



## Original Article

# Insufficient Rest Breaks at Workplace and Musculoskeletal Disorders Among Korean Kitchen Workers

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## ABSTRACT

**Background:** The socioeconomic burden of musculoskeletal disorders (MSDs) is significant, and kitchen work is a high-risk occupation for MSDs due to the intensive manual workload and repetitive movements that are involved. However, there are very few studies on MSDs and rest breaks as a workplace intervention among kitchen workers. This study examined the relationship between insufficient rest breaks and increased MSD risk among Korean kitchen workers.

**Methods:** Sociodemographic and occupational factors of 1,909 kitchen workers were collected from the 3rd–4th Korean Working Conditions Survey data. Five items on rest breaks at work were categorized into two groups, “sufficient” and “insufficient.” The number of MSDs and work-related MSDs (WMSDs), an outcome variable, was obtained from the sum of MSDs/WMSDs in three anatomical sites (back, neck, and upper limb, lower limb). The association between rest breaks and MSDs was estimated using zero-inflated negative binomial analyses, with adjustments for age, education level, and weekly working hours, and the analyses were stratified by sex.

**Results:** After adjustment, significant associations were found between insufficient rest breaks and an increased risk of MSDs (odds ratio [OR] 1.68 95% confidence interval [CI] 1.11–2.54) and WMSDs (OR 1.40 95% CI 1.01–1.96) among female kitchen workers. Insufficient rest breaks were significantly associated with MSDs in female kitchen workers in all three anatomical sites.

**Conclusion:** This study emphasizes the need for rest breaks as a workplace intervention for preventing MSDs in kitchen workers. Further studies to reveal the causality of this relationship are required.

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## 1. Introduction

Musculoskeletal disorders (MSDs) are a prevalent health condition among manual workers. The large number of workers' compensation claims arising therefrom, together with the associated costs, has a negative impact on both society and the individuals concerned [1]. These disorders are also the most common cause of occupational diseases in industrialized countries [2]. MSDs are the most costly occupational disease in Europe [3], as well as in Korea, where work-related MSDs (WMSDs) account for 70% of all occupational diseases [4].

MSDs are more frequently reported in women [5] and have an age-dependent prevalence [6]. Several occupational risk factors are well known for MSDs, including repetitive movements, high

degrees of physical strain, and awkward postures [7]. Also, various occupational groups such as manual workers [8], hospital staff [9], office [10], and kitchen workers [11] are at high risk of MSDs.

Kitchen workers, including cooks, are susceptible to musculoskeletal complaints because their jobs involve heavy lifting and repetitive motions of the upper limbs, prolonged standing, and a leaning forward of the trunk [12,13]. In a review of MSDs linked to this occupation, the prevalence of musculoskeletal discomfort was reported to be up to 86% [1]. Furthermore, a prospective study of 52,261 Chinese restaurant cooks revealed a 1.29–1.35 times higher risk of MSDs compared to their matched references [14]. In addition, musculoskeletal complaints were reported as the most common health problems that led to cooks leaving their jobs [15].

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Despite the frequent complaints and significant burden of kitchen workers' MSDs, there are few studies on this issue and even fewer discussions on workplace interventions to reduce MSDs among this occupational group [16]. Additionally, the latest reviews of workplace interventions for reducing MSDs have yielded conflicting results, one with moderate evidence and one with limited evidence, based on clinical trials mainly among office workers [17,18]. Therefore, additional evidence is needed regarding MSDs and rest breaks in this occupational sector.

The purpose of this study was to estimate the association between MSDs in kitchen workers and workplace rest breaks using data nationally representative of Korean workers. MSDs from single sites are relatively rare, and they more often comorbid to two or more anatomical sites with greater severity [19,20]; therefore, this study focused on the increased number of MSDs in the back, neck and upper limb, and lower limb in relation to insufficient rest breaks.

## 2. Methods

### 2.1. Data source and study population

This was a cross-sectional study that used publicly accessible data from the Korean Working Conditions Survey (KWCS) by the Korean Occupational Safety and Health Agency. The 3rd data set from 2011 and 4th data set from 2014 were merged and analyzed. The data from the KWCS represented the working adult population involved in economic activities and included characteristics of working environments, demographic and socioeconomic characteristics, and health-related factors. Participants were interviewed using well-structured questionnaires, and samples were extracted from the census using a multistage random sampling technique.

