WORKING ENVIRONMENT AND RESPIRATORY PROBLEMS AMONG EMPLOYEES IN 2 GARMENT FACTORIES IN UBON RATCHATHANI

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ABSTRACT: This study aimed to identify workplace environmental factors associated with prevalence of respiratory symptoms among employees in 2 garment factories in northeastern Thailand. Socio-demographic and behavioral factors were also examined. The study included 380 workers (excluding administrators). Respiratory symptoms included cough, phlegm, difficulty breathing, shortness of breath, chest tightness, wheeze, and rhinitis. Symptom prevalence was consistently higher at one factory (factory B) than the other (factory A). Factory A had air ventilation, whereas factory B did not. Also, presence of visible dust was more pronounced, and a higher proportion of workers sewed cotton fabric (as opposed to other types such as polyester), at factory B than factory A. Workers at factory B had also worked longer than those at factory A. Among socio-demographic factors, female gender was consistently associated with elevated prevalence. Surprisingly, smoking was not associated with increased respiratory symptom prevalence, possibly due to confounding in the data.

Study results suggest strongly that workplace environmental factors are associated with symptom prevalence in garment factory workers. However, because multivariable analysis was not conducted, the specific contributions of individual factors could not be compared with confidence. Further research on this topic is needed to inform policies that will ensure the safety of garment workers in Thailand.

Keywords: Respiratory problems, sawing employees, Garment factory, Unbon Ratchathani

INTRODUCTION

According to the best available estimates 100 million workers are 200 000 die each year in occupational accidents and 68-157 million new cases of occupational disease arc attributed to hazardous exposures or workloads. In 2001 reported by the Annual Epidemiology Surveillance, from occupation patients 3,035 found nuemoconiosis is 3.4 percent [1]. In 2005 found occupation lung diseases is 137 cases, morbidity 0.22 per hundred thousand population1993-2005: the northeast region has highest morbidity 0.28 per hundred thousand population, Ubon Ratchathani Province = 1.41 (4^{th} of northeast) and kind of dust classification of the sickness in this year found dust 17 cases from total occupation lung diseases [1]. From above problem so that the researcher is interested to study the problem of garment industry for help the workers in garments factories to reduce disease from working. A previous study in Songkhla Province, Thailand suggested increased rates of respiratory problems in cotton sewing workers, even though these workers may have only moderate cotton dust exposure. The researcher intends to assess this issue in garment factory workers in Ubon Ratchathani Province, Thailand, to help assess the public health burden of moderate cotton dust exposure. The study has conducted in 2 garment factories, one of which has relatively good ventilation (uses air vacuum cleaners), and one of which has relatively poor ventilation (uses only fans). The socioeconomic situation of workers is similar between these two factories.

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METHODS

The study was cross-sectional. All workers (excluding administrators) in the two factories were selected for study. There were a total of 200 workers in factory A and 180 in factory B. All 380 workers were invited to participate in this study, and all participated. This sample size was sufficient to detect a difference of 15% in prevalence, between 20% in the unexposed group and 35% in the exposed group, with 95% confidence and with power of 80%. (This confidence and power would have been maintained even with a dropout rate of 20%) A standardized, pre-tested interviewer-administered questionnaire was used to gather data. The questionnaire ascertained environmental, socio-demographic, and behavioral characteristics (independent variables) and presence or absence of symptoms in the previous 6 months (dependent variables). In addition to factory, environmental variables were presence of an air ventilation device (air vacuum cleaner), visible dust in the air and on

the floor, wearing a face mask, usually sewing cotton, and working at the factory for >5 years. Socio-demographic variables were gender, age, educational attainment, and monthly income ≥10,000 baht. Behavioral variables were cigarette smoking and drinking alcohol. Interviews were conducted after work by trained interviewers.

This study was approved by the Ethical Review Committee for Research Involving Human Research Subjects, Health Sciences Group, Chulalongkorn University. Permission to conduct the study was obtained from the factory owners. Signed informed consent was obtained from all study participants.

Data analysis included descriptive and analytical components. In the descriptive component, workers' personal and occupational characteristics are presented and their respiratory symptom rates are described. The analytical component assessed relationships between symptom prevalence and the independent variables described above. All independent and dependent variables were categorical, so chi-square tests were used to assess these relationships. Data analysis was conducted with SPSS for Windows.

