

Original Article

Prevalence of Work-related Musculoskeletal Symptoms and Their Associations with Job Stress in Female Caregivers Living in South Korea

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Abstract. [Purpose] The purpose of this study was to assess the work-related musculoskeletal system symptoms and the extent of job stress in female caregivers, as well as the interrelationship between these factors. [Subjects and Methods] Korea Occupational Safety and Health Agency (KOSHA) Code H-43 of the Guidelines for the Examination of Elements Harmful to the Musculoskeletal System was used as a tool to measure musculoskeletal symptoms. Caregiver job stress was assessed from the Korean Occupational Stress Scale short form. [Results] The level of symptoms in the hand/wrist/finger and leg/foot regions had some relation to job stress. Job stress scores were mainly shown to be high when pain was reported. On the other hand, it was shown that the degree of musculoskeletal symptoms by body part was unrelated to conflicts in relationships, job instability, or workplace culture. [Conclusion] As for the correlations between musculoskeletal symptoms and job stress, it was shown that as job requirements increased, most musculoskeletal symptoms also increased.

Key words: Female caregivers, Job stress, Work-related musculoskeletal symptom

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INTRODUCTION

Over the past twenty years, the international literature has consistently shown the importance of musculoskeletal disorders (MSDs)¹. If a work-related musculoskeletal disease (WMSD) is found early and treated, it can be almost completely healed, and the patient can return to work. However, if diagnosis and treatment are conducted late, the disease can become chronic and difficult to cure; thus, early intervention is required for treatment. The European Union announced that lumbar pain (25%) and muscle pain (23%) are the most frequent MSDs, and have become the major reason for absence from work. Some countries in the EU have reported that MSDs account for 40% of workers' compensation costs².

In Korea, the prevention of WMSDs began to be legislated in 2003, and regulations were put in place by 2005³. Musculoskeletal diseases account for 8.6% of all disaster victims (90,147 persons) and 67.3% of occupational disease patients⁴. Therefore, prevention of musculoskeletal system diseases occupies a very important position in Korea in terms of reducing occupational diseases⁵. In particular, it

is said that the MSD incident rates among medical institution workers are twice those of workers in other types of business⁶.

The population of Korea is aging. Hence, it introduced a long-term care insurance system for the elderly in 2008. Along with this initiative, Korea began to train caregivers so that they could provide services relating to the physical needs, home affairs, and daily lives of elderly people who are hampered in their tasks for mental and/or physical reasons⁷. Taking care of elderly persons can result in physical and emotional stress for the caregiver⁶. Many of the work activities and tasks of caregivers are associated with a high risk of WMSDs^{8, 9}. It has also been reported that there is a high occurrence rate of MSDs among women¹⁰, particularly as they get older⁴. Caregivers, who are mostly women aged 40 and above, have a high risk of being exposed to MSDs. In addition, it is known that caregivers suffer from stress due to their unstable job positions and uncertain job scope in the hospital⁵. This study aims to determine the prevalence of musculoskeletal symptoms and the extent of job stress among caregivers, and to assess the interrelationship between these factors. This research can be used as a basic material for caregivers seeking proper methods of preventing musculoskeletal disorders and properly adjusting their job stress.

SUBJECTS AND METHODS

The participants in this study were 390 female caregiv-

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ers working at 10 general hospitals located in Pusan City, Korea. With the cooperation of the supervisors in charge of the caregivers, the purpose of this study was explained to the caregivers; they understood the intent of this study and voluntarily consented to participate. Face-to-face interviews were then conducted with individual volunteer participants. The study was approved by the ethics committee of the Kangwon National University Hospital Institutional Review Board. All caregivers had provided a minimum of eight hours of daily care for at least one year.

Data collection from caregivers was conducted by the placement method using self-administered questionnaires, from March to April of 2011. The questionnaires were completed by the caregivers. The tool used in this study was a structured questionnaire consisting of 7 questions about general characteristics, 43 questions about work-related musculoskeletal symptoms, and 24 questions about job stress. The questionnaire was structured as follows: Information on the general characteristics of the study subjects was obtained through seven open-ended questions about gender, age, academic background, salary, number of patients being administered care, and work hours per day, along with questions about the caregivers' disease histories. The tool for Korea Occupational Safety and Health Agency (KOSHA) Code H-43, which is based on the guidelines for musculoskeletal disorders created by the National Institute for Occupational Safety and Health and a table prepared by the US National Institute of standards and Technology for use in examining symptoms.

