

Impacts of heavy smoking and alcohol consumption on workplace presenteeism

A cross-sectional study

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Abstract

Presenteeism refers to the practice of going to work despite poor health, resulting in subpar performance. This study aimed to explore the impacts of smoking and alcohol consumption on workplace presenteeism based on demographic, health-related, and employment variables.

The study adopted a cross sectional design with 60,051 wage workers from the database of the second and third Korean Working Conditions Surveys in 2010 and 2011, respectively. A total of 41,404 workers aged 19 years and older, who had worked for at least 1 hour in the previous week, answered the survey questions. Chi-square test as well as univariate and multiple logistic regression analyses were conducted using SPSS, version 18.0, to determine the impacts of smoking and alcohol consumption on workplace presenteeism.

Of the 41,404 Korean workers, 8512 (20.6%) had experienced presenteeism in the past 12 months. There were significant differences among gender, age, educational status, income, health problems, absenteeism, shift work, night shift, weekly working hours, exposure to secondhand smoke at work, and satisfaction with the workplace environment. Based on the results of multiple regression analysis, heavy smoking (adjusted odds ratio=1.38, 95% confidence intervals [1.11, 1.72]) and high-risk drinking (adjusted odds ratio=1.19, 95% confidence intervals [1.08, 1.31]) were significantly related to presenteeism among workers.

The results of our study confirmed that smoking and alcohol drinking were related to presenteeism even after controlling other variables (demographic, health-related, and employment variables) that affect presenteeism. Smoking and alcohol drinking are associated with and potentially influence presenteeism; in particular, heavy smoking and high-risk drinking contributed to presenteeism. Companies that encourage employees to receive treatments for reduction of smoking or alcohol consumption may benefit from greater productivity. Hence, we should consider the impact of smoking and alcohol consumption in the workplace and build appropriate strategies and programs to help reduce these behaviors.

Abbreviations: AOR = adjusted odds ratio, CI = confidence intervals, KWCS = Korean Working Conditions Surveys.

Keywords: alcohol consumption, occupational health, presenteeism, smoking, work performance, workplace

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1. Introduction

Nicotine and alcohol are among the most used substances in the world despite being harmful and addictive. However, in South Korea, substance use is a serious issue, as the country is rated at the top of the Organization for Economic Cooperation and Development member countries' list on smoking and alcohol consumption.^[1] According to the World Health Organization survey, South Korea's smoking rate among men has reached 43.1%, which is nearly twice the global average of 22.7%.^[2] Additionally, recent high-risk alcohol consumption rates were 20.8% for males and 8.4% for females,^[3] and the per capita annual alcohol consumption of 11.9L, almost twice the global average of 6.4L, is the highest among Western Pacific countries.^[4]

However, despite the harmful effects of smoking and alcohol consumption on health and various interventions, including educational and political approaches, their use is still prevalent.^[2,4] In particular, employees' smoking and alcohol consumption habits are considered important social and political issues, especially due to their impact on workers' physical and mental health.^[5-8] In Korea, alcohol consumption among employees includes heavy drinking at night before a work day and overall heavy alcohol use, such as binge drinking.^[8,9] They are susceptible to alcohol hangovers, which may lead to poor performance at work.^[10] Despite the amendment of the National Health Promotion Act which states that all public areas should be non-smoking areas,^[10,11] most workplaces have smoking zones, and many workers take smoke breaks during their working hours.

Smoking and alcohol consumption are not only significant factors affecting mental and physical health but also have socioeconomic costs. Workplaces that permit smoking make it more difficult for workers to quit and easier for them to become nicotine-dependent,^[12] adding the burden of poor health to company costs. Additionally, the poor health of workers affects their job performance,^[13] and health risks such as hypertension, diabetes, hyperlipidemia, poor nutrition, obesity, lack of exercise, and depression are related to productivity losses when employees continue to work while sick.^[14,15] Recent studies have investigated relationships between workers' health problems and presenteeism with regard to productivity. Presenteeism refers to workers' tendency to maintain attendance at work despite feeling sick or to work despite illness^[16]; it also includes the tendency to be present at work, albeit with some limitations in job performance due to health problems.^[17] It also refers to situations where workers may work with poor health conditions, including illness or stress, thereby suffering from reduced productivity or increased disease and injury risk.

Zakrzewska^[18] reported that presenteeism costs more than absenteeism and disability; thus, it is reasonable to link workers' health problems to presenteeism. However, most studies only link presenteeism to physical health problems, mental stress, and work environment stressors.^[14,19,20] Some have addressed links with health behaviors such as smoking, alcohol use, obesity, and physical activity.^[5,21,22]

Furthermore, the annual per-smoker cost of lost productivity because of unsanctioned smoke breaks ranges from \$3,077 to \$4,102; even if a smoker consumes only two cigarettes outside of sanctioned breaks per day, they spend 15 minutes per cigarette.^[5] One study reported that a current smoker's productivity loss is approximately 1.7-fold higher than that of a non-smoker.^[23] Others^[11,24] claim that the association between substance use and productivity is conditional, and other variables may

moderate the associations between smoking, alcohol use and presenteeism.

According to previous studies, workers' absenteeism and presenteeism can explain loss of productivity.^[25] Presenteeism accounts for 77% of total lost productivity in the workplace, while absenteeism is responsible only for 23% of that loss^[15]; yet, presenteeism has been overlooked as it is not as obvious as absenteeism.^[26] Previous studies regarded presenteeism primarily as a corporate issue; however, emerging discussions treat it as a social matter to be managed by clinicians and specialists.^[27] Smoking and alcohol consumption are major health determinants; accordingly, uncontrollable alcohol use and heavy smoking must be addressed by implementing preventive policies and workplace health management.