RESULTS

Descriptive and analytical results are presented below. Distributions of independent variables are presented in Table 1. 47.6% of subjects had an air ventilation device in their workplace. 60.3% reported visible dust both in the air and on the floor (as opposed to dust in the air or on the floor, or no visible dust). Sewing was the main job for 75.0% of subjects, and 45.0% sewed cotton fabric. 81.3% of subjects were females, and 42.9% had a primary school education. 7.1% had income of 10,000 baht or more per month. 8.9% of subjects smoked cigarettes and 36.8% drank alcohol.

Prevalences of self-reported symptoms in the past 6 months are shown in Table 2. Reported prevalences were generally quite high. Prevalences of cough, phlegm, and rhinitis were greater than 50%. Prevalences of shortness of breath and wheeze were 24.2% and 15.0%, respectively.

Relationships of environmental exposure-related independent variables with symptom rates are shown for two selected symptoms, phlegm and shortness of breath, in Tables 3 and 4, respectively. Phelgm prevalence was statistically significantly higher in factory B than factory A. Presence of dust in the air and on the floor was significantly associated with increased phlegm prevalence. Wearing a face mask was significantly associated with reduced phlegm prevalence. Presence of an air ventilation device was marginally significantly associated with reduced phlegm prevalence (p=0.067).

Table 1 Frequency distributions of environmental, socio - demographic, and behavioral characteristics in all 380 subjects.

Characteristic	Count	%
Environmental		
Factory		
A	200	52.6
B	180	47.4
Air ventilation device (N=379)		
No	198	52.1
Yes	181	47.6
Dust in air and on floor		
No	151	39.7
Yes	229	60.3
Wears face mask at work		
No	111	29.2
Yes	269	70.8
Sews cotton		
No	209	55.0
Yes	171	45.0
>5 yrs working at factory		
No	224	58.9
Yes	156	41.1
Socio-demographic		
Gender		
Female	309	81.3
Male	71	18.7
Age (yrs)		
≤30	165	43.4
31-40	160	42.1
>40	55	14.5
Education		
Primary	163	42.9
≤Secondary 3rd yr	146	38.4
>Secondary 3rd yr	71	18.7
Monthly income (baht)		
<10,000	353	92.9
≥10,000	27	7.1
Behavioral		
Smokes cigarettes		
No	346	91.1
Yes	34	8.9
Drinks alcohol		
No	240	63.2
Yes	140	36.8

Table 2 Prevalences (percent) of respiratory symptoms during the preceding 6 months in all 380 subjects.

Symptom	Count	%	Factory A (%)	Factory B (%)
Cough	217	57.1	113 (56.5)	104 (57.8)
Phlegm	207	54.5	99 (49.9)	108 (60.0)
Difficulty breathing	111	29.2	42 (21.0)	69 (38.3)
Shortness of breath	92	24.2	29 (14.5)	63 (35.0)
Chest tightness	112	29.5	45 (22.5)	67 (37.2)
Wheeze	57	15.0	22 (11.0)	35 (19.4)
Rhinitis	224	58.9	13 (67.5)	89 (49.4)

Table 3 Prevalences of phlegm in the preceding 6 months, at different levels of environmental independent variables, with p-values from chi-square tests.

Independent variable	Prevalence (%)	Count	p-value
Factory			
A	49.5	99	0.040
B	60.0	108	
Air ventilation device			
No	59.1	117	0.067
Yes	49.7	90	
Dust in air and on floor			
No	45.7	69	0.005
Yes	60.3	138	
Wears face mask			
No	65.8	73	0.005
Yes	49.8	134	
Sews cotton			
No	51.2	107	0.156
Yes	58.5	100	
>5 yrs working at factory			
No	54.9	123	0.838
Yes	53.8	84	

Table 4 Prevalences of shortness of breath in the preceding 6 months, at different levels of environmental independent variables, with p-values from chi-square tests.

Independent variable	Prevalence (%)	Count	p-value
Factory			
A	14.5	29	<0.001
B	35.0	63	
Air ventilation device			
No	33.3	66	<0.001
Yes	14.4	26	
Dust in air and on floor			
No	17.2	26	0.010
Yes	28.8	66	
Wears face mask			
No	33.3	37	0.008
Yes	20.4	55	
Sews cotton			
No	16.7	35	<0.001
Yes	33.3	57	
>5 yrs working at factory			
No	19.2	43	0.006
Yes	31.4	49	

Table 5 Directions of association between independent variables and symptom prevalences, for statistically significant associations only.

