Prevalence of Self-Reported Work-Related Skin Conditions in Taiwanese Working Population

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Abstract: Prevalence of Self-Reported Work-Related Skin Conditions in Taiwanese Working Population: Yu-Hsuan SHAO, *et al.* Environmental and Occupational Health, National Cheng Kung University—Work-related skin conditions are among the most prevalent occupational diseases, but population-based studies of occupational skin diseases are few. This study was conducted by a nationwide representative sampling of employed workers in Taiwan to estimate the prevalence of work-related skin conditions. A total of 18942 non-self-employed workers participated in this survey. Data were collected by self-administered questionnaires. Those workers who reported having upper extremity skin conditions and considered their skin conditions caused by work exposure were defined as having work-related skin conditions. More than a half of the skin conditions were considered work-related. Overall, 4.4% of male employees and 4.2% of female employees reported having work-related skin conditions in the past year. Work-related skin conditions were more prevalent among male workers than female workers (adjusted OR=0.8, $p<0.05$) after adjusting for other factors. Low education level (adjusted OR=2.52, $p<0.05$), exposure to paint (adjusted OR=1.69, $p<0.05$), electroplating fluid or agriculture pesticide (adjusted OR=2.11, $p<0.05$) and working in a hot working environment (adjusted OR=2.76, $p<0.05$) were predictors of having work-related skin conditions. Sanitary and pollution control services, mining and quarrying, personal services, building construction, and fishing were identified as high-risk industries. This study concluded that work-related skin conditions were a rather common occupational disorder in Taiwanese working population. Risk factors and high-risk industries were considered for further research and intervention. (*J Occup Health* 2001; 43: 238–242)

Key words: Work-related skin conditions, Surveillance

Occupational skin diseases are among the most prevalent occupational disorders¹⁾. These diseases have had a significant impact on workers including physical discomfort, hospitalization, loss of workdays, social activities, and medical payments^{2–5)}. Studies on hairdressers⁶⁾, fruit farmers⁷⁾, and construction workers⁸⁾ indicated a high prevalence of occupational skin diseases in these groups of workers in Taiwan. A study⁹⁾, done in a tertiary referral center in Taipei, Taiwan, found that contact dermatitis in 15.9% of patients was caused by work exposure, but the overall prevalence of occupational skin diseases in Taiwan is unknown. There are few workers' compensation cases for skin conditions¹⁰⁾, and most likely the true prevalence of occupational skin diseases is underestimated. Although information from population-based studies is useful in providing an estimate of occupational skin conditions, such studies are lacking. We conducted this investigation to provide the health care and public health communities with national prevalence estimates of skin conditions in the Taiwanese working population to determine high-risk industries and factors for further study and prevention.

Method

National prevalence estimates of self-reported skin conditions among working people were calculated from data collected for the 1994 Occupational Health Supplement to the National Survey of Manpower by the Directorate-General of Budget, Accounting, and Statistics (DGBAS) of the Taiwan Government. The study protocol was approved by the Council of Labor Affairs' Steering Committee, and complied with the principles outlined in the Declaration of Helsinki¹¹⁾. A stratified two-stage cluster sampling scheme was used in the survey. The primary sampling unit was Li (a unit of household districts), and the elementary units were households. Within each selected household, only subjects who were

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Table 1. Demographic data and skin problems in estimated total employed workers in Taiwan (in thousands)

		Population ^a	Prevalence of skin condition			Prevalence of work-related skin condition			
			No. ^a	%	SE ^b	No. ^a	%	SE ^b	p-value ^c
Total No.		5,322	414	8.2	0.2	299	4.3	0.2	
Gender	Male	3,143	249	7.9	0.3	138	4.4	0.2	0.2566
	Female	2,179	165	7.6	0.3	90	4.2	0.2	
Age (yr)	Under 20	2,656	20	7.4	0.8	11	4.3	0.6	0.0367
	20–29	1,645	112	6.8	0.3	59	3.6	0.3	
	30–39	1,773	148	8.3	0.4	80	4.5	0.3	
	40–49	1,061	85	8.0	0.4	49	4.6	0.3	
	50–59	448	35	7.7	0.6	22	4.9	0.5	
	60 or above	130	15	11.4	1.4	7	5.6	1.0	
Education	Primary school or less	1,010	110	10.9	0.5	74	7.4	0.4	<.0001
	Junior high school	935	93	9.9	0.5	58	6.2	0.4	
	Senior high school	1,944	130	6.7	0.3	64	3.3	0.2	
	College and above	1,433	81	5.7	0.3	33	2.3	0.2	

