Relationship between fatigue severity scale and occupational injury in Korean workers

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ABSTRACT

Background: The aim of this study is to investigate the relationship between fatigue and occupational injury.

Methods: This study was conducted at a university hospital in 2014 and 2015. In 2014, the fatigue severity scale (FSS) was used to evaluate workers’ fatigue levels. Later, when the same workers were examined in 2015, a questionnaire survey was conducted to determine whether they had experienced absences or treatment for work-related accidents. The \(\chi^2\) test was used to analyse the relationship between demographic characteristics, fatigue levels, and occupational injuries. After controlling for confounders, a logistic regression analysis was performed to calculate the odds ratios (ORs).

Results: In 2014, 19,218 workers were screened during health examination and their fatigue level were evaluated using FSS questionnaires. In result, men in the moderate- and high-fatigue groups, after adjusting for age, smoking and drinking habits, chronic diseases, and occupational factors such as size of company industrial classification and type of work (shift or non-shift), adjusted ORs for hospital treatment due to occupational injury were 1.76 (95% confidence interval [CI]: 1.39–2.24) and 2.61 (95% CI: 1.68–4.06), respectively. Among men in the medium- and high-fatigue groups, the adjusted ORs for absence due to occupational injury were 2.06 (95% CI: 1.52–2.80) and 3.65 (95% CI: 2.20–6.05), respectively. No significant association was observed between fatigue and occupational injury in women.

Conclusions: Male workers with high fatigue levels have a higher risk of experiencing work injuries. This study suggests that active intervention be considered to prevent injuries in workers with high scores on workplace fatigue evaluation scales.

Keywords: Fatigue; Fatigue severity scale; Occupational injury; Disease; Korean worker

BACKGROUND

According to International Labour Organization, an occupational injury is defined as any personal injury, disease or death resulting from an occupational accident which is an unexpected and unplanned occurrence, including acts of violence, arising out of or in connection with work which results in one or more workers incurring a personal injury, disease or death.
According to an analysis about industrial accidents on 2018 [1], among the 2.6 million workplaces covered by the Industrial Accident Compensation Insurance Act, 19 million workers had 102,305 injuries requiring more than 4 days of care, 2,142 of them died (0.2% of all injuries), and 89,588 workers (2.3%) were injured in need of medical care more than 6 months, and 10,302 (1%) were affected by occupational disease. Occupational injury goes beyond personal levels, but also social losses. The amount of direct losses (injury compensation payments) due to occupational accidents reached $4.3 billion in 2018, and the estimated economic loss, including indirect losses, is estimated at $25.2 billion [1]. In study of Belgian workers, during the last 12 months about 11.7% of workers were absent from work because of work-related accident [2]. In study of 1,479 injured Danish workers, 36% of these reported absence from work by themselves or others [3].

Occupational injuries are caused by a variety of causes. Previous studies have shown that occupational injuries are associated with cardiovascular disease, musculoskeletal problems [4], and it have been pointed out that incomplete work environments or non-ergonomic environments are related with occupational injuries. Recently, it is known that social and psychological factors such as low job autonomy, high job demand, low social support, interpersonal conflict, job dissatisfaction, and job stress are also related [5]. In a study of workers in Finland, the probability of occupational injuries was 1.42 times higher when they were under stress while performing the task [6], and if they hated the work, they suffer from occupational injuries with a higher probability [7]. It is known that fatigue during work is also related occupational injury [5].

Fatigue is a normal, everyday experience that complains after lack of rest or sleep, and exhaustion due to physical activity, and can also occur due to lack of motivation for work. Fatigue, broadly defined as “a feeling of weariness, tiredness, or lack of energy,” is a frequently cited complaint in workplace. The prevalence of fatigue in the general public has been variously reported from 7% to 45% due to differences in definition of fatigue, measurement tools, and diversity of subjects [8-10]. In a study of 3,300 workers in United States, 18.7% of workers complained of persistent fatigue for more than 1 month, and 11.5% complained of chronic fatigue for more than 6 months [11].

Fatigue significantly impair a person’s functioning and have a negative effect on his or her health-related quality of life, without which a person might drop into unrecoverable exhaustive state and, in the most severe case, can even die, referred to in Japanese as Karoshi. The major medical causes of Karoshi deaths are heart attack and stroke due to stress [12,13].