Of a total of 100,039, after combining 50,032 participants of the 3rd KWCS and 50,007 participants of the 4th KWCS, 1,939 individuals whose occupational code in the Korean Standard Classification of Occupations was "441\*" (cooks) were chosen. They comprised cooks who specialized in different types of cuisines (e.g.

Korean, Chinese, and Western, Japanese) and food categories (e.g. sushi and beverages). Of these, 12 white-collar workers were excluded because their working conditions were slightly different from those of the other manual or service class workers. After excluding an additional 18 subjects with missing values in key variables, such as rest breaks (8) and MSDs (10), the final analysis consisted of 1,909 kitchen workers (Fig. 1).

### 2.2. Measurements

#### 2.2.1. Rest breaks

Respondents were asked whether they could take a break at work whenever they wanted to, and the five responses presented to the respondents were: "always," "most of the time," "sometimes," "rarely," and "never." The first three were grouped as sufficient rest breaks, and the latter two were classified as insufficient.

#### 2.2.2. Musculoskeletal disorders (MSDs) and work-related MSDs (WMSDs)

The MSDs and WMSDs in the three areas of the back, upper limbs, and neck, and lower limbs were self-reported. Individuals were asked whether they had experienced any of these problems in the prior 12 months, and if so, whether these were related to their work. The purpose of the first question was to identify the existence of MSDs, and the second was to determine the existence of WMSDs. Each of the MSDs/WMSDs in each of the three sites was summed to produce a total number of MSDs/WMSDs for each participant.

### 2.3. Covariates

Covariates in this study included age groups (20–29, 30–39, 40–49, 50–59, or 60 or above), sex (male or female), region (urban or rural), marital status (married or other), educational level (less than high school, high school, or more than high school), income level (less than 1.5 million Korean Won or 1.5 million Korean Won or more), and weekly working hours (40 or less, 41–52, 53–60, or more than 60).

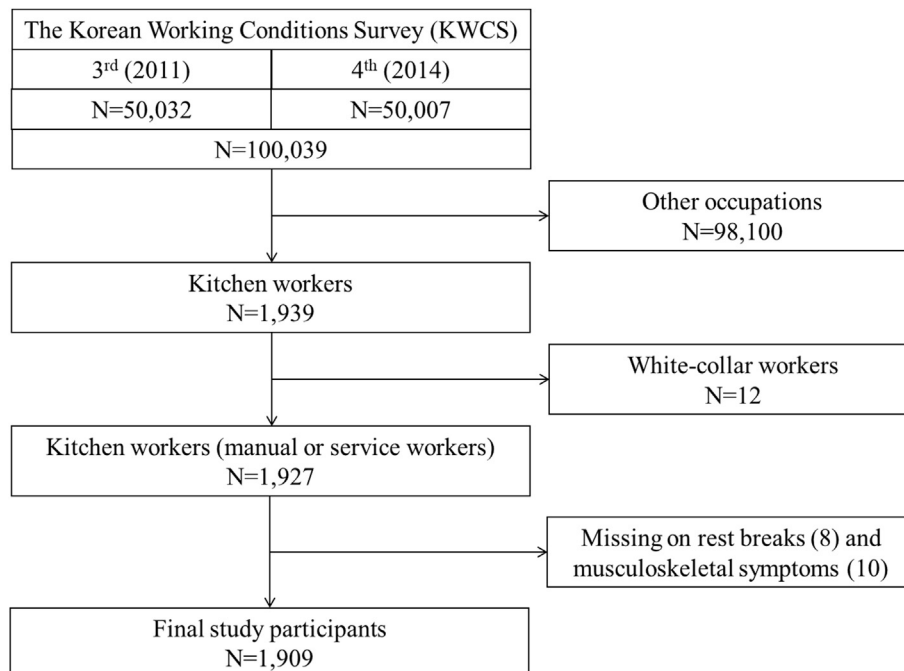


Fig. 1. Flowchart of study population from the 3rd and 4th KWCS data.