^aN × 1000. ^bstandard error. ^cp value for chi-square test for differences between groups.

employed during the survey period (September 1994) were included in this survey. A total of 22475 non-self-employed workers in households were sampled from the list of the residents of each Li during the study period. The subjects were asked to fill out the Occupational Health Supplement. The questionnaires were distributed to the eligible individuals by occupational health officers in person and were collected within one week by the same officers. The subjects were asked whether they had ever had any skin conditions in the 12 months before the survey, included itching, redness, eruptions, scaling or fissuring. The twelve-month prevalence estimates of self-reported skin conditions and occupation-related skin conditions among employees were calculated according to sampling scheme and adjusted for the gender and age groups of respondents. Those with skin conditions were asked whether one of the following was the cause of the condition: heredity, personal habits, work exposure, or others. They were also asked where they sought medical treatment for skin conditions, or had no treatment at all.

In this article, workers were considered as having work-related skin conditions if he or she reported having upper extremity skin conditions and self-reported their skin condition as work-related. Further data analysis was based on the definition of work-related skin conditions. In addition, the reported occupation is coded to two digits by the "Standard Industrial Classification System of Taiwan."¹²⁾ made by the Minister of Economics in Taiwan. Due to the small sample size in each industry, the classification of industries in this study is based on the code and grouped with similar work content.

The survey was conducted by nationwide representative sampling. Thus each subject in the survey was assigned a weighting factor, which is the number of people this subject

represented. Statistics were performed by means of JMP software version 3.26 (SAS institute Inc., Cary, NC, USA.) for windows. Chi-square was applied to analysis of the relationship between variants and work-related skin conditions, and multiple logistic regression was applied to determine the association of work-related skin conditions with other factors.

Results

A total of 18,942 employed workers completed the questionnaire satisfactorily, with a total response rate of 84%. The success rate was similar for men and women. The 18,942 subjects represented about 3.1 million male and 2.2 million female workers in the survey. The 12-month prevalence estimates were 8.2% for self-reported upper extremity skin conditions. Approximately 56.7% of the skin conditions were considered work-related, so that 4.4% of male employees and 4.2% of female employees had work-related skin conditions. In addition, 28.4% of respondents reported heredity was the cause of their skin conditions; 8.3% of them reported personal sanitation habits were the cause of their skin conditions. The other 3.6% of respondents reported their skin conditions may be due to other causes. Although male and female employees had a very similar rate of skin conditions in the past 12 months, the rates differed with the age group, with older employees reporting more skin conditions. In addition, the education level was negative correlated to the prevalence of skin conditions. Higher educated group employees reported fewer skin conditions (Table 1).

The highest prevalence estimates of having any work-related upper extremity skin conditions (Table 2) were among employees in sanitary and pollution control services (14.6%), Mining and quarrying (13.6%),

Table 2. The 12 month prevalence estimates (in thousands) of having work-related upper extremity skin conditions by industries