The survey asked the test subjects about any nonspecific symptoms such as pain or discomfort related to their job in their neck, shoulders, arms, or elbows; hands, fingers, or wrists; waist; or legs or feet over the past year¹¹). Distinctions were made between musculoskeletal symptoms in terms of the duration of pain, extent of pain, frequency of pain, present symptoms (musculoskeletal symptoms in the week immediately prior to the time of the survey), and the treatment of such pain. Nonspecific symptoms were defined as occurring when a person who had not been involved in an accident or sustained an injury had musculoskeletal symptoms originating from the workplace and the symptoms had continued for one week or more; the pain symptoms occurred once or more in a month and was rated at two points or more; there was evidence of one or more "severe" or "very severe" symptoms (pain, sore, numbness, etc.); management-level symptoms had occurred once or more in a month or were rated at two points or more; there was evidence of one or more "moderate" symptoms (pain, sore, numbness, etc.); or a symptom had been present for the past week based on the NIOSH standard for monitoring musculoskeletal disorders¹²), with the symptom being classified as a musculoskeletal symptom. This questionnaire allowed respondents to give more than one answer about different aspects of their symptoms.

Caregiver job stress was assessed using the 24 items of the Korean Occupational Stress Scale (KOSS) short form¹³). The KOSS short form has seven subdivisions: job demand, insufficient job control, interpersonal conflict, job insecurity, organizational system, lack of rewards, and occupational

climate. Respondents were asked to rate items on a four-point scale, ranging from "strongly disagree" to "strongly agree." A higher score on the scale implies a higher level of job stress. The job stress levels of the respondents were compared with the standard value for Korean workers.

Statistical analyses of general characteristics, job-related characteristics, extent of musculoskeletal symptoms, and frequency of job stress were conducted. The extent of musculoskeletal symptoms was judged according to the standard presented by the Korea Industry Safety Authority, and the extent of job stress was judged based on the reference values for Korean workers. Descriptive statistical processing was conducted for the levels of musculoskeletal symptoms and job stress, and the effects of musculoskeletal symptoms on job stress were tested through one-way analysis of variance (ANOVA). The correlations between musculoskeletal symptoms and job stress were then analyzed.

The reliability of the tools was measured by Cronbach's α , which is a measure of internal consistency. All analyses were conducted using SPSS ver. 15.0 for Windows (Statistical Package for the Social Sciences, SPSS Inc., Chicago, IL, USA).

RESULTS

The survey was administered to a total of 390 female caregivers, ranging from 20 to 60 years of age, with 6 to 14 years of schooling. They had an average of 3.6 years of experience as caregivers, and 81.5% (n=159) of them responded to the survey. A weekly average of 73 hours was dedicated to caring for patients; the minimum caregiving time was 48 hours, and the maximum caregiving time was 108 hours. The average number of patients per caregiver was 5.56. Of the respondents, 13.8% reported that they had been diagnosed with rheumatoid arthritis, diabetes, lupus, gout, or alcohol addiction. Regarding questions about regular leisure (30 minutes or more at a time, at least 2–3 times a week) and hobbies, 75.9% responded that they do not take time for these activities. When asked if they had suffered an injury or accident during exercise, 77.4% responded that they had not.

The results of the survey in relation to the Korean musculoskeletal disorder symptoms table are as follows: 11.8% had the most pain in the hand/wrist/finger, and overall, 17.4% reported pain. Of the respondents, 8.7% reported the most management-level symptoms in the hand/wrist/finger, and overall, 14.4% reported management-level symptoms. All of the subjects reported that there was no need for management for waist symptoms. The results showed that the hand/wrist/finger region most frequently exhibited symptoms (Table 1).