Characteristic	Cough	Phlegm	Difficulty breathing	SOB*	Chest tightness	Wheeze	Rhinitis
Environmental							
Factory B		Pos†	Pos	Pos	Pos	Pos	Neg
Ventilation device			Neg†	Neg	Neg	Neg	Pos
Dust in air and on floor		Pos	Pos	Pos			
Wears face mask		Neg		Neg	Neg		
Sews cotton			Pos	Pos	Pos		Neg
>5 yrs working at factory				Pos	Pos		
Sociodemographic							
Female gender		Pos	Pos	Pos	Pos	Pos	
Age			Com†	Pos		Pos	Neg
Education			Com				
Income					Pos	Pos	Neg
Behavioral							
Smokes					Neg		
Drinks alcohol	Pos	Neg		Neg	Neg		

* SOB=Shortness of breath

† Pos=positive, Neg = negative, Com=complex association, no consistent direction.

All environmental variables were significantly associated with prevalence of shortness of breath (SOB). Specifically, prevalence was higher in factory B, with presence of dust in the air and on the floor, with sewing cotton, and with >5 years working at the factory. Prevalence was significantly lower in association with an air ventilation device and with wearing a face mask.

Directions of statistically significant associations of independent variables with respiratory symptom prevalences are shown in Table 5. Working at factory B was generally positively associated with prevalences (with the exception of cough). Presence of dust both in the air and on the floor was also associated with increased prevalence, although not quite as strongly as was working at factory B. Having an air ventilation device and wearing a face mask were generally associated with reduced symptom prevalence, as was male gender. Sewing cotton was generally associated with increased prevalence. Surprisingly, cigarette smoking was not associated with increased symptom prevalence. Somewhat unexpectedly, alcohol drinking was negatively associated with prevalence more often than it was positively associated. Also somewhat unexpectedly, directions of association of environmental variables with rhinitis were generally the reverse of directions for other respiratory symptoms.

On balance, environmental variables were strongly associated with risk of respiratory symptom prevalence. Socio-demographic variables, and, to a lesser extent, behavioral variables were also associated with prevalence. Also, factory was strongly associated with other environmental variables. For example, in factory A, most workers had ventilation device and wore face masks, while the opposite was true in factory B. In factory B,

there was considerably more visible dust, and more workers sewed cotton, than at factory A. Thus, it was not possible to specify the relative importance of the various environmental, socio-demographic, and behavioral variables as risk factors for respiratory symptom prevalence. Despite this limitation in specific inference, environmental factors as a whole were clearly associated with risk of these symptoms.

SUMMARY

From this study in both factories found male 81.3%, age 30 or more 43.4%, primary school 42.9%, main job is sewing 77.1%, monthly income less than 10,000 baht 92.8%, work more than 5 years 41.1%, smokes cigarettes 8.94% and drinks alcohol 36.8%. For prevalences of respiratory symptoms, rhinitis 224 (58.9%), cough 217 (57.1%), phlegm 207 (54.5%), chest tightness 112 (29.5%), difficulty breathing 111 (29.2%), shortness of breath 92 (24.3%), wheeze 57 (15%), and eye irritation 187 (49.2%). Environment sector, see dust in the air and on floor 60.3% by factory B showed highest and sewing cotton is subject than factory A 170 (94.4%) were significant ($p<0.001$). Factory B where is poor ventilation had higher prevalence of respiratory symptoms than factory A where ventilation is better than at factory B. For association between characteristic of environment in 2 garment factories found factory B was association with prevalence of phlegm, difficulty breathing, shortness of breath, chest tightness and wheeze. Thus, not surprisingly, presence of a ventilation device was generally associated with reduced symptom prevalence. Dust in the air and on the floor was association with prevalence of phlegm, difficulty breathing and shortness of breath. Main job sewing was associated with prevalence of respiratory symptoms. This, too, is not surprising, since the main fabric used at factory A was polyester, whereas the main fabric at factory B was cotton. Sewing cotton was associated with prevalence of difficulty breathing, shortness of breath and chest tightness. Duration of work found work more than 5 years was associated with prevalence of shortness of breath and chest tightness. Among socio-demographic variables, female gender was associated with prevalence of phlegm, difficulty breathing, shortness of breath, chest tightness, wheeze and eyes irritation, age was association with prevalence of shortness of breath and wheeze, education was generally not associated with prevalence of respiratory symptoms. Income was associated with prevalence of wheeze and chest tightness. Regarding behavioral factors, smoking and drinking were sometimes negatively associated with prevalence. These findings were somewhat unexpected, especially for smoking.