## 2.4. Statistical analysis

All analyses were performed using SAS 9.4 (SAS Institute Inc., Cary, North Carolina), and *P*-values <0.05 were considered statistically significant. Relationships between MSDs and rest breaks and other variables were examined by using Chi-square tests and multiple logistic regressions. Odds ratios (ORs) with 95% confidence intervals (CIs) for the increased number of MSDs/WMSDs in relation to insufficient rest breaks were generated from zero-inflated negative binomial (ZINB) regression analyses, which were stratified by sex and comprised covariates, such as age group, educational level, and weekly working hours.

## 3. Results

Table 1 depicts the sociodemographic characteristics and sex differences of the study population. Most kitchen workers were women (77.84%), and women as compared to men were likely to be in their 40s and older (83.11% vs. 38.77%), have relatively low educational (24.03% vs. 8.31%) and income levels (60.49% vs. 22.97%), and have shorter weekly working hours (40.38% vs. 20.33%) and insufficient rest breaks (49.6% vs. 38.06%). More than half of the participants had at least one MSD (57.57%) or WMSD (51.96%), and the average number of MSDs (1.23 vs. 0.80) and WMSDs (1.08 vs. 0.76) was higher in women than men.

Table 2 shows the relationship between the socioeconomic factors and rest breaks of kitchen workers. Insufficient rest breaks at work were significantly associated with females and income levels lower than 1.5 million Korean Won. Likewise, Supplementary Table S1 presents the relationship between the characteristics of the kitchen workers and the prevalence of MSDs, in which having more than one MSD was significantly associated with higher age, being female, a lower educational level, and higher working hours per week.

The relationship between the average number of MSDs/WMSDs and the sum of MSDs/WMSDs for each site and workplace rest breaks is shown in Table 2. Insufficient rest breaks significantly increased the average number of MSDs (1.22 vs. 1.06) and WMSDs (1.08 vs. 0.94). In addition, of the three sites, only the MSDs/WMSDs associated with the back were significantly associated with insufficient rest breaks.

Table 3 shows the association between MSDs/WMSDs and rest breaks from the adjusted ZINB regressions. The adjusted model, including age, educational level, and weekly working hours, indicated a significantly increased risk of MSDs (OR 1.68 95% CI 1.11–2.54) and WMSDs (OR 1.40 95% CI 1.01–1.96) associated with insufficient rest breaks only among women. Additionally, adjusted ORs for MSDs (WMSDs) in all three sites were significantly increased by insufficient rest breaks only among women. (Supplementary Table S2).

## 4. Discussion

This study found an association between MSDs and insufficient rest breaks only in female kitchen workers. The increased risk of MSDs/WMSDs in women was significantly associated with insufficient rest breaks, and the same results were shown in the relationships between insufficient rest breaks and their MSDs/WMSDs for each anatomical site.

In this study, the association was significant only in female kitchen workers, which was consistent with the results of previous studies whereby women reported a higher prevalence of MSDs [21], and women in the catering industry were found to have had more MSDs [1]. In addition to the fact that women are physiologically different from men, including their pain thresholds, muscle

