes, which respondents believed to be related to the above symptoms were in decreasing order: powder drug compounding, tablet crushing or capsule opening, "unknown" and ointment preparation (Table 3). Significant differences were not seen between men and women. Drugs which respondents believed to be causal of symptoms ranked as follows: psycho-neurological drugs, "unknown," cardiovascular or respiratory drugs, gastrointestinal drugs, antibiotics, Kampo preparations, antipyretics, decoctions, metabolic disease drugs, antineoplastic drugs and antirheumatic drugs. There were no significant differences between men and women in the proportion of each drug.

Table 3 shows also the association of each major symptom with compounding processes and drugs which respondents believed to be related to symptoms. All compounding processes and some drugs (psycho-neurological drugs, cardiovascular or respiratory drugs, gastrointestinal drugs, Kampo preparations and antipyretics) were listed as possible causes of some symptoms ($p < 0.05$).

The frequency of scarce mask use during drug dispensing was 55.2%. Reasons for not using a mask were in the order consideration of patients (50.7%), being offensive (46.0%), and being an obstacle to work (28.4%). On the other hand, the frequency of glove use during drug dispensing was 93.9% for scarcely. As reasons of not using gloves, being an obstacle at work (55.5%) and being offensive (35.0%) were mainly listed. Dust collectors were installed in 17.9% of pharmacies where respondents were engaged.

The prevalence of past medical history was 17.1% for urticaria, 12.8% for eczema and 9.5% for hay fever without a significant difference between men and women. The proportion of present illness was 31.7% for hay fever (32.1% for men and 31.2% for women), followed by 9.2% for hypertension (12.4% for men and 4.5% for women, $p < 0.01$).

Table 4 presents the relationship of compounding processes, working environment and past medical history to each major symptom. Two ways of tablet crushing (coffee mill for family use and tablet cutter), capsule opening, and past history of some allergies (food allergy, urticaria, eczema and drug eruption) significantly

Table 4 Relationship of compounding processes, working environment and past medical history to each major symptom