Prior researches investigated the associations between smoking, alcohol use and presenteeism with conflicting results,^[6,7,22] and deteriorating health conditions and depression were mentioned as major factors of presenteeism^[21]; however, the number of studies on factors directly related to workers' smoking and alcohol consumption on presenteeism is currently inadequate.

The aim of this study was therefore, to explore the impacts of smoking and alcohol consumption on workplace presenteeism based on demographic, health-related, and employment-related variables.

1.1. Conceptual framework

Many researchers have proposed models for the moderator-mediator variables associated with presenteeism.^[16,20,24,28] This study used a modified conceptual framework from previous research^[11] (Fig. 1). In brief, the framework posits that demographic variables (e.g., gender, age, education, and income), health-related variables (e.g., health problems: hearing problems, dermatologic problems, musculoskeletal pain, headache/asthenopia, abdominal pain, respiratory distress, cardiovascular disease, injury, depression/anxiety disorders, fatigue, or insomnia/sleep disorders), and employment variables (e.g., absenteeism, job type, employment type, shift work, night shifts, weekly working hours, exposure to secondhand smoke at work, or satisfaction of workplace environment) can affect smoking and alcohol consumption on presenteeism.

2. Methods

2.1. Design

This study used a cross-sectional survey research design to conduct a secondary analysis of the survey data screened from the second and third Korean Working Conditions Surveys (KWCS) databases. We investigated the effects of smoking and alcohol consumption on presenteeism among wage workers.

2.2. Setting and sample subjects

The study used the raw data from second and third KWCS, approved by the Korea Occupational Safety and Health Agency. The SPSS data files classified by year were merged by cases (Approval No. 38002).

Our study, as a secondary analysis of existing data, was exempted from the ethics approval of the Institutional Review Board of the University of Ulsan (IRB No.1040968-E-2019-005).

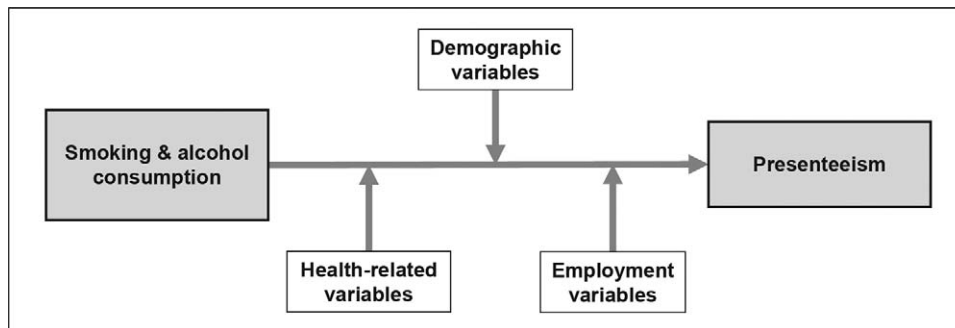


Figure 1. Conceptual framework of this study.

KWCS is a state-recognized statistical survey that has been conducted since 2006 to identify risk factors by working type and conditions—including mechanical, physical, and chemical hazards in the workplace—and psychosocial factors that influence working conditions. The KWCS was developed based on the methodology and survey questionnaire of the European Working Conditions Survey. The quality of the second KWCS was assured by high external validity, content validity and reliability.^[29] The population represented in the KWCS are economically active people, aged 15 years and older, residing in Korea. A two-step stratified cluster sampling method was used for the first and second sampling units. In contrast, sampling frameworks were stratified according to the criteria of city-province, neighborhood/township/town, and housing type (single houses/apartment homes). The informed consent from the participants were obtained.

The second and third KWCS enrolled 60,051 participants; from this group, we selected the 41,703 wage workers who were 19 years and older. After excluding surveys with insufficient or incomplete data, 41,404 completed surveys of workers were included in the present analysis.

2.3. Instruments

2.3.1. Presenteeism. Presenteeism is generally defined as going to work despite any health problems, and it is considered to cause productivity loss.^[27] In this study, presenteeism was assessed using the following question: “Have you ever come to work while sick in the past 12 months?” “Yes” responses to the question were considered to indicate presenteeism in this study.

2.3.2. Smoking and alcohol consumption. Smoking was assessed with the following two questions: “Have you ever smoked in your lifetime?” and “Are you currently smoking?” The possible responses to the first question were “smoked” and “never smoked.” The possible responses to the second question were “smoking daily,” “smoking intermittently,” and “not smoking.” If the participants’ answer to the first question was “never smoked,” they were considered to be non-smokers. If the participants’ response to the first question was “smoked,” but their response to the second question was that they do not currently smoke, they were considered to be ex-smokers. If the participants’ answered the second question saying that they currently smoked intermittently or 1 to 10 cigarettes per day, they were considered to be light smokers; if they answered saying that they currently smoked 11 to 20 cigarettes per day, they were considered to be moderate smokers. Whereas, if the participants

answered the second question saying that they currently smoked more than 21 cigarettes per day, they were considered to be heavy smokers, based on the existing literature^[30] (Supplement Digital Content Figure 1, <http://links.lww.com/MD2/A664>).