DISSCUSSION AND CONCLUSIONS

Working environment factors, these are ventilation was statistically significantly associated with prevalence of respiratory symptoms. This is consistent with Alemu et al. [2]. Amount of dust was statistically significantly associated with prevalence of respiratory symptoms. This is consistent with the study by Da Costa et al. [3]. If the visible dust in factory B was largely cotton dust, then cotton dust exposure was positively associated with respiratory symptom prevalence in the present study. This is consistent with the study by Wang et al. [4]. And duration of work was statistically significantly associated with prevalence of respiratory symptoms; this is consistent with the study by Jaikaow [5]; Wang et al. [4] and Christiani et al. [6]. It was also found that behavioral factors, these are alcohol drinking was statistically significantly associated with increased prevalence of respiratory symptoms, this finding in not line with the study by Lebowitz [7] and Garshick et al. [8]. And cigarette smoking was not associated with increased prevalence of respiratory symptoms, this was inconsistent with studies by Da Costa et al. [3]; Ekburanawat et al. [9] and with many other studies.This study did not ask about the history of common cold or influenza. This is a potential limitation, because colds and flu-like illnesses often involve some of the symptoms assessed in this study (such as cough, phlegm, and sometimes wheezing). Even so, it is unlikely that history of colds and flu-like illness would have differed substantially between factory A and factory B. Thus, it is likely that such history would not be a major confounder in the findings reported here. As mentioned above, study findings did not allow formal assessment of the relative importance of environmental factors, and of environmental factors in relation to socio-demographic and behavioral factors. Such assessment would require multivariable modeling, which is beyond the scope of the current analysis.

All employees who work in 2 garment factories in Ubon Ratchathani province that is 380 cases only. Study results may not be generalizable beyond Ubon Ratchathani Province. Uncountable who absent at work, did not voluntarily participate in this research, are administrators and security guards.

RECOMMENDATIONS

For policy: Should the results of the study was to base information for suggest or the knowledge for workers and establishment owners about protecting themselves from occupational exposure. Results of the present study are not conclusive. Even so, these results, together with previous results, suggest the

importance of protecting workers.

For future research: Should the study sample size, the larger will be more useful to refer to the employee of the garment and Longitudinal Study or Case - cohort Study to continuing in the worker are working in a manner that similar.

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REFERENCES

1. Annual Epidemiological Surveillance Report 2005: Pneumoconiosis. Nonthaburi: Ministry of Public Health; 2005. [cited June 2011]. Available from: http:occ.ddc.moph.go.th/downloads/byssinosis.pdf
2. Alemu K, Kumie A, Davey G. Byssinosis and other Respiratory symptoms among factory workers in Akaki textile factory, Ethiopia. Ethiop J Health Dev. 2010: 24(2); 133-9. [cited June 2011]. Available from: http://www.ajol.info/index.php/ejhd/article/viewFile/62962/50857
3. Da Costa JT, Barros H, Macedo JA, Ribeiro H, Mayan O, Pinto AS. Prevalence of respiratory diseases in the textile industry: relation with dust levels. Acta Med Port. 1998 Apr; 11(4):301-9.
4. Wang XR, Zhang HX, Sun BX, Dai HL, Hang JQ, Eisen EA, Wegman DH, et al. A 20-year follow-up study on chronic respiratory effects of exposure to cotton dust. Eur Respir J. 2005 Nov; 26(5): 881-6.
5. Jaikaow W. Health risk among workers at Six garment factories in Chiangmai province. Chiangmai: [s.n]; 1987.
6. Christiani DC, Wang XR, Pan LD, Zhang HX, Sun BX, Dai H, Eisen EA, et al. Longitudinal changes in pulmonary function and respiratory symptoms in cotton textile workers: a 15-yr follow-up study. Am J Respir Crit Care Med. 2001 Mar; 163(4): 847-53.
7. Lebowitz MD. Respiratory symptoms and disease related to alcohol consumption. Am Rev Respir Dis. 1981 Jan; 123(1): 16-9.
8. Garshick E, Segal MR, Worobec TG, Salekin CM, Miller MJ. Alcohol consumption and chronic obstructive pulmonary disease. Am Rev Respir Dis. 1989 Aug; 140(2): 373-8.
9. Ekburanawat W, Ekpanyaskul C, Brennan P, Kanka C, Tepsuwan K, Temiyastith S, Klinvimol T, et al. Evaluation of non-viral risk factors for nasopharyngeal carcinoma in Thailand: results from a case-control study. Asian Pac J Cancer Prev. 2010; 11(4): 929-32.

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