n	Symptoms in eyes			Symptoms in nose			Symptoms in oral cavity			Symptoms in throat			Symptoms in skin			Headache			Anxiety, helplessness			General fatigue			
	OR	95% CI	P value	OR	95% CI	P value	OR	95% CI	P value	OR	95% CI	P value	OR	95% CI	P value	OR	95% CI	P value	OR	95% CI	P value	OR	95% CI	P value	
Ways of tablet crushing (MA)																									
Mortar	279	1.40	(0.75-2.66)	0.262	1.56	(0.97-2.51)	0.051	1.42	(0.64-3.19)	0.357	1.33	(0.77-2.30)	0.283	2.66	(0.85-9.24)	0.104	1.48	(0.50-4.67)	0.605	1.30	(0.43-4.18)	0.798	1.28	(0.50-3.42)	0.577
Coffee mill for family use	187	1.41	(0.82-2.43)	0.186	1.15	(0.76-1.75)	0.496	2.92	(1.41-6.11)	0.001	1.64	(1.01-2.65)	0.034	1.60	(0.70-3.68)	0.227	1.00	(0.40-2.50)	1.000	0.81	(0.31-2.12)	0.639	2.19	(0.94-5.23)	0.047
Tablet cutter	79	1.98	(1.07-3.65)	0.019	1.81	(1.07-3.06)	0.019	1.57	(0.72-3.37)	0.215	1.41	(0.80-2.50)	0.208	1.28	(0.48-3.32)	0.584	1.80	(0.64-4.87)	0.208	0.93	(0.26-3.04)	1.000	2.24	(0.92-5.34)	0.047
Tablet crusher for exclusive use	65	1.71	(0.87-3.32)	0.090	1.51	(0.86-2.67)	0.128	0.77	(0.28-2.02)	0.572	1.10	(0.58-2.08)	0.747	0.79	(0.22-2.51)	0.868	2.34	(0.83-6.39)	0.067	1.19	(0.33-3.95)	0.996	0.79	(0.22-2.51)	0.868
Frequency of opening capsules																									
Often (n = 8) or sometimes (n = 121)	129	1.81	(1.04-3.14)	0.025	1.57	(1.00-2.45)	0.038	1.47	(0.74-2.92)	0.236	1.54	(0.94-2.52)	0.072	1.72	(0.75-3.93)	0.159	1.61	(0.63-4.05)	0.270	0.80	(0.27-2.28)	0.658	1.26	(0.54-2.93)	0.557
Scarcely	262																								
Use of mask																									
Always (n = 32) or sometimes (n = 143)	175	1.45	(0.85-2.50)	0.150	1.90	(1.24-2.90)	0.002	1.04	(0.53-2.05)	0.893	1.67	(1.04-2.70)	0.026	3.00	(1.26-7.34)	0.006	2.02	(0.80-5.21)	0.103	1.14	(0.44-2.98)	0.768	1.37	(0.60-3.10)	0.416
Scarcely	216																								
Use of gloves																									
Always (n = 1) or sometimes (n = 23)	24	0.61	(0.14-2.22)	0.596	0.86	(0.34-2.11)	0.714	0.33	(0.00-2.38)	0.423	0.55	(0.16-1.76)	0.398	1.87	(0.42-7.25)	0.563	0.68	(0.00-5.13)	1.000	0.75	(0.00-5.72)	1.000	0.53	(0.00-3.90)	0.822
Scarcely	367																								
Dust collector setting																									
With	70	1.24	(0.62-2.44)	0.513	1.45	(0.84-2.51)	0.159	1.63	(0.73-3.58)	0.192	1.50	(0.82-2.72)	0.155	0.72	(0.20-2.27)	0.728	1.30	(0.40-3.88)	0.830	1.91	(0.64-5.52)	0.190	1.51	(0.56-3.93)	0.363
Without	320																								
Past medical history (MA)																									
Urticaria	67	1.76	(0.91-3.38)	0.068	2.15	(1.22-3.82)	0.005	1.92	(0.88-4.16)	0.071	1.47	(0.80-2.68)	0.185	3.94	(1.66-9.29)	0.000	0.71	(0.16-2.64)	0.801	1.15	(0.31-3.79)	1.000	1.29	(0.45-3.52)	0.598
Eczema	50	1.82	(0.87-3.76)	0.079	1.78	(0.94-3.39)	0.058	2.19	(0.93-5.03)	0.044	1.23	(0.61-2.47)	0.530	4.24	(1.70-10.45)	0.000	0.30	(0.00-2.14)	0.354	2.96	(0.97-8.72)	0.026	2.36	(0.86-6.27)	0.057
Hay fever	37	0.81	(0.29-2.15)	0.658	1.02	(0.49-2.11)	0.957	0.66	(0.15-2.36)	0.681	1.04	(0.45-2.35)	0.921	2.15	(0.67-6.48)	0.247	0.91	(0.00-4.26)	1.000	1.01	(0.00-4.78)	1.000	0.69	(0.00-3.19)	0.872
Drug eruption	30	3.21	(1.37-7.47)	0.002	1.88	(0.83-4.30)	0.098	3.87	(1.51-9.74)	0.001	3.60	(1.59-8.18)	0.000	2.07	(0.56-6.91)	0.355	2.77	(0.74-9.53)	0.161	3.11	(0.82-10.86)	0.111	0.88	(0.00-4.12)	1.000
Food allergy	29	2.45	(1.00-5.88)	0.026	2.87	(1.20-7.02)	0.008	1.68	(0.53-4.98)	0.482	1.07	(0.42-2.65)	0.874	1.49	(0.34-5.66)	0.797	1.97	(0.44-7.68)	0.515	2.21	(0.48-8.68)	0.420	2.93	(0.89-9.09)	0.084
Atopic dermatitis	20	1.91	(0.63-5.57)	0.194	2.32	(0.84-6.59)	0.073	2.01	(0.54-6.85)	0.389	1.54	(0.54-4.30)	0.367	3.46	(0.90-12.22)	0.077	0.84	(0.00-6.38)	1.000	2.06	(0.00-10.29)	0.665	2.34	(0.51-9.28)	0.373
Asthma	16	2.71	(0.84-8.46)	0.053	0.93	(0.30-2.79)	0.884	2.72	(0.70-9.67)	0.185	1.29	(0.38-4.13)	0.869	0.83	(0.00-6.35)	1.000	1.07	(0.00-8.36)	1.000	4.58	(0.94-19.54)	0.063	0.00	(0.00-3.99)	0.504

Calculated by chi-square test between those with and without corresponding symptoms.