Previous studies on the relationship between fatigue and occupational injury have been reported. According to a study by Blackburn et al. [14], workers with fatigue were 3.1 times more likely to suffer eye damage. In a study of American police officers, the odds ratio (OR) of occupational accidents increased by 1.08 and 1.67 times in the medium and high fatigue groups compared to the low fatigue group [15]. However, these studies mainly targeted small and medium-sized businesses, or the number of samples was small. Therefore, this study intends to analyze largely and prospectively the relationship between workers’ fatigue and occupational injury.
METHODS

Population
This study was conducted at a university hospital in Incheon between January 1, 2014 and December 31, 2015. In 2014, during the health examination of 19,218 workers, fatigue level was evaluated using fatigue severity scale (FSS). And in 2015, occupational injury was evaluated. A 12,275 workers completed questionnaire about hospital treatment due to work related accident, while 12,254 workers completed questionnaire about absence due to work related accident. Follow rates of workers were 63.7%, 63.8% respectively. In result, total 12,275, 12,254 workers were included in this study.

Questionnaire survey
The questionnaire used in this study was self-written, and for whom couldn’t complete the questionnaire, a nurse or physician helped them to complete it. The FSS used in this study is a measurement tool developed to evaluate fatigue that is difficult to make objective evaluation [16]. The FSS consists of 9 questions, and the last week’s fatigue level is evaluated on a scale of 1 to 7 points. Higher score was regarded as more fatigue workers felt. In this study, the group with a fatigue evaluation scale score of less than 27 was regarded as a group with low fatigue, a group with a score of 27 or more and 44 or less as a medium fatigue group, and a group with a score of 45 or higher as high fatigue group.

In addition, occupational injury was defined as hospital treatment due to work-related accidents or worker’s absence due to work-related accidents. To evaluate these, workers were asked to answer “yes or no” questions below.

1) “Have you ever been hospitalized due to work-related accidents in last year?”—evaluating hospital treatment due to work-related accidents.
2) “Did you have been absent from work for more than one day in the last year because of work-related accidents?”—evaluating worker’s absenteeism due to work-related accidents.

In addition, age, gender, diabetes mellitus or hypertension, smoking history (current smoker, ex-smoker, or never smoker), drinking habit (units/day), and occupational characteristics such as industry classification, type of work (shift or non-shift) and size of workplace (less than 300 or not) were identified through the subjects’ health examination data. Questionnaire items were listed on the workers’ health checkup questionnaire. Participants received a consent to the use of personal information.

Statistical analysis
We analyzed the data of men and women separately because gender can influence occupational injury rates and fatigue level. Experiences of occupational injury according to the participant’s general and occupational characteristics and FSS were analyzed using the χ² test. In order to calculate the OR of FSS for occupational injury, a logistic regression analysis was performed. Adjusted ORs were calculated after adjusting for potential confounders. Age, hypertension or diabetes mellitus, smoking habit, alcohol consumption, industry classification, type of work (shift or non-shift) and size of employment were adjusted. These confounding variables were selected based on results of χ² testing by gender. SPSS (version 25; IBM Corp., Armonk, NY, USA) was used for statistical analysis.
RESULTS

Demographic characteristics of the study subjects
A 19,218 workers were completed FSS questionnaires in 2014. And in 2015, 12,275 (63.9%) workers responded question about hospital treatment due to occupational injury, and 12,254 (63.8%) workers responded question about absence due to occupational injury respectively.

As a result, 488 workers answered that they had experienced occupational injury. Among them, 354 patients (2.8%) received hospital treatment due to work-related accidents and 211 (1.7%) experienced absence from work due to work-related accidents.

Demographic characteristics of cases of hospital treatment due to occupational injury
For men, there was no significant difference between the group consist of cases of hospital treatment due to occupational injury ("injury group") and the control group in terms of age, hypertension or diabetes mellitus, and industry classification. Differences were observed according to the history of alcohol intake, smoking habit, size of employment, type of work (shift) and FSS scores. In the case of women, significant differences were found between the injury group and the control group for age groups, and there were no significant differences in other variables including the FSS score (Tables 1 and 2).

Demographic characteristics of cases of absence from work-related accidents
For men, no significant difference was found between the injury group and the control group in terms of age, diabetes mellitus or hypertension, and history of alcohol intake and industry classification but differences were found according to the smoking habit, size of employment, type of work (shift) and FSS scores. In the case of women, significant...
differences were found between the injury group and the control group for age groups, hypertension or diabetes mellitus, and there was no significant difference in other variables (Tables 3 and 4).