In the KWCS used in this study, the standard amount of alcohol for each type of alcoholic beverage was not mentioned, and the cup size used differed depending on the type of alcohol. Alcohol consumption was assessed with the following two questions: “How often do you drink alcohol?” and “How many glasses do you usually consume when you drink?” The possible responses to the first question were: “more than 4 times per week;” “2–3 times per week;” “2–4 times per month;” “once a month;” and “never drank.” The possible responses to the second question were: (1) 1 to 2 glasses of soju (Korean Liquor), 1 to 1.5 cans of beer, or 1 to 2 glasses of foreign liquor; (2) 3 to 4 glasses of soju, 1.5 to 3 cans of beer, or 3 to 4 glasses of foreign liquor; (3) 5 to 6 glasses of soju, 3 to 4.5 cans of beer, or 5 to 6 glasses of foreign liquor; (4) 7 to 9 glasses of soju, 4.5 to 6 cans of beer, or 7 to 9 glasses of foreign liquor; (5) 10 or more glasses of soju, 7 or more cans of beer, or 10 or more glasses of foreign liquor. If the participants answered the first question with “never drank,” they were considered to be non-drinkers. If the participants answered the first question with “once per month” or “2 to 4 times per month,” and to the second question with seven or less glasses of soju (Korean Liquor) per occasion for males and five or less glasses per occasion for females, they were considered to be moderate drinkers. If the participants answered that they drank two or more times per week, and that they drank seven or more glasses of soju (Korean Liquor) per occasion for males and five or more glasses for females, then they were considered to be high-risk drinkers (Supplement Digital Content Figure 2, <http://links.lww.com/MD2/A665>).

2.3.3. Demographic variables. Gender, age, educational status, and income were included. Age was classified into five categories: 19 to 29, 30s, 40s, 50s, and 60s and above. Educational status was classified into three categories: middle school graduates or lower, high school graduates, and college graduates or higher. Income was classified into three categories: under 1 million Korean won, between 1 and 3 million Korean won, and over 3 million won.

2.3.4. Health-related variables. To assess the health problems, we included those participants who answered “yes” to the question “Have you ever had health problems over the past 12 months, such as a hearing problem, a dermatologic problem,

musculoskeletal pain (back pain, shoulder/neck/arm muscular pain, or lower extremities muscular pain), headache/asthenopia, abdominal pain, respiratory distress, cardiovascular disease, injury, depression/anxiety disorders, fatigue, or insomnia/sleep disorders?”

2.3.5. Employment variables. Employment characteristics included absenteeism, job type, employment type, shift work, night shift, weekly working hours, exposure to secondhand smoke at work, and satisfaction with the workplace environment. Absenteeism was assessed with the following questions: “How many days have you been absent from work due to health problems in the last 12 months?” If the participants answered “none,” we classified it as “no.” If the participants answered “more than 1 day,” we classified it as “yes.” Job type was reclassified into three categories: blue collar (skilled and semi-skilled, elementary workers, agricultural, forestry, and fishery workers), sales and services, and clerks (professionals, managers, and clerks). Employment type was classified into two categories: permanent and temporary. In this study, a temporary worker was defined as one who was under a contract of employment for less than 12 months. Shift work was assessed with the following question: “Do you work in shifts?” The possible responses were “yes” and “no.” Night shift was assessed with the following question: “If working for at least 2 hours between 10 p.m. and 5 a.m. is called a night shift, how many days per month do you work at night?” The answers were classified into two categories: “yes” (indicating more than one day per month) and “no.” Working hours were assessed with the following question: “How many hours do you usually work per week in your main paid job?” The answers were classified into three categories: “less than 40 hours;” “more than 41 and less than 52 hours;” and “52 hours or more,” following the Korean Labor Standards Act that limits extended work hours longer than 52 hours a week.^[31] Exposure to secondhand smoke at work was assessed with the following question: “How long are you exposed to smoke at work?” The answers were classified into two categories: “yes” (for 1/4 or more of their working time) and “no.” Satisfaction with working environment was assessed with the following question: “Overall, what do you think of the working environment for your main job?” The answers were classified into two categories: “yes” (very satisfied and satisfied) and “no” (not satisfied and never satisfied).

2.4. Data analysis

Survey data obtained in this study were analyzed using SPSS 18.0. First, we analyzed the descriptive statistics for the variables such as unweighted frequencies, weighted proportions, weighted means, and weighted standard deviations. Chi-square tests were used to determine differences in presenteeism according to the subjects’ demographic, health-related, and employment characteristics. Moreover, univariate and multiple logistic regression analyses were used to evaluate the associations among smoking, drinking, and presenteeism. The odds ratio, adjusted odds ratio (AOR), and 95% confidence intervals (CI) were calculated, and the level of statistical significance was set at $P < .05$. The Hosmer-Lemeshow goodness-of-fit statistic was used to assess whether the necessary assumptions for applying multiple logistic regression were satisfied. The model was screened for multicollinearity according to the calculation of variance inflation factors, which revealed no problems.

3. Results

3.1. Smoking, alcohol consumption, presenteeism, demographic, health-related, and employment characteristics of the subjects

Approximately 20% of the participants had said they had experienced presenteeism in the past 12 months. Approximately half of the participants were non-smokers, followed by moderate (17.1%), and light smokers (15.4%). Overall, 63.3% were classified as moderate drinkers, while 12.4% were high-risk drinkers.

About 58.8% of the participants’ were male and average age of the participants was 40.7(±12.0) years. Of the participants, 51.5% reported their highest education as college graduate or higher, and 66.5% of the participants answered that they earned between 1 and 3 million Korean won. Moreover, for most participants, household income was less than 3 million Korean won per month.

