



What Kind of Stress Is Associated with Depression, Anxiety and Suicidal Ideation in Korean Employees?

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Various types of stress affect mental health in the form of mood disorders, anxiety disorders, and suicidal ideation. Recently, the increasing suicide rate in the working-age population has become a major mental health concern in Korea. Thus, we investigated what kind of stress influence depression, anxiety, and suicidal ideation in Korean employees. The study participants were 189,965 employees who attended health screenings and responded to the Center for Epidemiologic Study-Depression Scale, the Beck Anxiety Inventory, and a questionnaire on the major causes of stress and suicidal ideation. We investigated the major causes of stress by gender and age categories and used binary logistic regression to determine the impact of the causes of stress on depression, anxiety and suicidal ideation. Of several stress causes, work-related stress was the most prevalent, regardless of age category and gender, followed by interpersonal relationships. However, interpersonal relationships and financial problems were the predominant causes of stress related to depression or suicidal ideation. This research suggests that despite the fact that work is the most common cause of stress for Korean employees, stress related to life problems other than work has a greater influence on the mental health of Korean employees.

Keywords: Employees; Stress; Depression; Anxiety; Suicidal Ideation

INTRODUCTION

Stress not only causes physical illnesses including cardiovascular disease (1), but also has an impact on mental health. In particular, researchers have reported that stress can cause mood or anxiety disorders (2,3) and suicidal ideation (4). According to health insurance statistics released by the Korean National Health Insurance Service, the number of patients diagnosed with a “stress illness,” which is classified as F43 in the International Classification of Disease 10th edition (5), rose from 55,657 in 2004 to 109,517 in 2014; medical costs for the treatment of stress-related diseases quadrupled from 5.7 billion KRW in 2004 to 23.2 billion KRW in 2014 (6,7). The Korea Statistics Office, a bureau of the Korean government, found in its 2014 social survey that work-related stress was the most common cause of stress (30.1%) for household members aged 15 or older (8). It seems fair to assume that if the same research had examined employees only, the proportion of people reporting work-related stress as a stressor would have been even higher.

Suicide, according to the Korea Statistics Office, is the fourth leading cause of death in Korea. In fact, suicide tops the list for people in their 20s and 30s and ranks second for people in their 40s and 50s, with these four groups comprising the working age population (9). In Organization for Economic Cooperation and

Development (OECD) countries, the suicide rate is 12.0 out of 100,000 deaths, while in Korea, 29.1 out of 100,000 deaths are by suicide, the highest rate among OECD member countries (10). Indeed, stress, mental illness and suicide are emerging as critical issues in Korea. Recent studies have examined the correlation between work-related stress and mental health in Korean employees, and showed that work-related stress is associated with depression and anxiety symptoms (11-14). However, these results cannot be generalized to all employees, since the number of the participants in these studies was small. In addition, most previous studies confined the scope of their research to work-related stress and did not examine the correlation between stressors other than work and psychiatric symptoms such as depression, anxiety and/or suicidal ideation.

A stressor is a stimulus that rouses physiological or mental stress (15) and stress is determined not only by objective events, but also by subjective cognition (16). Therefore, we can assume that a variety of stressors other than work may result in different stress responses in employees. In this regard, categorizing a variety of stressors (including work) by cause and identifying which stressors influence depression, anxiety and suicidal ideation will help to enhance the mental health of Korean employees. To this end, in this study we sought to identify the major causes of stress for Korean employees and to examine the correlation of

each cause with depression, anxiety and, ultimately, suicidal ideation. We also investigated what kind of stress is associated with suicidal ideation when the impacts of depression and anxiety, which influence suicidal ideation (17), were controlled.

MATERIALS AND METHODS

Study participants

The study participants were 204,433 male and female employees aged 19 to 65 years who received regular health checkups at the Health Screening Center of Kangbuk Samsung Hospital from January to December of 2014. If a participant received 2 or more checkups in a year, as per the standards stipulated in the Occupational Safety and Health Act of Korea (18), the data from the first checkup during the study period were used. As 14,468 self-report questionnaires were invalid for analysis due to incomplete answers, the remaining 189,965 questionnaires were analyzed.

Data collection and research tools

Demographic information was gathered and age categories were divided into "29 or younger," "30 to 39," "40 to 49," "50 to 59," and "60 or older."