### ORs for hospital treatment due to occupational injury

In the group with moderate and high scores in the male FSS, the OR was 1.71 (95% confidence interval [CI]: 1.36–2.17) and 2.58 (95% CI: 1.66–4.00). When adjusted for age, smoking habit, drinking habit, hypertension or diabetes mellitus, and occupational factors the OR was 1.76 (95% CI: 1.39–2.24) and 2.61 (95% CI: 1.68–4.06) (Table 5).

In the group with moderate and high scores in the women's FSS score, no statistically meaningful results found even when adjusting confounding factors.

### ORs for absence due to occupational injury according to FSS

In the group with medium and high scores in the male fatigue evaluation scale, the OR was 2.02 (95% CI: 1.49–2.74) and 3.69 (95% CI: 2.23–6.09). When adjusted for age, smoking habit, drinking habit, hypertension or diabetes mellitus, and occupational factors, the OR was 2.06 (95% CI: 1.52–2.80) and 3.65 (95% CI: 2.20–6.05) (Table 6).

In the group with moderate and high scores in the women's fatigue score scale, no statistically meaningful results found even when adjusting confounding factors.
Table 3. General characteristics of male and female experienced absence due to occupational injury

| Variables                              | Male                        | Female                      |
|----------------------------------------|-----------------------------|-----------------------------|
|                                        | Total Value | p-value* | Total Value | p-value* |
| Total                                  | 9,290        | 191 (2.1) | 2,964        | 20 (0.7) |
| Age (years)                            |              |          |              |          |
| < 30                                   | 997          | 22 (2.2) | 943          | 5 (0.5)  |
| 39–39                                  | 2,774        | 57 (2.1) | 948          | 2 (0.2)  |
| 40–49                                  | 2,940        | 53 (1.8) | 595          | 6 (1.0)  |
| 50–59                                  | 2,400        | 56 (2.3) | 447          | 6 (1.3)  |
| > 59                                   | 179          | 3 (1.7)  | 31           | 1 (3.2)  |
| Hypertension or diabetes mellitus      |              |          |              |          |
| No                                     | 7,878        | 167 (2.1)| 2,800        | 15 (0.5) |
| Yes                                    | 1,412        | 24 (1.7) | 164          | 5 (3.0)  |
| Smoking habit                          |              |          |              |          |
| Never                                  | 2,315        | 32 (1.4) | 2,813        | 19 (0.7) |
| Former                                 | 2,684        | 46 (1.7) | 70           | 1 (1.4)  |
| Current                                | 4,191        | 113 (2.6)| 81           | 0 (0.0)  |
| Alcohol consumption (unit/week)        |              |          |              |          |
| 0                                      | 2,215        | 46 (2.1) | 1,644        | 15 (0.9) |
| 1–14                                   | 4,640        | 88 (1.9) | 1,153        | 5 (0.4)  |
| > 15                                   | 2,435        | 57 (2.3) | 167          | 0 (0.0)  |
| Fatigue severity scale                 |              |          |              |          |
| < 27                                   | 5,511        | 77 (1.4) | 1,168        | 9 (0.8)  |
| 27–44                                  | 3,376        | 94 (2.8) | 1,489        | 9 (0.6)  |
| > 44                                   | 403          | 20 (5.0) | 307          | 2 (0.7)  |

Values are presented as number (%).

*Obtained by a χ² test or Fisher’s exact test.

Table 4. Occupational characteristics of male and female experienced absence due to occupational injury