The majority of the participants answered that they had no hearing, dermatologic problems, abdominal pain, respiratory distress, cardiovascular disease, injury, depression, insomnia and other sleep disorders. However, 37.4% had musculoskeletal pain and about one-fifth of participants reported fatigue, headache, and asthenopia.

Of the participants, 9.3% reported they had experienced absenteeism in the past 12 months. Job types of the participants were evenly contributed. Most participants were permanently employed (79.2%), not in shift work (90.0%) or night shift (86.6%), and exposed to secondhand smoke at work (89.4%). Of the participants, 63% worked 40 to 51 hours per week. About 73.0% were satisfied with their workplace environment (Table 1).

3.2. Presenteeism by smoking, alcohol consumption, demographic, health-related, and employment variables

Presenteeism by demographic, health-related, and employment variables are provided in Table 2. Presenteeism was significantly different for smoking and alcohol consumption. Presenteeism was significantly different for all the demographic and health-related variables. Among employment variables, job type and employment type were not significantly different, while the rest of the variables were significantly different (Table 2).

3.3. Results from a univariate or multiple logistic regression analysis

The univariate logistic regression analysis is provided in Table 3. Heavy smokers were more likely to experience presenteeism than non-smokers (OR = 1.36, 95% CI 1.12–1.65). Workers classified as high-risk drinkers were more likely to have an experience of presenteeism (OR = 1.20, 95% CI 1.10–1.32).

The results of the multivariate logistic regression analysis are also shown in Table 3. Heavy smokers were more likely to experience presenteeism than non-smokers (aOR = 1.38, 95% CI 1.11–1.72). Workers classified as high-risk drinkers were more likely to have an experience of presenteeism (aOR = 1.19, 95% CI 1.08–1.31). The demographic variables that increased the likelihood of presenteeism were: being female (aOR = 1.54, 95% CI 1.42–1.66); being in one’s 30s, 40s, and 50s (aOR = 1.29, 95% CI 1.18–1.42; aOR = 1.30, 95% CI 1.18–1.43;

Table 1
Smoking, alcohol consumption, presenteeism, demographic, health-related, and employment characteristics of the subjects (N=41,404).

| Characteristics | Classification | n (%) |
|---------------------------------------|-------------------|---------------|
| Presenteeism | No | 32,892 (79.4) |
| | Yes | 8512 (20.6) |
| Smoking | Non-smoker | 22,796 (55.1) |
| | Ex-smoker | 4352 (10.5) |
| | Light smoker | 6372 (15.4) |
| | Moderate smoker | 7112 (17.1) |
| | Heavy smoker | 773 (1.9) |
| Alcohol Consumption | Non-drinker | 9932 (24.0) |
| | Moderate drinker | 26,349 (63.6) |
| | High-risk drinker | 5124 (12.4) |
| Demographic variable | | |
| | Gender | |
| Age (yr) (M ± SD: 40.7 ± 12.0) | Male | 24,340 (58.8) |
| | Female | 17,064 (41.2) |
| | 19–29 | 8,583 (20.7) |
| | 30–39 | 11,816 (28.5) |
| | 40–49 | 11,092 (26.8) |
| | 50–59 | 7037 (17.0) |
| Educational status | ≥ 60 | 2877 (7.0) |
| | ≤ Middle school | 4536 (11.0) |
| | ≤ High school | 15,528 (37.5) |
| | ≥ College | 21,340 (51.5) |
| Income (KRW10,000*) | <100 | 5514 (13.4) |
| | 100–299 | 27,554 (66.5) |
| | ≥300 | 8336 (20.1) |
| Health-related variable | | |
| | Hearing problem | |
| Dermatologic problem | Does not have | 40,643 (98.2) |
| | Has | 762 (1.8) |
| Musculoskeletal pain | Does not have | 40,383 (97.5) |
| | Has | 1021 (2.5) |
| Headache/Asthenopia | Does not have | 25,839 (62.4) |
| | Has | 15,565 (37.6) |
| Abdominal pain | Does not have | 33,946 (82.0) |
| | Has | 7459 (18.0) |
| Respiratory distress | Does not have | 40,815 (98.6) |
| | Has | 589 (1.4) |
| Cardiovascular disease | Does not have | 41,115 (99.3) |
| | Has | 290 (0.7) |
| Injury | Does not have | 40,934 (98.9) |
| | Has | 470 (1.1) |
| Depression/Anxiety disorder | Does not have | 40,563 (98.0) |
| | Has | 841 (2.0) |
| Fatigue | Does not have | 40,802 (98.5) |
| | Has | 603 (1.5) |
| Insomnia/Sleep disorder | Does not have | 32,112 (77.6) |
| | Has | 9292 (22.4) |
| Employment variable | Does not have | 40,339 (97.4) |
| | Has | 1065 (2.6) |
| Absenteeism | Does not have | 1065 (2.6) |
| | Has | 37,559 (90.7) |
| Job type | No | 3846 (9.3) |
| | Yes | 14,512 (35.0) |
| | Blue collar | 11,183 (27.1) |
| | Sales & services | 15,709 (37.9) |
| Employment type | Clerks | 15,709 (37.9) |
| | Temporary | 8619 (20.8) |
| Shift work | Permanent | 32,785 (79.2) |
| | No | 37,285 (90.0) |
| Night shift | Yes | 4120 (10.0) |
| | No | 35,858 (86.6) |
| Weekly working hours | Yes | 5546 (13.4) |
| | No | 4305 (10.4) |
| | <40 | 26,069 (63.0) |
| Exposure to secondhand smoke at work | 40–51 | 11,031 (26.6) |
| | ≥52 | 37,019 (89.4) |
| | No | 4385 (10.6) |
| Satisfaction of workplace environment | Yes | 30,090 (72.7) |
| | Not satisfied | 11,315 (27.3) |