**Table 1**  
General characteristics of study participants

Characteristics	N (%)	Sex	
		Men (%)	Women (%)
Total	1909 (100)	423 (22.16)	1486 (77.84)
Age			
20–29	245 (12.83)	110 (26)	135 (9.08)
30–39	265 (13.88)	149 (35.22)	116 (7.81)
40–49	577 (30.23)	97 (22.93)	480 (32.3)
50–59	635 (33.26)	59 (13.95)	576 (38.76)
60 or above	187 (9.8)	8 (1.89)	179 (12.05)
Region			
Urban	863 (45.21)	228 (53.9)	635 (42.73)
Rural	1046 (54.79)	195 (46.1)	851 (57.27)
Marital status			
Married	1337 (70.04)	292 (69.03)	1045 (70.32)
Other	572 (29.96)	131 (30.97)	441 (29.68)
Educational level			
Middle school or lower	389 (20.54)	35 (8.31)	354 (24.03)
High school	1157 (61.09)	236 (56.06)	921 (62.53)
College or higher	348 (18.37)	150 (35.63)	198 (13.44)
Income level			
≥1,500,000 Won	904 (47.81)	322 (77.03)	582 (39.51)
<1,500,000 Won	987 (52.19)	96 (22.97)	891 (60.49)
Weekly working hours			
≤40	686 (35.94)	86 (20.33)	600 (40.38)
41–52	408 (21.37)	97 (22.93)	311 (20.93)
53–60	456 (23.89)	119 (28.13)	337 (22.68)
>60	359 (18.81)	121 (28.61)	238 (16.02)
Rest breaks at work			
No	898 (47.04)	161 (38.06)	737 (49.6)
Yes	1011 (52.96)	262 (61.94)	749 (50.4)
Musculoskeletal symptoms			
No	810 (42.43)	229 (54.14)	581 (39.10)
Yes	1099 (57.57)	194 (45.86)	905 (60.90)
Work-related musculoskeletal symptoms			
No	917 (48.04)	239 (56.5)	678 (45.63)
Yes	992 (51.96)	184 (43.5)	808 (54.37)
Musculoskeletal symptoms			
Backache	457 (23.94)	55 (13.0)	402 (27.05)
Upper limb pain	971 (50.86)	174 (41.13)	797 (53.63)
Lower limb pain	738 (38.66)	110 (26.00)	628 (42.26)
Work-related musculoskeletal symptoms			
Backache	388 (20.32)	53 (12.53)	335 (22.54)
Upper limb pain	875 (45.84)	164 (38.77)	711 (47.85)
Lower limb pain	655 (34.31)	103 (24.35)	552 (37.15)
Average number of musculoskeletal symptoms*	1.13 ± 1.13	0.80 ± 1.00	1.23 ± 1.15
Average number of work-related musculoskeletal symptoms*	1.00 ± 1.11	0.76 ± 0.98	1.08 ± 1.13

\* Mean ± standard deviation.

mass, and strength, they also suffer more often from harmful working conditions and psychosocial factors [22,23]. This can lead to higher workloads for women than men in the performance of identical work tasks [24]. Meanwhile, MSDs have been associated with aging [25] and socioeconomic status such as income and education [26]. Therefore, the significant association of only women in this study can be explained by features such as higher age and low levels of income and education as compared to men.

There are several occupational factors that make kitchen workers more susceptible to MSDs, including posture (neck flexion, bending and leaning forward of the body), force (carrying heavy raw materials), repetition (preparing food and dishwashing), and

**Table 2**  
General characteristics of study participants by rest breaks at work

Characteristics	Rest breaks at work		p-value
	Yes [n (%)]	No [n (%)]	
Total	1011 (52.96)	898 (47.04)	
Age			0.4414
20–29	122 (12.07)	123 (13.7)	
30–39	153 (15.13)	112 (12.47)	
40–49	305 (30.17)	272 (30.29)	
50–59	330 (32.64)	305 (33.96)	
60 or above	101 (9.99)	86 (9.58)	
Sex			<.0001
Men	262 (25.91)	161 (17.93)	
Women	749 (74.09)	737 (82.07)	
Region			0.5165
Urban	450 (44.51)	413 (45.99)	
Rural	561 (55.49)	485 (54.01)	
Marital status			0.7586
Married	705 (69.73)	632 (70.38)	
Other	306 (30.27)	266 (29.62)	
Educational level			0.1031
Middle school or lower	190 (18.94)	199 (22.33)	
High school	616 (61.42)	541 (60.72)	
College or higher	197 (19.64)	151 (16.95)	
Income level			<.0001
≥1,500,000 Won	533 (53.25)	371 (41.69)	
<1,500,000 Won	468 (46.75)	519 (58.31)	
Weekly working hours			0.4029
≤40	324 (32.05)	362 (40.31)	
41–52	234 (23.15)	174 (19.38)	
53–60	259 (25.62)	197 (21.94)	
>60	194 (19.19)	165 (18.37)	
Musculoskeletal symptoms	559 (55.29)	540 (60.13)	0.0326
Backache	203 (20.08)	254 (28.29)	<.0001
Upper limb pain	494 (48.86)	477 (53.12)	0.0634
Lower limb pain	372 (36.8)	366 (40.76)	0.076
Work-related musculoskeletal symptoms	508 (50.25)	484 (53.9)	0.1111
Backache	174 (17.21)	214 (23.83)	0.0003
Upper limb pain	448 (44.31)	427 (47.55)	0.1565
Lower limb pain	329 (32.54)	326 (36.3)	0.0841
Average number of musculoskeletal symptoms*	1.06 ± 1.10	1.22 ± 1.16	0.0016
Average number of work-related musculoskeletal symptoms*	0.94 ± 1.07	1.08 ± 1.14	0.0075

\* Mean ± standard deviation.

duration (long working hours and insufficient breaks) [1]. Moreover, because most of the kitchen work is done while walking and standing, muscle fatigue can accumulate in one or more anatomical sites, leading to the development of MSDs in kitchen workers [27].