Stress causes were measured with the "stress cause question," which is part of the stress questionnaire developed by Lee et al. for the Korea National Health and Nutrition Examination Survey (KNHANES) (19). The KNHANES is conducted annually by the Korean government to investigate the level of public health and to compile statistics in order to establish and evaluate public health policy. The stress-cause question categorizes the major causes of stress into 7 groups: 1) Work, job or school; 2) Interpersonal relationships (relationships with family or others of importance); 3) Changes in relationships (e.g., death, birth, divorce or marriage); 4) Sickness or injury of oneself or others; 5) Financial problems; 6) Unusual happenings (e.g., crime, natural disaster, accident, or moving); and 7) Change or lack of change in routine. Respondents were asked which of the seven items affected him/her the most if he/she had experienced stress over the previous month.

The intensity of depression was evaluated with the Korean version of the Center for Epidemiologic Studies rating scale for Depression (CES-D) (20). The CES-D is a self-report questionnaire designed to measure depressive symptoms in the general population (21). It consists of 20 items on a scale of 0 to 3. As suggested by Cho and Kim (20), we used 21 points as the cut-off score, such that participants scoring 21 or higher were classified into the "Depression" group, and those scoring 20 or lower were classified into the "Normal" group.

For anxiety examination, we employed the Korean version of the Beck Anxiety Inventory (BAI), developed by Beck et al. (22) and translated by Yook and Kim (23). The BAI is a self-report

questionnaire with 21 items on a scale of 0 to 3. As suggested by Yook and Kim (23), we classified subjects scoring 22 points or higher into the "Anxiety" group, and those scoring 21 points or lower into the "Normal" group.

Suicidal ideation was evaluated on the basis of questions asked in the KNHANES (24). Respondents who answered "Yes" to the yes/no question "Over the last year, have you ever felt that you would be better off dead?" were classified into the "Suicidal ideation" group.

Statistical analysis

The collected data were analyzed with Predictive Analytics Software, version 18.0 (PASW Statistics, SPSS Inc., Chicago, IL, USA). We stratified participants by gender and age categories to explore the major causes of stress according to those groups, and used linear by linear association to investigate whether there were tendencies in the major causes of stress for each group. The χ^2 test was performed to identify distribution differences in depression, anxiety and suicidal ideation according to stress cause.

Binary logistic regression was then conducted with each stress cause as an independent variable and depression, anxiety and suicidal ideation as dependent variables, with adjustment for gender, age, and the variables that exhibited significant differences on univariate analysis. When examining the impact of one of the stress causes on depression symptoms, we controlled for anxiety symptoms and the other causes. In our analysis of the impact of stress causes on anxiety symptoms, we controlled for depression symptoms and the other causes. To determine the impact on suicidal ideation, we controlled for both depression and anxiety symptoms. The odds ratio (OR) and 95% confidence interval (CI) was then determined for the group that had experienced a given stressor, relative to the group that had not. $P < 0.05$ was used as the level of significance for all statistics.

Ethics statement

This study protocol was approved by the Institutional Review Board of Kangbuk Samsung Hospital (IRB No. 2013-01-217). All participants provided written informed consent.

RESULTS

Demographics and major causes of stress of the study participants

The mean age of the participants was 35.98 years, with 30–39 being the largest age group with 78,733 participants (41.4%) and 50–65 being the smallest group with 13,797 subjects (7.3%). Of the participants, 125,033 (65.8%) were male, the largest group of whom were 30–39 years old (54,371 participants, 43.5%). Among females, 19- to 29-year-olds were the largest group, accounting for 24,886 participants (38.3%). In response to the question "If

you have felt stressed in the past month, which of the following affected your feelings the most?" the most common response was work, job or school (63.2%), followed by interpersonal relationships (16.9%) and financial problems (5.7%). On the basis of their CES-D scores (with 21 points or higher indicating depression) and BAI scores (with 22 points or higher indicating anxiety), 11,222 participants (5.9%) were classified into the depression group and 5,516 participants (2.9%) were classified into the anxiety group. A total of 10,907 participants (5.7%) reported having suicidal ideation over the previous year (Table 1).

Table 1. Demographic characteristics of the study population

Clinical characteristics	No. (%)
Age, yr	35.98 ± 8.572
Male	125,033 (65.8)
Female	64,932 (34.2)
CES-D ≥ 21	11,222 (5.9)
BAI ≥ 22	5,516 (2.9)
Suicidal ideation	10,907 (5.7)
Cause of stress	
Work, job, or school	120,080 (63.2)
Interpersonal relationships	32,027 (16.9)
Change in relationships	3,908 (2.1)
Sickness or injury	3,993 (2.1)
Financial problems	10,746 (5.7)
Unusual happenings	2,867 (1.5)
Change or lack of change in routine	7,685 (4.0)

Values are presented as number (%) or mean ± SD.