* KRW 10,000=USD 8.20=EUR 7.56 (2020.4.9 exchange rate).

aOR=1.20, 95% CI 1.08–1.34, respectively); having graduated from high school (aOR=1.17, 95% CI 1.02–1.32); and earning 3 million Korean won and higher (aOR=1.23, 95% CI 1.08–1.41). For most health-related variables, the workers with health problems were more likely to have an experience of presenteeism. The employment variables that increased the likelihood of presenteeism were: experiencing absenteeism (aOR=4.90, 95% CI 4.52–5.31); working in sales and service departments (aOR=1.39, 95% CI 1.27–1.52); working night shifts (aOR=1.41, 95% CI 1.29–1.55); working longer hours (aOR=1.44, 95% CI 1.27–1.63); and being unsatisfied with the workplace environment (aOR=1.09, 95% CI 1.00–1.20; Table 3).

4. Discussion

The aim of the present study was to explore the impacts of smoking and alcohol consumption on workplace presenteeism on a sample of Korean employees by utilizing the database of the second and third KWCS. The following main findings will be discussed: (a) overall, approximately one out of five employees reported presenteeism; (b) differences in presenteeism according to demographic, health-related, and employment variables, including smoking and alcohol consumption; and, (c) heavy smoking and high-risk drinking were found to be associated with presenteeism.

In the present study, 20.6% of workers reported presenteeism. It is difficult to generalize and compare the results because the concept of presenteeism and its measurement tools are not unified. However, according to the previous study^[32] of 26 the Organization for Economic Cooperation and Development countries based on the European Working Conditions Survey and KWCS, for presenteeism, Denmark (63.0%) had the highest incidences of presenteeism, followed by Luxembourg (62.2%), and the United Kingdom (61.2%), whereas the lowest incidences were observed in Portugal (19.7%), followed by South Korea (23.5%) and Switzerland (26.6%). Nonetheless, it is assumed that the cultural characteristics of Korea, such as being oriented towards high achievement and emphasizing social structure among the members of the organization, influence presenteeism.

In this study, the variables that influenced the presenteeism could be largely categorized into three sub-factors. Demographic variables related to presenteeism were being female, being in one's 30s, 40s, or 50s, graduating high school, and earning more than 3 million Korean won. Similar results were found in previous studies that reported the association between presenteeism in women with endometriosis symptoms or in pregnancy.^[33,34] It is worth noting here that women are considered more vulnerable to harsh physical conditions and situations because the experience of childbirth and childrearing at home, after they return home from work, may be exhausting. To enhance female workers' productivity as well as their health, socio-cultural factors such as childrearing environments should be considered. In previous studies that investigated presenteeism of workers in the United States, presenteeism was associated with a certain age group: higher in those aged between 30s and 40s; and lower in those aged over 60.^[35] Workers in their 30s to 40s are more likely to have greater workloads and responsibilities, and they might feel more pressure to go to work, rather than be absent. Among health-related variables, presenteeism was associated with specific health problems: dermatological problems, musculoskeletal pain, headache/asthenopia, abdominal pain, cardio-

Table 2**The relationship between smoking, alcohol consumption, demographic, health-related, employment characteristics, and presenteeism (N = 41,404).**