	No. ^a	Work related upper extremity skin condition			Work related skin condition			Total skin condition		
		No. ^a	%	SE ^b	No. ^a	%	SE ^b	No. ^a	%	SE ^b
Sanitary and pollution control services	41	6	14.6	2.9	7	18.0	3.2	9	23.8	3.5
Mining and quarrying	14	2	13.6	5.2	2	13.6	5.2	3	18.2	5.8
Personal services	202	23	11.3	1.2	23	11.5	1.2	35	17.2	1.4
Building construction	432	48	11.0	0.8	54	12.4	0.8	77	17.8	0.9
Fishing	18	2	10.0	2.9	2	11.8	3.2	3	17.2	3.7
Petroleum and coal product manufacturing	18	1	7.9	3.3	1	7.9	3.3	3	14.9	4.4
Transport equipment manufacturing and repairing	88	7	7.4	1.5	7	8.2	1.5	14	15.4	2.0
Pulp, paper and paper product manufacturing	46	3	7.3	2.0	4	8.9	2.2	6	12.9	2.6
Wood and bamboo product manufacturing	29	2	6.5	2.2	3	8.8	2.6	3	11.0	2.8
Eating and drinking places	121	8	6.4	1.2	10	7.9	1.3	15	12.7	1.6
Other construction	265	16	6.2	0.8	20	7.5	0.8	34	12.9	1.1
Non-metallic mineral product manufacturing	86	53	6.2	1.3	6	7.5	1.4	13	15.0	1.9
Leather and fur product manufacturing	36	2	5.5	2.0	2	6.4	2.1	4	10.2	2.6
Furniture and fixture manufacturing	43	2	4.8	1.7	3	5.8	1.8	4	10.3	2.4
Basic metal industries and metal product manufacturing	278	12	4.4	0.7	14	5.2	0.7	29	10.6	1.0
Electricity, gas and water supply	33	1	4.2	1.5	2	4.9	1.6	4	13.0	2.6
Chemical product manufacturing	95	4	4.2	1.1	5	5.6	1.2	10	10.7	1.7
Other services	656	25	3.7	0.4	27	4.2	0.4	65	9.9	0.6
Agriculture, forestry, animal husbandry and hunting, forestry and logging	37	1	3.6	1.4	1	3.6	1.4	33	8.8	2.2
Rubber and plastic product manufacturing	152	54	3.6	0.8	7	4.4	0.9	13	8.9	1.2
Printing processing	50	2	3.3	1.4	2	3.3	1.4	4	8.1	2.2
Textiles mill, wearing apparel and accessory manufacturing	240	7	3.1	0.6	10	4.3	0.7	26	11.0	1.1
Machinery and equipment manufacturing	513	14	2.8	0.4	18	3.5	0.5	45	8.8	0.7
Miscellaneous industrial product manufacturing	111	3	2.8	0.8	5	4.1	1.0	10	9.3	1.5
Food Manufacture	117	3	2.6	0.8	5	4.5	1.0	14	11.8	1.6
Transport, storage and communication	298	6	2.0	0.4	9	2.9	0.5	30	10.2	0.9
Commerce	621	11	1.7	0.3	14	2.2	0.3	49	7.9	0.6
Business services	138	19	1.4	0.6	2	1.6	0.6	10	7.2	1.2
Public administration	281	3	1.2	0.4	5	1.8	0.4	21	7.4	0.8
Finance, insurance and real estate	261	14	0.5	0.2	2	0.9	0.3	16	6.2	0.8
Total No.	5322	229			273			575		

^aN × 1000. ^bstandard error.

Personal services (11.3%), Building construction (11.0%), Fishing (10.0%), Petroleum and coal product manufacturing (7.9%), Transport equipment manufacturing and repairing (7.4%), Pulp, paper and product manufacturing (7.3%), Wood and bamboo product manufacturing (6.5%), Eating and drinking place (6.4%) (Table 2). Almost forty-five percent of employees with skin conditions did not go to a physician for therapy or a more definite diagnosis. They either took medications themselves or did not seek medical attention.

The association between sex, education, chemicals and a hot working environment is shown in Table 3. After adjusting for education, chemicals and a hot working environment, female workers are less likely to have skin condition (odds ratio (OR)=0.8) than male workers. Workers whose education level was primary school or less had more skin conditions (OR=2.52). Exposure to paint (OR=1.69) and other chemicals including agriculture pesticides or electroplating fluid (OR= 2.11) was a significant predictor of a high prevalence rate, and

Table 3. Factors associated with work-related skin conditions by multiple logistic regression analysis