| Variables                                                      | Male                        | Female                      |
|                                                               | Total Value | p-value* | Total Value | p-value* |
| Total                                                         | 9,290        | 191 (2.0) | 2,964        | 20 (0.7) |
| Industry                                                      |              |          |              |          |
| Manufacturing                                                | 4,943        | 106 (2.1)| 1,360        | 12 (0.9) |
| Sewerage, waste management, materials recovery and remediation activities | 11 | 0 (0.0) | 2 | 0 (0.0) |
| Construction                                                 | 11           | 0 (0.0)  | 1           | 0 (0.0)  |
| Wholesale and retail trade                                   | 214          | 2 (0.9)  | 33          | 0 (0.0)  |
| Transportation                                               | 2,516        | 56 (2.2) | 85          | 0 (0.0)  |
| Accommodation and food service activities                     | 53           | 1 (1.9)  | 27          | 0 (0.0)  |
| Information and communications                               | 194          | 0 (0.0)  | 39          | 0 (0.0)  |
| Financial and insurance activities                           | 3            | 0 (0.0)  | 0           | 0 (0.0)  |
| Real estate activities and renting and leasing               | 47           | 0 (0.0)  | 6           | 0 (0.0)  |
| Professional, scientific and technical activities            | 4            | 0 (0.0)  | 0           | 0 (0.0)  |
| Business facilities management and business support services  | 342          | 10 (2.9) | 302         | 3 (1.0)  |
| Public administration and defence; compulsory social security | 345          | 2 (0.6)  | 30          | 0 (0.0)  |
| Education                                                    | 192          | 3 (1.6)  | 110         | 1 (0.9)  |
| Human health and social work activities                      | 257          | 3 (1.2)  | 944         | 4 (0.4)  |
| Membership organizations, repair and other personal services | 125          | 7 (5.6)  | 4           | 0 (0.0)  |
| Other                                                        | 33           | 1 (3.0)  | 21          | 0 (0.0)  |
| Size of employment                                           |              |          |              |          |
| < 300                                                         | 4,479        | 114 (2.5)| 816          | 6 (0.7)  |
| 300 or more                                                  | 4,811        | 77 (1.6) | 2,148        | 14 (0.7) |
| Shift work                                                   |              |          |              |          |
| No                                                           | 8,435        | 187 (2.2)| 2,448        | 19 (0.8) |
| Yes                                                          | 855          | 4 (0.5)  | 516          | 1 (0.2)  |

Values are presented as number (%).

*Obtained by a χ² test or Fisher’s exact test.
This study is intended to prospectively confirm the association between fatigue and occupational injury of workers working in various workplaces. In this study, the fatigue level felt by workers was evaluated by using the FSS during the workers’ health examination in 2014, and occupational injuries were checked during the workers’ health examination in 2015. Thus, we evaluated association between fatigue and occupational injuries among workers prospectively. In this study, as the FSS score increased in men, the frequency of hospital treatment and absence due to accidents related with work increased. The results are similar to previous studies evaluating association between fatigue and occupational injury (hospital treatment or absenteeism due to accidents). Chang et al. [5] classified fatigue levels into quartiles and analyzed the relationship between fatigue and medical use, work accidents, and absences. As a result, compared to the lowest quartile group, the ratio of outpatient use in the 2nd, 3rd, 4th quartile group was as high as 1.19 (95% CI: 1.05–1.35), 1.45 (95% CI: 1.28–1.65), and 1.95 (95% CI: 1.70–2.24), respectively [3]. The risk of accident of the highest fatigue group was 1.69 times higher than the low fatigue group (95% CI: 1.03–2.78) [17]. Among police officers, increase in fatigue score was associated with a 33% increase in prevalence of injury [15]. In a study of Canadian, fatigue has a statistically significant negative association with participation for individuals with spinal cord injury [18]. Significant associations between fatigue and occupational injuries have been demonstrated, but little is known about the mechanism. In previous studies, it was explained as a decrease in concentration due to fatigue during work, a decrease in judgment, and a decrease in reaction speed [17,19].
According to a previous study, risk factors for occupational injury include personal factors such as age [20], hypertension or diabetes mellitus [21,22], smoking [23], and alcohol [24,25], and workplace factors such as workplace size [26,27], shift work [2,19], and type of industry [28,29]. In this study, when these factors were identified, men were found to have higher risk of occupational injuries in group of current smoking, drinking more than 15 units per week, working in workplaces with less than 300 workers, and non-shift work. In the case of shift work, results are contrary to those of previous studies [19,28]. It might be because of selection bias. In this study, one university hospital workers (mostly nurses) and one airline workers were the only workers with shift work. Due to this, it seems that the contrary result was shown in this study. After adjusting these factors, it was found that the OR of FSS scores for occupational injuries – hospital treatment or absence due to work related accidents were significantly high in men.

However, in women, no significant association was observed between fatigue and occupational injuries in this study. This was not significant even when the general and occupational factors were adjusted. Several hypotheses can be suggested for the results.

First, it can be considered that women’s fatigue awareness level is higher than that of men. The FSS used in this study measure subjective symptoms. Therefore, the number may vary depending on the workers. In this study, female workers are 1.2 to 1.7 times more likely to experience fatigue than men. In a study about 10,000 Korean workers, women’s fatigue complaint rate was higher than that of men (51.2% vs. 39.9%) [30], and a similar results were revealed several studies [31,32]. For this reason, the fatigue evaluation scale is relatively high in women, and the association between fatigue and occupational injury may have been attenuated.

