

1)

1)

**Abstract**

**Relationship of Burdened Work and Musculoskeletal Symptoms in Small-to-medium-sized Enterprises.**

Sin-Goo Park, Hong-Jae Chae<sup>1)</sup>, Joo-Youn Shin, Dal-Young Jung,  
Yong-Kyu Kim, Tae-Jin Jung, Jong-Han Leem, Hawn-Cheol Kim, Yeui-Cheol Lee

*Department of Occupational & Environmental Medicine, Inha University Hospital  
Department of Occupational & Environmental Medicine, Chonnam National University Hospital*

**Objective:** This study was performed to evaluate relationship of burdened work and musculoskeletal symptoms in small-to-medium sized enterprises.

**Method:** After a questionnaire survey was administered to 9,950 workers in 122 workplace, 7,626 workers(76.6%) were finally selected for the study analysis.

Industrial hygienists visited 122 small-to-medium sized enterprises to investigate the presence of burdened works within the workplace. The selection of jobs with significant burden was based on the Ministry of Labor 's recent notification in 11 types of job description associated with musculoskeletal disorders. The subjects of this study were then divided into three categories. 1) non-burdened white collar workers, 2) non-burdened blue collar workers, and 3) burdened workers (include some VDT workers). Multiple logistic regression was used to evaluate the relationship between burdened work and musculoskeletal symptoms.

**Results:** The burdened workers reported significantly more musculoskeletal symptoms than non-burdened white collar workers and non-burdened blue collar workers(OR:1.57, 95% CI: 1.314-1.875). There was no significant difference in reports of musculoskeletal symptoms between non-burdened white and blue collar workers.

**Conclusion:** To prevent or diminish musculoskeletal disorders in small-to-medium sized enterprises, we need to better manage burdened works.

**Key Words:** Musculoskeletal symptom, Burdened works

2000 1,076 가 2004  
4112 44.8%  
가 . 가

(02.12.30)  
(03.7.12)

가 (McAtamney & Corlett, 1993;  
Humantech Inc. 1995; OSHA, 1995; ANSI, 1996)

(checklist)

가

(2003. 7)

11가  
가

가

가

“ 1)

4

”; “ 2)

2

가

가

가

11가

가

가

,

가

가

,

가

3

2004 6

1.

300

112

가

2004 1

2004 10

,

1999

9950

(Ahn et al, 2002)

5

(4.4%), 5 50 (38.0%), 50 300  
(22.2%), 300 1,000 (12.2%),  
1000 (23.2%) 300

7,626 ( 76.6%)

2.

1)

가

4

가

4가

가

Job Content

(OSHA, 1995; ANSI, 1996).

가

Questionnaire  
al, 1997)

(Chang et  
가

5 9 14

(multiple logistic regression)

KOSHA CODE(H-30-2003)

(reference)

2) 가

(1)

가  
National Institute for  
Occupational Safety and Health(NIOSH)

1.

(43.4%),

1

1

30

(37.4%)

, BMI 20

(39.6%)

, 가

2

(44.6%)

(Table 1).

(2)

가

2.

5

9

14

(1 )

(35.0%),

(4 ) Likert 4

(38.0%),

5

9

(38.6%),

8

(38.0%),

(42.6%),

가

(high

( , , , )

strain)

(44.4%)

(Table 2).

(3)

가

3.

2003

가

,

,

11가

,

,

가

가

1)

21.5%

(4

), 2)

가

(Table 3).

, 3)

(4

4.

3.

square test t-test

Chi-

),

(

( , , BMI, 가

가

( )

(1.570)

( , , BMI, 가 ),

(

(Table 4).

**Table 1.** General characteristics

Item		Musculoskeletal symptom(-) N*(%)	Musculoskeletal symptom(+) N*(%)	p-value
Sex	male	3845 (70.0)	1648 (30.0)	0.000
	female	1194 (56.6)	917 (43.4)	
Age	<30	1325 (62.6)	791 (37.4)	0.000
	30-39	1518 (67.3)	739 (32.7)	
	40-49	1330 (65.5)	700 (34.5)	
	50	855 (72.0)	333 (28.0)	
Marital status	non-married	1581 (65.0)	852 (35.0)	0.274
	married	3148 (66.3)	1602 (33.7)	
BMI	<20	535 (60.4)	351 (39.6)	0.000
	20.0-24.9	3058 (67.5)	1470 (32.5)	
	25.0	1039 (66.5)	524 (33.5)	
Drinking	none	1607 (64.0)	904 (36.0)	0.034
	2-3/month	1493 (67.6)	717 (32.4)	
	1-2/week	1436 (67.3)	697 (32.7)	
	3/week	395 (65.0)	213 (35.0)	
Smoking	non-smoker	2197 (63.9)	1243 (36.1)	0.001
	ex-smoker	527 (69.3)	234 (30.7)	
	current smoker	2202 (67.7)	1050 (32.3)	
Domestic affair (hr/day)	2hr	4200 (67.1)	2058 (32.9)	0.000
	>2hr	463 (55.4)	373 (44.6)	