The extent of job stress among caregivers was compared with the reference values for Korean workers. The job stress scores were in the lower 25% among the reference values for female Korean workers, and this indicated that the respondents' job requirements were low and that their job autonomy was high. The scores related to conflicts in relationships and job instability were in the upper 50%, indicating that participants experienced some conflicts in

Table 1. Prevalence of musculoskeletal disorder symptoms

Classification	Neck	Shoulder	Arm/ Elbow	Hand/Wrist/ Finger	Waist	Leg/Foot	Total
No symptom	176 (90.3%)	175 (89.7%)	180 (92.3%)	155 (79.5%)	195 (100%)	167 (85.6%)	133 (68.2%)
Management- level symptoms	12 (6.2%)	11 (5.6%)	6 (3.1%)	17 (8.7%)	0 (0%)	13 (6.7%)	28 (14.4%)
Symptom Pain	7 (3.6%)	9 (4.6%)	9 (4.6%)	23 (11.8%)	0 (0%)	15 (7.7%)	34 (17.4%)
Total	19 (9.8%)	20 (10.2%)	15 (7.7%)	40 (20.5%)	0 (0%)	28 (14.4%)	62 (31.8%)

Table 2. Extent of job stress

Area	Mean value of caregivers	Reference value				Meaning of scores
		Lower 25%	Lower 50%	Upper 50%	Upper 25%	
Job demand	49.9±28.4	50.0 or lower	50.1–58.3	58.4–66.6	66.7 or higher	If the score is higher than the reference value, job demand is relatively high.
Job self-regu- lation	47.8±32.0	50.0 or lower	50.1–58.3	58.4–66.6	66.7 or higher	If the score is higher than the reference value, job self-regulation is relatively low.
Relationship conflict	35.8±26.3	-	33.3 or lower	33.4–44.4	44.5 or higher	If the score is higher than the reference value, the relationship conflict is relatively high.
Job instability	37.4±30.4	-	33.3 or lower	33.4–50.0	50.1 or higher	If the score is higher than the reference value, the job is relatively unstable.
Organizational system	39.8±31.7	41.6 or lower	41.7–50.0	50.1–66.6	66.7 or higher	If the score is higher than the reference value, the organization is relatively unsystematic.
Compensation inadequacy	37.4±31.2	44.4 or lower	44.5–55.5	55.6–66.6	66.7 or higher	If the score is higher than the reference value, the compensation is relatively inadequate.
Workplace culture	39.5±23.5	33.3 or lower	33.4–41.6	41.7–50.0	50.1 or higher	If the score is higher than the reference value, relatively, the workplace has problems.
Total score	39.5±23.5	44.4 or lower	44.5–50.0	50.1–55.6	56.0 or higher	If the score is higher than the reference value, relatively, the workplace has problems.

relationships and job instability. The scores relating to organizational systems and inappropriate compensation indicated that the respondents' organizations are systematized and their compensation is appropriate. The score related to workplace culture indicated that workplace culture was not a cause of stress. The overall stress score was in the lower 25%, indicating that the level of job stress in the caregivers was relatively low. Therefore, although these caregivers had experienced some conflicts in relationships and job instability, their conditions in relation to job requirements, job autonomy, organizational systems, inappropriate compensation, and workplace culture were rather good. Thus, their overall job stress was low (Table 2).

The correlations between musculoskeletal symptoms and job stress were as follows. Job requirements showed positive correlations with the neck region ($r=0.15$), arm/elbow region ($r=0.38$), hand/wrist/finger region ($r=0.27$), leg/foot region ($r=0.23$), and whole body symptoms ($r=0.23$), indicating that as job requirements increased, most musculoskeletal symptoms also increased. Job autonomy showed positive correlations with arm ($r=0.26$), hand/wrist/finger region ($r=0.15$), and leg/foot region musculoskeletal symp-

toms ($r=0.15$), indicating that as job autonomy scores increased, some musculoskeletal symptoms increased; furthermore, as job autonomy decreased, musculoskeletal system symptoms increased. Job instability showed weak positive correlations with hand/finger ($r=-0.16$) musculoskeletal symptoms, showing that as the degree of job instability increased, musculoskeletal symptoms increased. The organizational system showed a positive correlations with arm/elbow ($r=0.26$), hand/wrist/finger ($r=0.19$), leg/foot ($r=0.17$), and whole body musculoskeletal symptoms ($r=0.19$), demonstrating that as organizations became less systematic, musculoskeletal symptoms increased. Inappropriate compensation showed a positive correlation with arm region ($r=0.26$) musculoskeletal symptoms, indicating that as compensation became more inappropriate, arm region musculoskeletal symptoms increased. Conflicts in relationships and workplace culture showed no correlations with musculoskeletal system symptoms. Overall job stress scores showed positive correlations with arm ($r=0.26$) and hand ($r=0.19$) region and whole body musculoskeletal symptoms ($r=0.15$), showing that as overall job stress increased, these musculoskeletal symptoms also increased (Table 3).