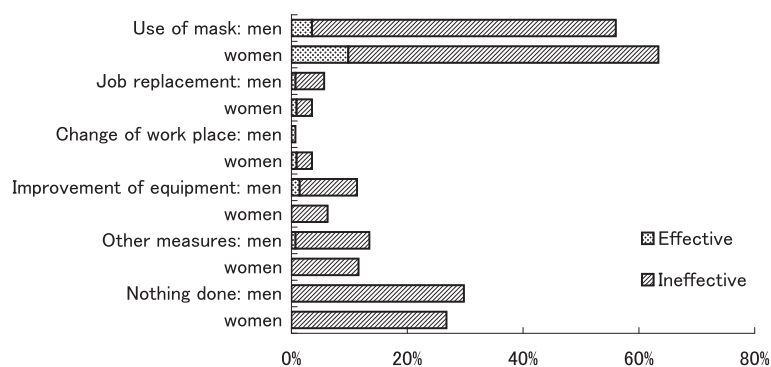


Fig. 1 Countermeasures adopted against occupational health problems and their effectiveness. There was no statistically significant difference in proportion of countermeasures and their effectiveness between men and women.

Table 5 Univariate and multivariate analysis of the association between related factors and self-rated satisfaction with work

	Self-rated satisfaction with work					
	Univariate OR			Multivariate OR*		
	OR	95% CI	P value	OR	95% CI	P value
Sex (female)	—			0.91	(0.51–1.63)	0.758
Age (years)	—			1.00	(0.97–1.02)	0.678
Major symptoms	—					
Symptoms in eyes	0.57	(0.31–1.02)	0.056	1.29	(0.60–2.76)	0.519
Symptoms in nose	0.49	(0.29–0.81)	0.005	0.65	(0.35–1.20)	0.170
Symptoms in oral cavity	0.53	(0.26–1.07)	0.072	0.80	(0.34–1.91)	0.620
Symptoms in throat	0.52	(0.30–0.88)	0.014	0.73	(0.37–1.43)	0.355
Symptoms in skin	0.48	(0.21–1.10)	0.077	0.66	(0.24–1.79)	0.412
Headache	0.49	(0.19–1.25)	0.130	0.90	(0.29–2.78)	0.850
Anxiety, helplessness	0.37	(0.15–0.92)	0.026	0.96	(0.31–3.00)	0.942
General fatigue	0.19	(0.09–0.41)	0.000	0.19	(0.07–0.49)	0.001
Use of mask	0.95	(0.57–1.58)	0.841	1.12	(0.62–2.02)	0.709
Use of gloves	5.63	(0.75–42.47)	0.061	14.83	(0.86–256.93)	0.064
Dust collector setting	0.74	(0.40–1.39)	0.347	0.82	(0.40–1.67)	0.585
Present illness						
Food allergy	0.16	(0.05–0.52)	0.003	0.18	(0.05–0.66)	0.010
Urticaria	0.13	(0.04–0.45)	0.001	0.16	(0.04–0.70)	0.014
Eczema	0.17	(0.04–0.79)	0.029	0.20	(0.04–1.08)	0.061
Atopic dermatitis	0.24	(0.03–1.71)	0.171	—		
Hay fever	1.07	(0.62–1.85)	0.804	—		
Hypertension	0.70	(0.31–1.55)	0.375	—		
Heart diseases	0.24	(0.03–1.71)	0.171	—		
Other diseases	0.65	(0.20–2.10)	0.504	—		

*Adjusted for all variables excluded five variables by univariate analysis: atopic dermatitis, hay fever, hypertension, heart disease and other diseases.

raised the proportion of particular symptoms ($p < 0.05$). Respondents using mask showed a higher proportion of symptoms in nose, throat and skin ($p < 0.05$). No significant relationship was noticed for the presence of symptoms and the usage of gloves or dust collector setting.