| Characteristics | Classification | Presenteeism | | χ^2 (P) |
|---|----------------------|--------------|---------------|----------------------|
| | | Yes n (%) | No n (%) | |
| Smoking | Non-smoker | 4,709 (20.7) | 18,087 (79.3) | 37.36 ($<.001$) |
| | Ex-smoker | 939 (21.6) | 3413 (78.4) | |
| | Light smoker | 1,270 (19.9) | 5102 (80.1) | |
| | Moderate smoker | 1,377 (19.4) | 5734 (80.6) | |
| | Heavy smoker | 217 (28.1) | 556 (71.9) | |
| Alcohol Consumption | Non-drinker | 1,892 (19.1) | 8039 (80.9) | 21.09 ($<.001$) |
| | Moderate drinker | 5,497 (20.9) | 20,852 (79.1) | |
| | High-risk drinker | 1,123 (21.9) | 4001 (78.1) | |
| Demographic variable | | | | |
| Gender | Male | 4,607 (18.9) | 19,733 (81.1) | 95.92 |
| | Female | 3,905 (22.9) | 13,159 (77.1) | ($<.001$) |
| Age (yr) (M \pm SD: 40.73 \pm 12.01) | 19–29 | 1,440 (16.8) | 7142 (83.2) | 107.55 |
| | 30–39 | 2,471 (20.9) | 9345 (79.1) | ($<.001$) |
| | 40–49 | 2,417 (21.8) | 8675 (78.2) | |
| | 50–59 | 1,602 (22.8) | 5434 (77.2) | |
| | ≥ 60 | 581 (20.2) | 2296 (79.8) | |
| Educational status | \leq Middle school | 1,112 (24.5) | 3423 (75.5) | 50.48 |
| | \leq High school | 3,164 (20.4) | 12,364 (79.6) | ($<.001$) |
| | \geq College | 4,236 (19.8) | 17,105 (80.2) | |
| Income (KRW10,000*) | < 100 | 1,000 (18.1) | 4515 (81.9) | 23.23 |
| | 100–299 | 5,785 (21.0) | 21,769 (79.0) | ($<.001$) |
| | ≥ 300 | 1,727 (20.7) | 6609 (79.3) | |
| Health-related variable | | | | |
| Hearing problem | Does not have | 8,227 (20.2) | 32,416 (79.8) | 134.86 |
| | Has | 285 (37.4) | 477 (62.6) | ($<.001$) |
| Dermatologic problem | Does not have | 8,083 (20.0) | 32,301 (80.0) | 297.79 |
| | Has | 430 (42.1) | 591 (57.9) | ($<.001$) |
| Musculoskeletal pain | Does not have | 3,695 (14.3) | 22,144 (85.7) | 1648.34 |
| | Has | 4,817 (30.9) | 10,748 (69.1) | ($<.001$) |
| Headache/Asthenopia | Does not have | 6,022 (17.7) | 27,924 (82.3) | 916.23 |
| | Has | 2,490 (33.4) | 4,969 (66.6) | ($<.001$) |
| Abdominal pain | Does not have | 8,239 (20.2) | 32,576 (79.8) | 243.36 |
| | Has | 273 (46.3) | 316 (53.7) | ($<.001$) |
| Respiratory distress | Does not have | 8,376 (20.4) | 32,739 (79.6) | 125.14 |
| | Has | 136 (47.1) | 153 (52.9) | ($<.001$) |
| Cardiovascular disease | Does not have | 8,295 (20.3) | 32,639 (79.7) | 193.02 |
| | Has | 218 (46.3) | 253 (53.7) | ($<.001$) |
| Injury | Does not have | 8,162 (20.1) | 32,401 (79.9) | 233.10 |
| | Has | 350 (41.6) | 491 (58.4) | ($<.001$) |
| Depression/Anxiety disorder | Does not have | 8,218 (20.1) | 32,584 (79.9) | 299.12 |
| | Has | 294 (48.8) | 308 (51.2) | ($<.001$) |
| Fatigue | Does not have | 5,427 (16.9) | 26,686 (83.1) | 1173.60 |
| | Has | 3,086 (33.2) | 6207 (66.8) | ($<.001$) |
| Insomnia/Sleep disorder | Does not have | 8,017 (19.9) | 32,322 (80.1) | 449.69 |
| | Has | 495 (46.5) | 570 (53.5) | ($<.001$) |
| Employment variable | | | | |
| Absenteeism | No | 6,390 (17.0) | 31,169 (83.0) | 3114.83 |
| | Yes | 2,123 (55.2) | 1723 (44.8) | ($<.001$) |
| Job type | Blue collar | 2,992 (20.6) | 11,520 (79.4) | 3.04 |
| | Sales & services | 2,239 (20.0) | 8944 (80.0) | (.219) |
| | Clerks | 3,281 (20.9) | 12,428 (79.1) | |
| Employment type | Temporary | 1,753 (20.3) | 6866 (79.7) | 0.32 |
| | Permanent | 6,759 (20.6) | 26,026 (79.4) | (.571) |
| Shift work | No | 7,549 (20.2) | 29,736 (79.8) | 22.21 |
| | Yes | 963 (23.4) | 3157 (79.6) | ($<.001$) |
| Night shift | No | 6,933 (19.3) | 28,925 (80.7) | 245.49 |
| | Yes | 1,579 (28.5) | 3967 (71.5) | ($<.001$) |
| Weekly working hours | < 40 | 676 (15.7) | 3629 (84.3) | 216.02 |
| | 40–51 | 5,076 (19.5) | 20,993 (80.5) | ($<.001$) |
| | ≥ 52 | 2,761 (25.0) | 8270 (75.0) | |
| Exposure to secondhand smoke at work | No | 7,373 (19.9) | 29,646 (80.1) | 87.95 |
| | Yes | 1,139 (26.0) | 3247 (74.0) | ($<.001$) |
| Satisfaction of workplace environment | Satisfied | 5,228 (17.4) | 24,862 (82.6) | 683.47 |
| | Not satisfied | 3,284 (29.0) | 8030 (71.0) | ($<.001$) |

* KRW 10,000 = USD 8.20 = EUR 7.56 (2020.4.9 exchange rate).

n, %: weighted.