\*Some responses were omitted

**Table 2.** Work-related characteristics

Item		Musculoskeletal symptom(-) N*(%)	Musculoskeletal symptom(+) N*(%)	p-value
Shift work	no	2977 (65.0)	1603 (35.0)	0.013
	yes	1370 (68.2)	640 (31.8)	
Extra work	no	1251 (70.3)	529 (29.7)	0.000
	yes	2505 (62.0)	1533 (38.0)	
Job tenure(yr)	<1	981 (69.6)	428 (30.4)	0.000
	1-4	1879 (62.9)	1107 (37.1)	
	5-9	599 (61.4)	376 (38.6)	
	10	652 (67.0)	321 (33.0)	
Worktime(hr)/day	8	2628 (66.9)	1301 (33.1)	0.000
	>8	1430 (62.0)	878 (38.0)	
Work load change	not changed	2998 (69.2)	1333 (30.8)	0.000
	decreased	376 (64.9)	203 (35.1)	
	increased	1146 (57.4)	850 (42.6)	
Job strain	low strain	1365 (75.8)	435 (24.2)	0.000
	passive	776 (67.4)	376 (32.6)	
	active	1103 (63.8)	627 (36.2)	
	high strain	903 (55.6)	721 (44.4)	

\*Some responses were omitted

가  
8  
가  
(Klave et al, 1985; Park et al, 1989)  
(Ong et al, 1995; Kwon et al, 1996)  
1-9 가  
, 10  
(Park et al, 2004)  
(Sim et al, 2002).  
(Park et al, 2004; Moon et al, 1991; Kim et al, 1995; Park et al, 1995; Choi et al, 1996) 가 (strain)  
가  
가  
(Moon et al, 1991; Choi et al, 1996)가 (Bonger et al, 1993; Evanoff et al, 1994; NIOSH, 1997).  
가 (Yim et al, 1997)  
(Kim et al, 2003)  
(Park et al, 2004) 30 가 (Han et al, 2003)  
가  
30 가  
(healthy worker effect)가

**Table 3.** Musculoskeletal symptoms and Body region according to burdened work Unit: N (%)

Body region	Neck*	Shoulder*	back*	arm /elbow*	wrist /finger*	knee*	leg /foot*	more than one*
White collar workers (no burden) (N=1638)	253 (21.5)	318 (19.4)	214 (13.1)	46 (2.8)	127 (7.8)	91 (5.6)	76 (4.6)	542 (33.1)
Blue collar workers (no burden) (N=3530)	310 (8.8)	532 (15.1)	467 (13.2)	197 (5.6)	312 (8.8)	250 (7.1)	231 (6.5)	1006 (28.5)
Burdened workers (N=2458)	287 (11.7)	542 (22.1)	447 (18.2)	265 (10.8)	396 (16.1)	251 (10.2)	266 (10.8)	1022 (41.6)

\*p<0.01 by Chi-square test

**Table 4.** Odds ratio of musculoskeletal symptoms according to burdened work

Burdened work	Odds ratio*	95% Confidence interval
White collar workers(no burden)	1	-
Blue collar workers(no burden)	0.955	0.809 - 1.128
Burdened workers	1.570	1.314 - 1.875

\*adjusted by sex, age, BMI, shift work, extra work, job tenure, work load change, job strain

가

1 , 2 , 3  
1 , 2

1 가“ 4

, 3

” , 4

가

. , ?

( )

가

가

(Kim

가

가

11가

가

가

et al, 2005)

가

(Chae et

al, 2002)

가

가

2~4가

가

가

가

2

(Kim, 2004).

가 (RULA,

REBA, NIOSH, JSI )

가

가

11

가

가

(Kim et al, 2005).

가

가

가

가

가

, 11가

가

가

가

가

가

가 가

가

가

,

가 가

:

:

112 9950

, 7626(76.6%)

가 가

가 1)

2) 3)

( )

:

,

( ,

, BMI, 가 ), ( ,

, , )

가

( )

(1.542)

:

가

American National Standards Institute. Control of work-related cumulative trauma disorders, Part 1, Upper extremities(working draft): National Safety Council; 1996. p.4.1-A.17.

Ahn YS, Choi YH, Kang SK, Chung HK. Analysis of Work-Related Musculoskeletal Disease by Approved Korea Labor Welfare Corporation in 1999. Korean J Occup Environ Med 2002;14(2):154-68. (Korean)

Bongers PM. de Winter, Kompier MAJ, Hidebrandt VH. Psychosocial factors at work and musculoskeletal disease. Scan J Work Environ Health 1993;19:297-312.