Fig. 1 shows the countermeasures which respondents adopted against occupational health problems and the effectiveness of those countermeasures. As other countermeasures, gargling and drug therapy were both listed by 3.2% of respondents with symptoms. Although use of a mask was the most adopted measure, its effectiveness was not high. The effectiveness of equipment improvement, job replacement, and change of workplace also was low.

As to self-rated life satisfaction, 80.6% and 87.0% of respondents answered “satisfied” or “somewhat satisfied” with work and family life, respectively, with no significant difference between men and women. Table 5 presents the relationship between presence of major symptoms and self-rated satisfaction with work. Histories

of present allergic diseases were related to lower satisfaction with work. The proportion of “satisfied” and “somewhat satisfied” was lower for those with general fatigue ($p < 0.01$) than for those without corresponding symptoms, even after adjustment for related factors including present illness.

Discussion

About two-thirds of the pharmacists reported they had symptoms, which they believed were related to drug compounding. Most of the reported symptoms in relation to drug compounding were from the eyes, nose, oral cavity and throat. The response rate of this survey was not high. It is possible that the subjects of the survey without any symptoms were not interested in the survey and did not respond to the questionnaire. Therefore, it could be concluded that at least 20%, 11% and 8% of pharmacists (including non-respondents) have nasal symptoms, throat symptoms and eye symptoms, respectively. We did not examine reference group, however, the proportion of pharmacists with these symptoms was higher than the results of a national survey sample for all ages¹⁹: 5.7% for cough or sputum, 5.4% for nasal obstruction or nasal discharge, 2.0% for breathlessness, 1.4% for wheezing, 1.9% for skin eruption or rash, 4.4% for itching, 4.4% for headache, and 5.4% for general fatigue, although the inquired symptoms were not always consistent. General fatigue was the leading symptom among above-listed ones both in men (5.9% and 5.1%) and women (8.1% and 8.0%) aged 35–44 years and 45–54 years, respectively.

There are several limitations in this study besides response rate. The present study is based on cross-sectional data. The issues of recall and rumination bias should be considered because only self-reported data were used. Although our study subjects were pharmacist, we did not evaluate the accuracy of their responses. Furthermore, the social desirability bias may have affected in a part of questionnaire.

As the respondents-presumed cause of health problems, powder drug compounding and dose form modification (tablet crushing and/or capsule opening) were most frequently listed. Tablet crushing using coffee mill or tablet cutter and capsule opening related to symptoms in eyes, nose, oral cavity and throat also in all respondents. The proportion of tablet crushing may be more causal than capsule opening because the reported frequency of capsule opening was low. It was reported that dose form modification resulted equally from prescription dose form modification into powders or solutions and from lack of suitable preparation in purchased drugs⁵. A reduction in dose form modifications by using more suitable preparations and by informing physicians of the health problems incurred by pharmacists because of such reformulation, especially for presumed causal drugs of health problems, would improve the health of pharmacists. Additionally, fewer dose modifications would be beneficial for more accurate dosage dispensing and better drug quality control⁹. Precautions against drug dust exposure should also be undertaken in the cases of tablet crushing and capsule opening for delivering medication via enteral tube²⁰⁽²¹⁾; use of a simple suspension method²² is one of the preferred countermeasures.

To prevent allergy by powder drugs, an alteration of the dose form, such as fine granulation, is sometimes conducted²³. Consideration of the dose formulation in order to provide various preparations in the production process is useful to avoid dose form modification in the dispensing process.

As the respondents-presumed causal drugs of health problems in this survey, psycho-neurological drugs, cardiovascular/respiratory drugs, gastrointestinal drugs, and antibiotics ranked high; these drugs are widely dispensed. In previous reports, psycho-neurological drugs, gastrointestinal drugs, vitamins, and anti-allergic drugs were shown to be the cause of allergic rhinitis⁸, and psycho-neurological drugs were also found to be causal for contact dermatitis, uncomfortable feeling in the throat, allergic conjunctivitis, atopic dermatitis, and asthma^{9(79)–11}. For about 20% of the symptoms, doubtful drugs were not listed. This may be because respondents deal with so many drugs that they were not able to presume doubtful drugs.