Table 3**Results from a univariate or multiple logistic regression analysis.**

| Characteristics | Classification | Presenteeism | |
|---------------------------------------|-------------------|---------------------------------|---------------------------------|
| | | OR (95%CI) | AOR (95%CI) |
| Smoking | Non-smoker | 1 | 1 |
| | Ex-smoker | 1.04 (0.96–1.14) | 1.27 (1.15–1.41) ^{***} |
| | Light smoker | 1.03 (0.95–1.11) | 1.21 (1.10–1.32) ^{***} |
| | Moderate smoker | 0.94 (0.87–1.01) | 1.13 (1.03–1.24) [*] |
| | Heavy smoker | 1.36 (1.12–1.65) ^{**} | 1.38 (1.11–1.72) ^{**} |
| Alcohol Consumption | Non-drinker | 1 | 1 |
| | Moderate drinker | 1.14 (1.07–1.21) ^{***} | 1.11 (1.04–1.19) ^{**} |
| | High-risk drinker | 1.20 (1.10–1.32) ^{***} | 1.19 (1.08–1.31) ^{**} |
| Demographic variable | | | |
| Gender | Male | 1 | 1 |
| | Female | 1.26 (1.20–1.33) ^{***} | 1.54 (1.42–1.66) ^{***} |
| Age (yr) (M±SD: 40.73±12.01) | 19–29 | 1 | 1 |
| | 30–39 | 1.37 (1.26–1.49) ^{***} | 1.29 (1.18–1.42) ^{***} |
| | 40–49 | 1.43 (1.32–1.56) ^{***} | 1.30 (1.18–1.43) ^{***} |
| | 50–59 | 1.41 (1.28–1.55) ^{***} | 1.20 (1.08–1.34) ^{***} |
| | ≥ 60 | 1.15 (1.02–1.30) [*] | 1.05 (0.90–1.22) |
| Educational status | ≤Middle school | 1 | 1 |
| | ≤High school | 1.20 (1.10–1.30) ^{***} | 1.17 (1.03–1.32) [*] |
| | ≥College | 1.04 (0.98–1.09) | 0.97 (0.90–1.04) |
| Income (KRW10,000 [*]) | <100 | 1 | 1 |
| | 100–299 | 1.23 (1.14–1.33) ^{***} | 1.09 (0.98–1.21) |
| | ≥300 | 1.22 (1.11–1.34) ^{***} | 1.23 (1.08–1.41) ^{**} |
| Health-related variable | | | |
| Hearing problem | Does not have | 1 | 1 |
| | Has | 2.04 (1.74–2.41) ^{***} | 1.06 (0.87–1.28) |
| Dermatologic problem | Does not have | 1 | 1 |
| | Has | 2.71 (2.35–3.12) ^{***} | 1.28 (1.08–1.51) ^{**} |
| Musculoskeletal pain | Does not have | 1 | 1 |
| | Has | 2.52 (2.39–2.65) ^{***} | 1.75 (1.65–1.87) ^{***} |
| Headache/Asthenopia | Does not have | 1 | 1 |
| | Has | 2.24 (2.10–2.38) ^{***} | 1.23 (1.15–1.33) ^{***} |
| Abdominal pain | Does not have | 1 | 1 |
| | Has | 3.32 (2.80–3.94) ^{***} | 1.25 (1.03–1.52) [*] |
| Respiratory distress | Does not have | 1 | 1 |
| | Has | 3.02 (2.34–3.90) ^{***} | 1.07 (0.79–1.44) |
| Cardiovascular disease | Does not have | 1 | 1 |
| | Has | 2.88 (2.35–3.53) ^{***} | 1.55 (1.23–1.96) ^{***} |
| Injury | Does not have | 1 | 1 |
| | Has | 2.12 (1.82–2.46) ^{***} | 0.97 (0.81–1.15) |
| Depression/Anxiety disorder | Does not have | 1 | 1 |
| | Has | 3.60 (3.01–4.32) ^{***} | 1.47 (1.19–1.81) ^{***} |
| Fatigue | Does not have | 1 | 1 |
| | Has | 2.32 (2.19–2.45) ^{***} | 1.56 (1.47–1.67) ^{***} |
| Insomnia/Sleep disorder | Does not have | 1 | 1 |
| | Has | 3.29 (2.86–3.78) ^{***} | 1.42 (1.20–1.67) ^{***} |
| Employment variable | | | |
| Absenteeism | No | 1 | 1 |
| | Yes | 6.14 (5.69–6.62) ^{***} | 4.90 (4.52–5.31) ^{***} |
| Job type | Blue collar | 1 | 1 |
| | Sales & services | 0.98 (0.92–1.04) | 1.39 (1.27–1.52) ^{***} |
| | Clerks | 0.96 (0.90–1.02) | 1.10 (1.01–1.19) [*] |
| Employment type | Temporary | 1 | 1 |
| | Permanent | 1.09 (1.02–1.16) [*] | 1.05 (0.97–1.13) |
| Shift work | No | 1 | 1 |
| | Yes | 1.20 (1.11–1.31) ^{***} | 1.07 (0.96–1.19) |
| Night shift | No | 1 | 1 |
| | Yes | 1.63 (1.52–1.76) ^{***} | 1.41 (1.29–1.55) ^{***} |
| Weekly working hours | <40 | 1 | 1 |
| | 40–51 | 1.30 (1.18–1.43) ^{***} | 1.21 (1.08–1.37) ^{**} |
| | ≥52 | 1.81 (1.64–2.00) ^{***} | 1.44 (1.27–1.63) ^{***} |
| Exposure to secondhand smoke at work | No | 1 | 1 |
| | Yes | 1.37 (1.27–1.48) ^{***} | 1.50 (1.41–1.60) ^{***} |
| Satisfaction of workplace environment | Satisfied | 1 | 1 |
| | Not satisfied | 1.89 (1.78–1.99) ^{***} | 1.09 (1.00–1.20) [*] |

* <.05.