Second, differences in occupational factors between men and women may affected the result. Among the subjects of this study, there is a difference in the industrial classification in which women and men are mainly engaged. Men are mainly engaged in manufacturing and transportation, and women tend to work in human health and social work activities. So, relatively less cases of occupational injuries would be reported among female workers. The size of the workplace also differs between men and women. For women, 27.6% of workers were at workplaces with less than 300 employees, but 48.2% for men. Considering that workers working in small workplaces have a higher risk of occupational injury [26,27], women may have relatively fewer occupational injuries. In conclusion, it can be assumed that women experience fewer occupational injuries than men, and that symptoms are also mild. Therefore, the association between FSS and occupational injuries may not have been clearly seen.

There are some limitations in this paper. First, even in the same occupational injury, the period of absence and the type of damage are different. This may need to be revealed through further research. Second, relatively low follow-up rate (63.7%, 63.8% respectively) between 2014 and 2015, there may be workers who quit their job or had been in a sick leave due to a work-related accident. Therefore, considering this effect, it is possible that the relationship between work injury and fatigue is underestimated. Third, time difference is existing between the time when fatigue is evaluated and the time occupational injury occurred. So that, a fatigue level at the time when occupational injury occurred may not be directly evaluated. There are limitations in evaluating differences in the types of work between blue-collar workers and white-collar workers, and whether and how shifts are made.
CONCLUSIONS

Male workers with high FSS score are at a higher risk of experiencing occupational injury. Since this study prospectively assessed fatigue and identified the subsequent occupational injuries, it is possible to consider active intervention to prevent work related accidents of workers with high FSS scores. Proactively identifying and managing workers who are likely to suffer occupational injuries not only helps workers’ health, but also helps the efficient operation of the workplace. To this end, it would be helpful to classify the high-risk group with a high probability of injuries by using the FSS score and take action such as switching work or reducing work time. In addition, long-term follow-up studies on the relationship between fatigue and occupational injuries are considerable.

REFERENCES

1. Korea Occupational Safety & Health Agency. *Analysis on the Industrial Accident*. Ulssan: Korea Occupational Safety & Health Agency; 2018.
2. Alali H, Braeckman L, Van Hecke T, Abdel Wahab M. Shift work and occupational accident absence in Belgium: findings from the sixth European Working Condition Survey. Int J Environ Res Public Health 2018;15(9):E1811.
3. Jørgensen K, Laursen B. Absence from work due to occupational and non-occupational accidents. Scand J Public Health 2013;41(1):18-24.
4. Ariëns GA, Bongers PM, Hoogendoorn WE, van der Wal G, van Mechelen W. High physical and psychosocial load at work and sickness absence due to neck pain. Scand J Work Environ Health 2002;28(4):222-31.
5. Chang SJ, Koh SB, Kang D, Kim SA, Chung JJ, Lee CG, et al. Fatigue as a predictor of medical utilization, occupational accident and sickness absence. Korean J Occup Environ Med 2005;17(4):318-32.
6. Salminen S, Kouvonen A, Koskinen A, Joensuu M, Väänänen A. Is a single item stress measure independently associated with subsequent severe injury: a prospective cohort study of 16,385 forest industry employees. BMC Public Health 2014;14(1):543.
7. Salminen S, Perutula P, Hirvonen M, Perkiö-Mäkelä M, Vartia M. Link between haste and occupational injury. Work 2017;56(1):119-24.
8. Ricci JA, Chee E, Lorandeaual, Berger J. Fatigue in the U.S. workforce: prevalence and implications for lost productive work time. J Occup Environ Med 2007;49(1):1-10.
9. Janssen N, Kant IJ, Swaen GM, Janssen PP, Schröer CA. Fatigue as a predictor of sickness absence: results from the Maastricht cohort study on fatigue at work. Occup Environ Med 2003;60 Suppl 1(Suppl 1):i71-6.
10. Bültmann U, Kant I, Karl SV, Beurskens AJ, van den Brandt PA. Fatigue and psychological distress in the working population: psychometrics, prevalence, and correlates. J Psychosom Res 2002;52(6):445-52.
11. Shefer A, Dobbsin JG, Fukuda K, Steele L, Koo D, Nisenbaum R, et al. Fatiguing illness among employees in three large state office buildings, California, 1993: was there an outbreak? J Psychiatr Res 1997;31(1):31-43.
12. Hiyama T, Yoshihara M. New occupational threats to Japanese physicians: karoshi (death due to overwork) and karojisatsu (suicide due to overwork). Occup Environ Med 2008;65(6):428-9.
13. Michie S, Cockcroft A. Overwork can kill. BMJ 1996;312(7036):921-2.
14. Blackburn J, Levitan EB, MacLennan PA, Owsley C, McGwin G Jr. A case-crossover study of risk factors for occupational eye injuries. J Occup Environ Med 2012;54(1):42-7.