The proportion of respondents who worked in dispensing rooms with a dust collector was low, and the proportions of symptoms were not significantly different between those working in dispensing rooms with or without a dust collector. As the significance of a dust collector was not confirmed in this study, further investigation on the proper use of dust collectors considering room air flow and drug dust particle size²⁴⁽²⁵⁾ and regulation of air flow by air-conditioners, which also collect drug dust, in dispensing rooms is needed. In the case of

small dosage dispensing e.g. for infants, air flow should not obstruct weighing. The re-spread of drug dust from the dust collector of automatic dividing and packing machines²⁰⁾ and from the attached vacuum cleaner for residual drug removal should be checked.

Respondents who used mask during drug compounding showed a higher proportion of symptoms, we interpret that this use of mask was resulted from attempt against symptoms. Although the effectiveness of masks, which have been adopted in the majority of pharmacies as countermeasures against health problems was not high, some pharmacists reported its effectiveness. An atmosphere of freely using a mask in the dispensing room is important. Few pharmacists recognized gloves as personal protection, and many pharmacists regarded gloves as an obstacle to drug dispensing. Gloves are useful not only for sanitary management but also for personal protection; however, they include the problem of latex allergy especially when they are powdered²⁷⁾.

The presence of past or present history of allergic diseases was related to the proportion of several symptoms as has been reported previously⁷⁾. Additional personal protection from dust may be useful in pharmacists with a past, present, or family history of allergic diseases. Countermeasures to prevent symptoms should be evaluated individually because the effectiveness of adopted countermeasures was not high.

General fatigue was related to low level of self-rated satisfaction with work even after adjustment for present illness. Because causal relationship between symptom and satisfaction cannot be proven in the present study, further epidemiological studies are needed.

We conclude that the atmosphere of adopting personal protection according to personal susceptibility in addition to standard control of working environment and operation is important. The recognition and cooperation of prescribing physicians are also important. However, the present study is based on subjective judgments of pharmacists related to drug compounding. Additional surveys to assess the factors of health problems objectively and the effectiveness of countermeasures that reduce the occupational exposure to drug dust according to each work style and environment will be needed.

Acknowledgement

We thank the office staffs of a prefecture pharmaceutical association for their cooperation, and Ms. Mayumi Okumura for helping arrange the data.

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調剤薬局薬剤師の調剤業務に関連した健康問題

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—キーワード—

自覚症状, 職業曝露, 調剤

薬剤師本人が調剤業務に関連すると考えている健康問題の特徴を把握することを目的として, 郵送によるアンケート調査を実施した. 調査対象は一県内の調剤薬局の管理薬剤師 899 名である. 調査内容は, 1) 本人が調剤業務に関連すると考える症状, 2) 本人が症状に関連すると考える調剤業務, 3) 調剤業務の内容と職場環境, 4) 業務および生活の満足感とした. 391 名 (43.5%) から回答が得られた.

薬剤師本人が調剤業務と関連すると考える自覚症状は男性の 60.3%, 女性の 71.3% に認められた. これらの症状のほとんどは眼, 鼻腔, 口腔, 咽頭のアレルギー症状または刺激症状であった. 薬剤師本人がこれらの症状と関連すると考える調剤業務としては, 散剤調剤, 錠剤粉碎, 脱カプセルが多かった. 症状と関連すると考える薬物としては, 精神・神経科用薬, 循環・呼吸器科用薬, 胃腸薬が多かった. 調剤業務の内容および既往歴と自覚症状との関連をみると, 錠剤粉碎や脱カプセル, アレルギー既往歴が症状と関連していた ($p < 0.05$). 倦怠感は仕事の満足度の低さと関連していた ($p < 0.01$).

予防的に薬物の粉塵曝露低減策を強化するとともに, これらの健康問題の要因についてさらなる調査を行うことが必要であると考えられる. また, 処方する医師の理解と協力も重要であると考えられる.

(日職災医誌, 60: 23—31, 2012)