Table 3. Relationship between musculoskeletal symptoms and job stress

	Job demand	Job self-regulation	Relationship conflict	Job instability	Organizational system	Compensation inadequacy	Workplace culture	Total score
Neck	0.15*	-0.02	0.01	0.10	0.09	0.01	0.02	0.06
Shoulder	0.08	0.07	0.04	0.10	0.04	0.01	0.08	0.08
Arm	0.38**	0.26**	0.02	0.06	0.26**	0.26**	0.13	0.26**
Hand	0.27**	0.15*	0.01	0.16(*)	0.19**	0.13	0.09	0.19**
Leg	0.23**	0.15*	0.00	-0.01	0.17*	0.11	0.05	0.13
Whole body	0.23**	0.12	-0.01	0.10	0.19**	0.10	0.07	0.15*

**p<0.01; *p<0.05

DISCUSSION

The aim of this study was to examine the levels of musculoskeletal disease symptoms and job in Korean caregivers and the relationships between them. It was found that those who reported pain and management most frequently had musculoskeletal symptoms in the hand/wrist/finger region, followed by the leg/foot region, with no symptoms in the lumbar region. Those with musculoskeletal symptoms throughout the whole body represented 31.8% of the sample, including those who reported management (14.4%) and pain (17.4%). In a study conducted on operating room nurses¹⁴, the proportion of those who reported musculoskeletal system symptoms was 75.6%, while another study found that 44.9% of dental technicians reported musculoskeletal system symptoms¹⁵; the ratios in these studies were higher than those in the present research. In a study conducted by Bejia et al. (2005)¹⁶, musculoskeletal systems were exhibited most frequently in the shoulder, followed by the lumbar region, neck, and lower extremities, while another study reported that operating room nurses exhibited symptoms in the lumbar and leg/foot regions¹¹, demonstrating contrasting results from those of this study. The National Institute for Occupational Safety and Health reported that repeated work, excessive force, and improper working postures cumulatively affected musculoskeletal system symptoms in the arm/wrist/hand region; that the neck/shoulder region was affected by improper working postures; and that the lumbar region was affected by lifting/hard physical work or systemic vibrations¹⁷. Therefore, it can be said that in the work of caregivers who frequently had musculoskeletal system symptoms in the hand/wrist/finger region, repeated work, excessive force, and improper working postures had cumulative effects. Inappropriate postures and handling techniques brought about by movement of patients or objects in medical institutions⁶ are related to work that imposes loads on the musculoskeletal system¹⁷. Furthermore, according to Kwon et al. (2008)⁵, the number of patients with musculoskeletal diseases related to work that imposes loads on the body and occupation-related lower back pain has been continuously decreasing since 2003; in the present study, there were no caregivers with lumbar region musculoskeletal diseases.

When the extent of job stress in the caregivers was compared with the reference values for Korean workers, it was shown that the caregivers had a slightly high level of

conflict in relationships and job instability, while they had relatively good conditions in terms of job requirements, job autonomy, organizational systems, inappropriate compensation, and workplace culture; thus, their overall job stress was relatively low. In another study conducted on caregivers, it was reported that physical job stress symptoms were the most frequent, followed by behavioral symptoms, psychological symptoms, and emotional symptoms; that study, the overall job stress of subjects was relatively low, and their job stress was highest when they had to do work that was different from their job¹⁸. These results are similar to the results obtained in the present study, which showed slightly high job instability. A study by Im²¹ also showed that the job stress of caregivers was not high, and reported that caregivers in convalescent hospitals had lower job stress than those in convalescent facilities. Since the caregivers who participated in this study worked in hospitals, it can be said that the results are similar to those of Lim (2001)¹⁹.