15. Fekedulegn D, Burchfiel CM, Ma CC, Andrew ME, Hartley TA, Charles LE, et al. Fatigue and on-duty injury among police officers: the BCOPS study. J Safety Res 2017;60:43-51.

16. Krupp LB, LaRocca NG, Muir-Nash J, Steinberg AD. The fatigue severity scale. Application to patients with multiple sclerosis and systemic lupus erythematosus. Arch Neurol 1989;46(10):1121-3.

17. Van Dijk FJ, Swan GM. Fatigue at work. Occup Environ Med 2003;60 Suppl 1(Suppl 1):i1-2.

18. Smith EM, Imam B, Miller WC, Silverberg ND, Anton HA, Forwell SJ, et al. The relationship between fatigue and participation in spinal cord injury. Spinal Cord 2016;54(6):457-62.

19. Jung YJ, Kang SW. Differences in sleep, fatigue, and neurocognitive function between shift nurses and non-shift nurses. Korean J Adult Nurs 2017;29(2):190-9.

20. Kang Y, Siddiqui S, Suk SJ, Chi S, Kim C. Trends of fall accidents in the U.S. construction industry. J Constr Eng Manage 2017;143(8):04017043.

21. Kubo J, Goldstein BA, Cantley LF, Tessier-Sherman B, Galusha D, Slade MD, et al. Contribution of health status and prevalent chronic disease to individual risk for workplace injury in the manufacturing environment. Occup Environ Med 2014;71(3):159-66.

22. Smith P, Bielecky A, Mustard C. The relationship between chronic conditions and work-related injuries and repetitive strain injuries in Canada. J Occup Environ Med 2012;54(7):841-6.

23. Kim HC, Lamichhane DK, Jung DY, Kim HR, Choi EH, Oh SS, et al. Association of active and passive smoking with occupational injury in manual workers: a cross-sectional study of the 2011 Korean working conditions survey. Ind Health 2015;53(5):445-53.

24. Dawson DA. Heavy drinking and the risk of occupational injury. Accid Anal Prev 1994;26(5):655-65.

25. Wang J, Wheeler K, Bai L, Stallones L, Dong Y, Ge J, et al. Alcohol consumption and work-related injuries among farmers in Heilongjiang Province, People’s Republic of China. Am J Ind Med 2010;53(8):825-35.

26. Fabiano B, Carró F, Pastorino R. A study of the relationship between occupational injuries and firm size and type in the Italian industry. Saf Sci 2004;42(7):587-600.

27. Morse T, Dillon C, Weber J, Warren N, Bruneau H, Fu R. Prevalence and reporting of occupational illness by company size: population trends and regulatory implications. Am J Ind Med 2004;45(4):361-70.

28. Feyer AM, Williamson AM, Stout N, Driscoll T, Usher H, Langley JD. Comparison of work related fatal injuries in the United States, Australia, and New Zealand: method and overall findings. Inj Prev 2001;7(1):22-8.

29. Benavides FG, Delclos GL, Cooper SP, Benach J. Comparison of fatal occupational injury surveillance systems between the European Union and the United States. Am J Ind Med 2003;44(4):385-91.

30. Chang SJ, Koh SB, Kang MG, Hyun SJ, Cha BS, Park JK, et al. Correlates of self-rated fatigue in Korean employees. J Prev Med Public Health 2005;38(1):71-81.

31. Chen MK. The epidemiology of self-perceived fatigue among adults. Prev Med 1986;15(1):74-81.

32. Kroenke K, Wood DR, Mangelsdorff AD, Meier NJ, Powell JB. Chronic fatigue in primary care. Prevalence, patient characteristics, and outcome. JAMA 1988;260(7):929-34.