CES-D = Center for Epidemiologic Studies rating scale for Depression, BAI = Beck Anxiety Inventory, SD = standard deviation.

Major causes of stress by gender and age categories

Regardless of gender and age categories, the majority of participants chose work, job or school as the cause of stress, followed by interpersonal relationships. From the third-ranked cause onward, the rankings varied with gender and age (Tables 2 and 3). Compared with men, women in older age categories were less likely to select work, job or school, but were more likely to report stress due to interpersonal relationships with increasing age (Fig. 1).

Association of stress causes with depression, anxiety and suicidal ideation

The χ^2 test was used to examine whether there were distribution differences in depression, anxiety and suicidal ideation according to each stress cause. For stress caused by a change or lack of change in routine, there was no significant difference in the distribution of depression. For stress caused by work, job or school and unusual happenings, there was no significant difference in the distribution of anxiety, and there was no significant difference in the distribution of suicidal ideation for unusual happenings. For all other causes, the distribution of depression, anxiety and suicidal ideation varied significantly according to each stress cause (Table 4).

Binary logistic regression analyses revealed that the odds of developing depression symptoms were 2.855-fold higher (95% CI, 2.509–3.248) in participants who felt stressed due to a change in relationships than in those with no such stress. In terms of the effect on the odds of depression, this cause of stress was fol-

Table 2. Major causes of stress for Korean employees according to age and gender (male)

Cause of stress	< 30 yr (n = 23,177)	30–39 yr (n = 54,371)	40–49 yr (n = 36,676)	≥ 50 yr (n = 10,809)	P trend*
Work, job, or school	14,442 (62.3)	37,551 (69.1)	25,128 (68.5)	6,509 (60.2)	0.134
Interpersonal relationships	3,496 (15.1)	7,191 (13.2)	4,768 (13.0)	1,679 (15.5)	0.083
Change in relationships	593 (2.6)	1,277 (2.3)	294 (0.8)	160 (1.5)	< 0.001
Sickness or injury	451 (1.9)	994 (1.8)	487 (1.3)	297 (2.7)	0.922
Financial problems	1,733 (7.5)	2,752 (5.1)	1,502 (4.1)	830 (7.7)	< 0.001
Unusual happenings	442 (1.9)	695 (1.3)	250 (0.7)	130 (1.2)	< 0.001
Change or lack of change in routine	2,048 (8.8)	1,653 (3.0)	397 (1.1)	289 (2.7)	< 0.001

Values are presented as number (%).

*Pearson's χ^2 test, $P < 0.05$.

Table 3. Major causes of stress for Korean employees according to age and gender (female)

Cause of stress	< 30 yr (n = 24,886)	30–39 yr (n = 24,362)	40–49 yr (n = 12,696)	≥ 50 yr (n = 2,988)	P trend
Work, job, or school	14,909 (59.9)	13,982 (57.4)	6,289 (49.5)	1,270 (42.5)	< 0.001*
Interpersonal relationships	5,320 (21.4)	5,251 (21.6)	3,417 (26.9)	905 (30.3)	< 0.001*
Change in relationships	578 (2.3)	766 (3.1)	152 (1.2)	88 (2.9)	0.004*
Sickness or injury	484 (1.9)	672 (2.8)	422 (3.3)	186 (6.2)	< 0.001*
Financial problems	1,831 (7.4)	1,024 (4.2)	726 (5.7)	348 (11.6)	0.532*
Unusual happenings	493 (2.0)	526 (2.2)	267 (2.1)	64 (2.1)	0.323
Change or lack of change in routine	1,633 (6.6)	1,154 (4.7)	344 (2.7)	167 (5.6)	< 0.001*

Values are presented as number (%).

*Pearson's χ^2 test, $P < 0.05$.