** <.01.

*** <.001.

AOR=adjusted odds ratio, CI=confidence interval.

vascular disease, depression/anxiety disorders, fatigue, and insomnia/sleep disorders. More specifically, musculoskeletal pain was found to be associated with presenteeism in this study, which could be consistent with the findings of previous studies.^[15,36,37] In addition, health problems were associated with sickness presenteeism, in the future as well as in the present.^[25] Therefore, it should be appropriately managed. For employment variables, workers were 4.9 times more likely to engage in presenteeism when they are absent from work. This finding is consistent with other studies that indicate that presenteeism and absenteeism in the workplace are associated.^[28] Working night shifts, working longer hours, and exposure to smoke at work were also found to be associated with presenteeism. Previous studies also found that those with greater responsibility at work were more likely to experience more frequent presenteeism.^[16] Compared to employees working in the sales and service departments, it might not be easy for workers who are engaged in manual labor to be replaced with substitute employees when they are absent from their duties. In this context, according to previous studies, work environment factors and presenteeism at work were directly or indirectly related.^[16,20]

More specifically, the present study found that heavy smoking and high-risk alcohol drinking were related to presenteeism. Many employees had health issues that significantly affected presenteeism,^[19,21] including psychological distress and mental health problems^[14,19,21]; in recent studies, smoking^[5,19,23] and alcohol consumption problems^[6,7,19] were considered factors related to presenteeism. Though all employees can occasionally be unproductive, research suggests that smoking alone negatively impacts productivity due to loss of work time smoke breaks.^[5] It can be assumed that presenteeism might occur when employees take more frequent smoking breaks and face decreased concentration due to craving and withdrawal symptoms related to smoking even if they are at work. High-risk drinking and alcohol dependency are not equivalent dimensions of alcohol use, and most heavy drinkers are not dependent or addicted. However, in recent studies, binge drinking was associated with presenteeism,^[38] and higher levels of alcohol consumption were associated with higher levels of impaired work performance (i.e., presenteeism).^[6] In this study, we defined high-risk alcohol drinkers as binge and heavy drinkers. Although the present study did not measure total exposure time and quantity, it assessed the frequency of use in terms of non-drinker, moderate drinker, and high-risk drinker.

However, the relationship between smoking and alcohol consumption on presenteeism shows conflicting results in different studies^[6,7,11,22]; nevertheless, these differences depend on the demographic characteristics of the study subjects, the methods assessing smoking and alcohol drinking behaviors, and the measuring instrument. In this context, Boles et al^[22] failed to show that smoking and alcohol use were related to presenteeism, as there were differences in the demographics and the assessing of smoking and alcohol consumption: female (72.3%), under 35 years (72.6%); the quantity in terms of smoking and alcohol was not assessed.

Smoking and alcohol consumption are not equivalent dimensions with regard to the measurement of dependency, addiction, and negative effects on work performance; however, research has found that job stress increases workers' alcohol consumption,^[38] and heavy alcohol use is associated with reduced productivity.^[6] Similar to results of previous studies,^[6,7,38] the present study found associations between heavy

smoking and alcohol drinking with presenteeism, even after adjusting for physical illnesses, which implies high costs to employers. Research suggests that high costs are incurred due to smokers' absenteeism, presenteeism, smoke breaks, healthcare costs, and pension benefits,^[5] and heavy drinking increases absenteeism and leads to declines in productivity, which can be more harmful to the company than absenteeism.^[39] However, in this study, we did not analyze the relationship between heavy smoking and high-risk alcohol drinking and absenteeism; we found instead that absenteeism related to presenteeism.

In Korea, changes are needed to improve the health of workers who smoke and consume alcohol. Our society should pay more attention to anti-smoking intervention programs; based on our study, it would be wise to target heavy smokers in the workplace. Smoke-free workplace programs encourage smokers to quit and improve their overall health and productivity.^[39] A recent study showed that when heavy smokers were part of a smoking cessation program, their success rates of quitting were higher than non-heavy smokers.^[40] There is little information on whether changes in the work structure can reduce the harmful effects of alcohol in the workplace^[41]; however, mandatory screening programs are effective for industries such as transportation. Furthermore, investments in social welfare policies outside the workplace can decrease alcohol-related absences and increase productivity.^[38] Considering the favorable atmosphere for smoking and alcohol consumption in Korea, it is important to examine the effects of alcohol consumption and smoking on presenteeism.

Though our study yielded important results, it had some limitations. First, this cross-sectional study could only confirm the associations between factors; in other words, it could not prove that smoking and drinking are direct causes of presenteeism. Second, errors regarding the assessment of health problems may have occurred from using participants' responses instead of doctors' diagnoses. Third, substance use and employee productivity are multidimensional constructs and the associations between smoking and alcohol consumption may be conditional; the present study did not explore moderators of these associations, which is an area for future research. Additionally, residual confounding may exist since there was no control for personality variables; this, too, could be included in future research on presenteeism. Nonetheless, this research is significant in being the first to investigate the effects of both smoking and alcohol consumption on presenteeism. The results of this study suggest that smoking and alcohol consumption, which have mainly been treated as health risk factors, may also be related to national productivity. In addition, this research, based on a national survey, can serve as a basic guide for future researchers to learn about the impacts of heavy smoking and high-risk alcohol use in the workplace and the necessity of implementing relevant intervention programs.

5. Conclusions

This study demonstrates that smoking and alcohol consumption relates to presenteeism. A total of 20.6% of the sample of Korean wage workers surveyed, experienced presenteeism. Workers who were classified as heavy smokers or high-risk drinkers were 1.38 times and 1.19 times respectively, more likely to experience presenteeism. Smoking and alcohol consumption are associated with chronic health diseases and high socio-economic costs worldwide. The present findings further highlight the problems of

smoking and alcohol consumption, as these are associated with greater odds of presenteeism among Korean workers. These findings demonstrate a critical need for social and behavioral interventions to alter employees' smoking and drinking habits. Further research is needed to identify efficacious treatments as well as the impacts of reduced smoking and alcohol consumption on presenteeism.

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Author contributions

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