**Table 3**  
Odds ratio and 95% confidence interval for musculoskeletal symptoms according to rest breaks at work from the zero-inflated negative binomial regression analyses

Outcome	Crude		Adjusted <sup>a</sup>	
	Men	Women	Men	Women
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
<b>Musculoskeletal symptoms</b>				
Rest breaks at work				
Yes	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
No	0.89 (0.49–1.62)	1.43 (1.01–2.01)	0.95 (0.45–1.98)	1.68 (1.11–2.54)
<b>Work-related musculoskeletal symptoms</b>				
Rest breaks at work				
Yes	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
No	0.89 (0.50–1.58)	1.27 (0.94–1.72)	0.90 (0.45–1.80)	1.40 (1.01–1.96)

OR, odds ratio; CI, confidence interval.

\* Adjusted for age group, educational level, and weekly working hours.

In particular, the results of the comparison of ergonomic risk factors for MSDs between kitchen workers and other employees using the KWCS data showed that the proportions of exposure for a duration of more than half of the working time to four risk factors (“fatigue-inducing or painful posture”; 46.01% vs. 33.51%; “dragging, pushing, or moving heavy objects,” 24.50% vs. 20.82%; “standing posture,” 83.00% vs. 49.21%; “repetitive hand or arm movements,” 73.98% vs. 54.25%), were significantly higher in kitchen workers than in other employees (Supplementary Table S3).

On the other hand, rest breaks or pauses at work were believed to help recovery from fatigue and reduce the incidence of MSDs [28,29]. A recent review on MSDs and workplace interventions based on the results of randomized trials among office and agriculture workers found moderate evidence that supplementary rest breaks, as compared to conventional break schedules, were helpful in alleviating musculoskeletal symptoms on the neck, shoulder, back, and upper limbs [17]. The authors drew this conclusion by modifying the methodological aspects of previous reviews [30–32]. In line with the above findings, this study has emphasized the implementation of rest breaks during work as one of the workplace interventions that can reduce MSDs in kitchen workers, and further studies are needed to explore the causality of this relationship.

This study has several limitations. First, caution must be exercised when interpreting the results because of the nature of the cross-sectional design. However, because MSDs and rest breaks among kitchen workers have rarely been examined, it is meaningful to report their association. Second, the question regarding rest breaks had five responses, which could have caused confusion for participants compared to dichotomous or four-choice questions because it included the “sometimes” response. Also, detailed information on rest breaks, such as number, duration, and timing, was not included in this study. However, this definition of insufficient rest breaks has been associated with several health problems [33]. Third, as seen in Table 3, ORs were increased after adjustment, which might be due to bias of over-adjustment. However, as a result of a directed acyclic model to determine variables for adjustment, the adjusted model in this study is considered to be appropriate. Finally, MSDs as the outcome variables were measured using a self-reported question, which may have caused a recall bias. However, self-reported MSDs are considered a useful tool to estimate the burden of MSDs in health surveys because this method has shown substantial reliability and consistency with perceived pain [34].

In conclusion, using nationally representative data of Korean workers, this study found a significant association between insufficient rest breaks at work and MSD risk among kitchen workers, a high-risk occupation for MSDs. The risk of increased numbers of MSDs and WMSDs was significantly associated with insufficient

workplace rest breaks among female kitchen workers. The results of this study highlight the need for rest breaks at work for kitchen workers, and further studies are needed to understand the causality of this relationship.

### Authors' contributions

Study design: SP, JHL.

Analysis and interpretation of data: JL.

Drafting manuscript: SP.

Revision and final approval of manuscript: all authors.

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### Conflicts of interest

All authors have no conflicts of interest to declare.

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### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.shaw.2021.01.012>.

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