In terms of the effects of the levels of musculoskeletal symptoms by body part on job stress, job requirements, job autonomy, organization systems, inappropriate compensation, and total job stress, the scores in the present study varied with the level of arm/elbow region musculoskeletal symptoms. Job requirements, organizational systems, and total job stress scores varied with the levels of hand/wrist/finger region symptoms. Job requirements, job autonomy, organizational systems, and total job stress scores varied with the levels of leg/foot region symptoms, and job stress scores were shown to be high mainly when pain was reported. On the other hand, it was shown that the levels of musculoskeletal symptoms by body part did not affect conflicts in relationships, job instability, or workplace culture.

According to Bongers et al. (1993)²⁰, the sociopsychological characteristics of workers may directly affect working speeds, movement acceleration, forces applied, and postures, and their sociopsychological characteristics may also show stress reactions that could bring about physiological changes, thereby inducing musculoskeletal system symptoms. The researchers also reported that these characteristics might affect their evaluation of work situations and musculoskeletal symptoms, and stress reactions might contribute to turning acute musculoskeletal system symptoms into subacute or chronic symptoms. It is known that workers exposed to a high level of sociopsychological stress factors experience higher physical working intensities, even when they perform the same physical work as others²¹, and

that stress is involved in many mechanisms that impose pain¹⁴). The results of the present study seem to be similar to those of previous studies.

In terms of the correlations between musculoskeletal symptoms and job stress, the present study showed that as job requirements increased, most musculoskeletal symptoms also increased, and as job autonomy decreased, arm, hand/wrist/finger region, and leg/foot region symptoms increased. Furthermore, as the degree of job instability increased, hand/finger region symptoms increased, and as organizations became less systematic, arm/elbow, hand/wrist/finger, leg/foot, and whole body musculoskeletal symptoms increased. Moreover, as compensation systems became more inappropriate, arm region symptoms increased. It was also shown that as overall job stress increased, arm, hand, leg, and whole body musculoskeletal symptoms increased. Many previous studies reported that symptom incidence rates were high when job requirements were high and job autonomy was low^{22, 23}), supporting the results of the present study, which showed correlations between low job requirements, high job autonomy, and low degrees of musculoskeletal symptoms. It has been reported that excessive mental tension is a more important musculoskeletal system symptom-inducing factor than physical loads²⁴). High psychological job requirements are associated with neck and shoulder symptoms²⁵). In this study, the levels of neck and shoulder musculoskeletal symptoms were shown to be low, and this seems to be associated with the low degree of job stress. In a study conducted on hospital workers, it was shown that the risk of musculoskeletal system diseases increased when job requirements were higher and support from bosses and colleagues was low¹⁷). In a study by Chae (2005)²⁵) conducted on air maintenance mechanics, the amounts of necessary work discretion, job requirements, and work tension (as a combination of work discretion and job requirements) showed no difference in terms of musculoskeletal system symptoms; these results differ from those of the present study.

The present study showed results similar to those of previous studies. Here, the overall percentage of WMSDs was relatively low, at 17.4%, and job stress was also shown to be low. It is considered that this is because the average length of the careers of the participants in the study was 3.6 years, which is relatively short, and the “caregiver” designation represents a new job group. However, the caregivers in this study had hand/wrist/finger region musculoskeletal symptoms¹⁷), which are considered to be caused most frequently by repetitive work, and thus it is thought that as the length of their career increases, WMSDs will also increase. Since additive or synergetic associations exist between WMSDs and job stress, it is considered that as the lengths of the caregivers’ career increase, not only musculoskeletal system diseases, but also the degree of job stress, will also increase. Thus, appropriate preventive measures for these work-related problems are necessary.