Term		Population ^a	No. of Case ^a	%	Adjusted OR ^b	95% CI ^c
Sex	Female	2,179	90	4.2	0.80*	(0.68, 0.93)
	Male	3,143	138	4.4	1	
Education	Primary and less	1,010	74	7.4	2.52*	(2.01, 3.16)
	Junior and senior high school	2,879	121	4.2	0.95	(0.78, 1.16)
	College or above	1,433	33	2.3	1	
Chemicals	Paint	286	33	11.6	1.69*	(1.15, 2.46)
	Adhesive/solvent	424	42	10.0	1.40	(0.99, 1.97)
	Acid/alkali	87	10	11.4	1.56	(0.83, 2.77)
	Others**	115	15	13.3	2.11*	(1.26, 3.45)
Hot environment	No	4,411	128	2.9	1	
	Yes	632	74	11.7	2.76*	(2.34, 3.26)
	No	4,690	155	3.3	1	

* $p < 0.05$. **other chemicals: agriculture pesticide and electroplating fluid. ^a $N \times 1000$. ^bodds ratio adjusted for sex, education, using chemicals, and hot working environment. ^c95% confidence interval.

working in a hot environment predicted a high prevalence of occupational skin conditions (OR=2.76).

Discussion

In a representative sample of employed Taiwanese workers, 8.2% of people reported having skin conditions. Approximately 56.7% of respondents reported that their skin conditions were caused by work exposure. More than half the subjects considered their skin condition work-related. According to the results, work-related skin conditions could be considered at least as important as non-work-related skin conditions in the employed population, so that occupational exposure may be an important cause of skin conditions in Taiwan.

The prevalence of occupational skin conditions had been unknown in Taiwanese employees, and they made very few workers' compensation claims for occupational skin diseases¹⁰⁾, but this investigation showed occupational skin conditions to be common. It's likely that only the most severe cases of skin disease were recorded in the worker's compensation system. Therefore, this investigation provided important information on the high-risk occupational groups developing skin diseases in Taiwan. Further investigation for identifying of causes of or for controlling occupational skin diseases should be focused on the high-risk industries identified in this investigation, such as sanitary and pollution control services, mining and quarrying and building construction.

The findings of this investigation are somewhat compatible with previous findings of a tertiary referral center in Taipei¹³⁾, showing that construction workers, hairdressers (belonging to personal services), and workers in chemical matter manufacturing had high rates of occupational skin diseases, but we found high prevalence

of occupational skin conditions also in sanitary and pollution control services, mining and quarrying, fishing, transport equipment manufacturing, pulp, paper, and paper product manufacturing, and wood and bamboo product manufacturing. The difference between these two studies may be caused by the difference in the numbers of workers in various jobs, the catchment area of the tertiary referral center in Taipei which is more representative of urban areas, and that only patients with diseases of at least moderate severity appeared at that center.

Employees in some industries were more likely to develop skin conditions. The results may be attributable to specific agents in these industries. Skin conditions were associated with wet work, chemicals, hairdressing, soaps, petroleum, cement and other exposure^{1, 14-16)}. In this study, these agents were commonly used by workers in the industries with high prevalence rates. For example, employees working in sanitary and pollution control were frequently exposed to wet work and soap. Reducing the frequency of exposure to these causative agents may effectively decrease the incidence of work related skin conditions.

A different age group and different education level predicted a different prevalence rate, but age did not show a significant relationship with occupational skin conditions after adjusting for the education level and exposure to chemicals. As a result, the education level shows a strong association with skin conditions in this population. In addition to education, job content may contribute to the association between skin conditions and education, since education is related to the worker's occupation, as well as exposure in the workplace.

Population-based surveillance studies are best for estimating overall prevalence. The various surveillance

schemes, however, have their own limitations. Limitations of this self-reported investigation included potential underreporting or over reporting of work-related skin conditions, lack of information on the severity of these skin conditions, and lack of detailed exposure classification due to the use of industry groups as surrogates of work exposure. Generally the estimate from self-reported surveillance is higher than that from the reports of compensation systems or from specialist physicians^{17, 18)}. Only severe cases may go to compensation systems or to the physicians who might report to the Safety and Health authority. Excluding minor cases is a potential problem with other surveillance schemes.

Conclusion

The prevalence of having a skin condition in the past 12 months has been high in several groups of employees in Taiwan. A substantial proportion of the skin conditions among working people in Taiwan may be work-related. The prevalence estimates of this survey identify occupations in which efforts are needed to prevent or reduce occupational skin diseases.

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