Chae HJ, Lee SK, Lee KJ, Moon JD. Characteristics of Work-Related Musculoskeletal Disorders and Effect of Intervention Program in Shipyard Workers. Korean J Occup Environ Med 2002;14(4):468-77. (Korean)

Chang SJ, Cha BS, Koh SB, Kang MK, Koh SY, Park JK. Association between job characteristics and psychosocial distress of industrial workers. Korean J Occup Environ Med

1997;30(1):129-44. (Korean)

Choi JW, Yum YT, Song DB, Park JT, Chang SH, Choi JA. Musculoskeletal Diseases of Upper Extremities Among the Electronic Assembly Workers and Telecommunication Workers. Korean J Occup Environ Med 1996;8(2):301-9. (Korean)

Evanoff BA, Rosenstock L. Psychophysiologic stressors and work organization. In: Rosenstock L, Cullen MR editors. Textbook of clinical occupational and environmental medicine. Tokyo; W. B. Saunders company;1994. pp.717-28.

Han SH, Cho SH, Kim JY, Sung NJ. Importance of Job Demands, Career Development, Role Pressure, and Economic-Issue-Related Job stress as Risk Factors for Work Related Musculoskeletal Disorders in Electronics Assembly Line Workers. Korean J Occup Environ Med 2003; 15(3):269-80. (Korean)

Humantech Inc. Applied ergonomics training manual, 2nd edition: 1995. p 66-80

Kim BK, Park CY, Yim HW, Koo JW, Lee KS. Selection of a High Risk Groups and the Effectiveness of an Exercise Program on Musculoskeletal Symptoms in Small and Medium Sized Enterprises. Korean J Occup Environ Med 2005;17(1):10-25. (Korean)

Kim CH. A Review of DOL Notification on Over-burned Work for Musculoskeletal System. Proceeding of 2004 Congress of the Ergonomic Society of Korea. (Korean)

Kim CH, Bak SR, Moon BK, Son KI, Jang AS. Evaluation of DOL Notification on Over-burned Work for Musculoskeletal System. Proceeding of 2005 Congress of the Ergonomic Society of Korea. (Korean)

Knave BG, Wildom RI, Voss M, Hedstrom LD, Bergqvist U. Work with video display terminals among office employees I. Subjective symptoms and discomfort. Scand J Work Environ Health 1985;11:457-66.

Kim HJ Jeong WC. Symptom Prevalence and Primary Intervention of Work-Related Musculoskeletal Disorders and Their Related Factors Among Manufacturing Workers. Korean J Occup Environ Med 2005;17(2):116-28. (Korean)

Kwon HJ, Ha MN, Yun DR, Cho SH, Kang DH, Ju YS, Paek NJ. Perceived Occupational Psychosocial Stress and Work-related Musculoskeletal Disorders Among Workers Using Video Display Terminals. Korean J Occup Environ Med 1996; 8(3):570-7.(Korean)

Kim HR, Won JU, Song JS, Kim CN, Kim HS, Roh JH. Pain Related Factors in Upper Extremities among Hospital Workers Using Video Display Terminals. Korean J Occup Environ Med 2003;15(2):140-9. (Korean)

Kim YO, Park J, Ryu SY. A Study on the cervicobrachial Syndrome among the Microwave-oven Assemblers( )- A Review on the symptoms Investigated by the Questionnaire. Korean J of Occup Environ Med 1995;7(2):306-19. (Korean)

- McAtamney L, Corlett EN. RULA: a survey method for investigation of work-related upper limb disorders. *Appl Ergo* 1993;24(2):91-9.
- Ministry of Labor, Notification. 2003
- Moon JD, Lee MC, Kim BU. A Study on the Factors Affecting the Subjective Symptoms of VDT Syndrome. *J Prev Med* 1991;24(3):373-89. (Korean)
- NIOSH(US). Musculoskeletal disorder and workplace factors: A critical review of epidemiologic evidence for work-related musculoskeletal disorder the neck, upper extremity, and low back. 1997.
- Occupational Safety and Health Administration. Draft Ergonomic Standard: OSHA; 1995.
- Ong CN, Chia SE, Jeyaratnam J, Tan KC. Musculoskeletal disorders among operators of visual display terminals. *Scan J Work Environ Health* 1995;21:60-4.
- Park CY, Cho KH, Lee SH. Cervicobrachial Disorders of Female International Telephone Operators . Subjective Symptoms. *Korean J Occup Environ Med* 1989;1(2):141-50. (Korean)
- Park J, Kim YO, Ryu SY, Ha SH, Park BG. A Study on the cervicobrachial Syndrome among the Microwave-oven Assemblers( )- A Review on the Findings of the Examinations. *Korean J Occup Environ Med* 1995;7(2):320-31. (Korean)
- Park SG, Lee JY. Characteristics and Odds ratio of Work related Musculoskeletal Disorders According to Job Classification in Small-to-medium-sized Enterprises. *Korean J Occup Environ Med* 2004;16(4):422-35. (Korean)
- Sim YJ, Kim HA. Rate of Musculoskeletal Disorder Symptoms Complained by Some Insurance Inspectors. *Korean J Occup Health*. 2002;41(3):120-30. (Korean)
- Yim SH, Lee YG, Cho JJ, Son JI, Song JC. Symptom Prevalence of Work-Related Musculoskeletal Disorders and Related Factors among Bank Workers by Visual Display Terminal Use. *Korean J Occup Environ Med* 1997;9(1):85-98. (Korean)