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REFERENCES

- 1) Safety and Health at Work, European Good Practice Awards 2007, Prevention of work-related MSDs in practice. Bilbao: European Agency for Safety and Health at Work, 2007, p 5.
- 2) European Agency for Safety and Health at Work: Work-related musculoskeletal disorders: prevention report; 2008. Bilbao: European agency for Safety and Health at Work, 2008, p 13.
- 3) Park KH, Jeong B: Characteristics and causes of musculoskeletal disorders for employees aged 50 years or older. *J Ergono Soc Kor*, 2009, 28: 139–145. [CrossRef]
- 4) Ministry of Labor of Korea: Industrial accident analysis, 1998–2006. Seoul: Ministry of Labor of Korea, 2008, p 37.
- 5) Kwon BH, Park KH, Kim W, et al.: Occurrence progress analysis of the musculoskeletal disorders in Korea (1998–2007). *Ergo Soci Kore Spring Confe*, 2008, 36–41.
- 6) Lagerlof E, Broberg E: Occupational injuries and diseases. In: Brune DK, Elding C, editors. *Occupational hazards in health professions*. Boca Raton: CRC Press, 1989.
- 7) Welfarelawforaged. www.moleg.go.kr.http://law.go.kr/unSc.do?menuId=7&query=%EC%9A%94%EC%96%91%EB%B3%B4%ED%98%B8.
- 8) Daynard D, Yassi A, Cooper JE, et al.: Biomechanical analysis of peak and cumulative spinal loads during simulated patient-handling activities: a substudy of a randomized controlled trial to prevent lift and transfer injury of health care workers. *Appl Ergon*, 2001, 32: 199–214. [Medline] [CrossRef]
- 9) Lee JE, Kim SL: Work related musculoskeletal risk level with nursing tasks in hospital. *Kore J Occup Health Nurs*, 2003, 12: 31–38.
- 10) Nelson A, Lloyd JD, Menzel N, et al.: Preventing nursing back injuries: redesigning patient handling tasks. *AAOHN J*, 2003, 51: 126–134. [Medline]
- 11) Waters TR, Dick RB, Davis-Barkley J, et al.: A cross-sectional study of risk factors for musculoskeletal symptoms in the workplace using data from the General Social Survey (GSS). *J Occup Environ Med*, 2007, 49: 172–184. [Medline] [CrossRef]
- 12) McFarlane AC: Stress-related musculoskeletal pain. *Best Pract Res Clin Rheumatol*, 2007, 21: 549–565. [Medline] [CrossRef]
- 13) Korea Occupational Safety & Health Agency: KOSHA code H-30–2003. www.kosha.or.kr, 2003.
- 14) Lee CO, Ahn YS, Kwak WS, et al.: Work related musculoskeletal disorders and ergonomic work posture analysis of operating room nurses. *Kore Industr Hygie Assoc Jr*, 2009, 19: 171–181.
- 15) Kim JH, Oh SY, Kim WC, et al.: Relationship of stress symptoms and work related factors in Korean dental laboratory technicians. *J Health Sci*, 2001, 27: 32–38.
- 16) Bejia I, Younes M, Jamila HB, et al.: Prevalence and factors associated to low back pain among hospital staff. *Joint Bone Spine*, 2005, 72: 254–259. [Medline] [CrossRef]
- 17) Korea Occupational Safety & Health Agency. http://www.kosha.or.kr/www/boardView.do?menuId=896&contentId=338223&boardType=A.
- 18) Ro HL: Relationship between job stress and self-esteem of physical therapists. *J Kore Socie Phys Ther*, 2010, 22: 83–90.
- 19) Lim JD: The relationship between job stress and job satisfaction of geriatric care helpers. *J Kore Conte Soci*, 2011, 11: 225–235. [CrossRef]
- 20) Bongers PM, de Winter CR, Kompier MA, et al.: Psychosocial factors at work and musculoskeletal disease. *Scand J Work Environ Health*, 1993, 19: 297–312. [Medline] [CrossRef]
- 21) Choi MG, Choi SB, Cha SE: A survey on the subjective symptoms and risk factors of musculoskeletal disorders in dentists. *J Kore Socie Safe*, 2006, 21: 106–115.
- 22) Hales TR, Sauter SL, Peterson MR, et al.: Musculoskeletal disorders among visual display terminal users in a telecommunications company. *Ergonomics*, 1994, 37: 1603–1621. [Medline] [CrossRef]
- 23) Leino PI, Hänninen V: Psychosocial factors at work in relation to back and limb disorders. *Scand J Work Environ Health*, 1995, 21: 134–142. [Medline] [CrossRef]
- 24) Toomingas A, Theorell T, Michélsen H, et al. Stockholm MUSIC I Study Group: associations between self-rated psychosocial work conditions and musculoskeletal symptoms and signs. *Scand J Work Environ Health*, 1997, 23: 130–139. [Medline] [CrossRef]
- 25) Chae DH, Kim JH: Risk factors for musculoskeletal symptoms in aviation maintenance technicians. *Kore J Occup Environ Med*, 2005, 17: 173–185.