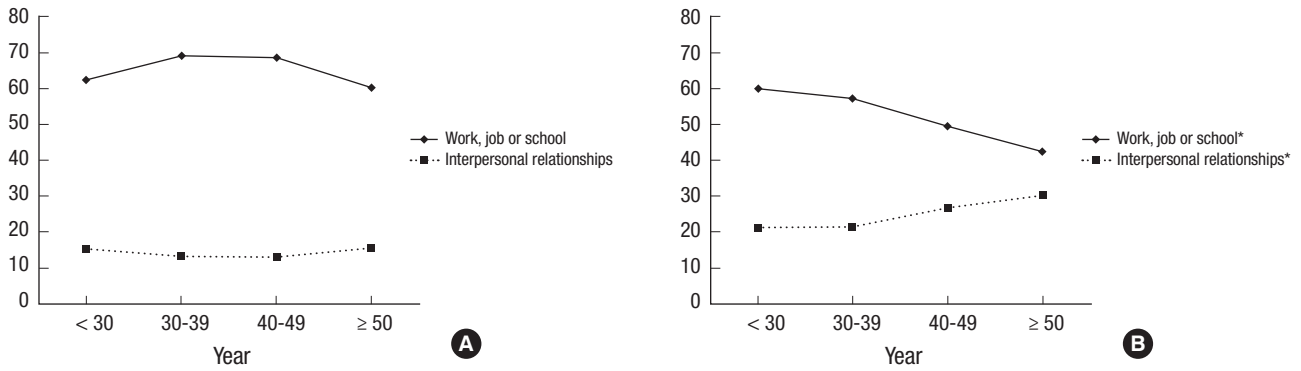


Fig. 1. Major causes of stress for Korean employees according to age and gender. The longitudinal axis indicates the percentage of participants who responded that they suffered from work, job or school stress and interpersonal relationships stress. The horizontal axis indicates age categories. (A) Male, (B) Female. *P for trend < 0.05.

Table 4. Distribution of depression, anxiety and suicidal ideation according to causes of stress

Causes of stress	Depression		Anxiety		Suicidal ideation	
	CES-D ≥ 21	P value	BAI ≥ 22	P value	Positive	P value
Work, job, or school	6,758 (5.6)	< 0.001	3,430 (2.9)	0.108	5,837(4.9)	< 0.001
Interpersonal relationships	2,960 (9.2)	< 0.001	1,379 (4.3)	< 0.001	3,240 (10.1)	< 0.001
Change in relationships	409 (10.5)	< 0.001	172 (4.4)	< 0.001	373 (9.5)	< 0.001
Sickness or injury	296 (7.4)	< 0.001	181 (4.5)	< 0.001	306 (7.7)	< 0.001
Financial problems	793 (7.4)	< 0.001	400 (3.7)	< 0.001	1,122 (10.4)	< 0.001
Unusual happenings	117 (4.1)	< 0.001	84 (2.9)	0.933	151 (5.3)	0.271
Change or lack of change in routine	452 (5.9)	0.922	177 (2.3)	0.001	377 (4.9)	0.001

Values are presented as number (%). CES-D = Center for Epidemiologic Studies rating scale for Depression, BAI = Beck Anxiety Inventory.

Table 5. Adjusted association of stress with depression, anxiety and suicidal ideation

Cause of stress	Depression*	Anxiety†	Suicidal ideation‡
Work, job, or school	1.781 (1.663-1.907) [§]	1.631 (1.470-1.810) [§]	1.378 (1.289-1.472) [§]
Interpersonal relationships	2.469 (2.296-2.655) [§]	1.670 (1.498-1.862) [§]	2.466 (2.301-2.642) [§]
Change in relationships	2.855 (2.509-3.248) [§]	1.438 (1.187-1.742) [§]	2.048 (1.801-2.330) [§]
Sickness or injury	1.676 (1.446-1.941) [§]	2.177 (1.802-2.629) [§]	1.636 (1.427-1.876) [§]
Financial problems	1.922 (1.743-2.119) [§]	1.635 (1.426-1.876) [§]	2.838 (2.608-3.088) [§]
Unusual happenings	0.834 (0.672-1.034)	1.813 (1.406-2.339) [§]	1.262 (1.052-1.514) [§]
Change or lack of change in routine	1.793 (1.589-2.024) [§]	0.974 (0.812-1.169)	1.229 (1.086-1.390) [§]

Values are presented as OD (95% CI). OD = odds ratio, CI = confidence interval.

*Adjusted for age, gender and anxiety as well as the following stress causes: work, job, or school, interpersonal relationships, change in relationships, sickness or injury, financial problems and unusual happenings stress; †Adjusted for age, gender and depression as well as the following stress causes: work, job, or school, interpersonal relationships, change in relationships, sickness or injury, financial problems and change or lack of change in routine; ‡Adjusted for age, gender, depression and anxiety as well as the following stress causes: work, job, or school, interpersonal relationships, change in relationships, sickness or injury, financial problems, and lack of change in routine; §P < 0.05.

lowed by interpersonal relationships; financial problems; change or lack of change in routine; work, job, or school; and sickness or injury of oneself or others. The participants who felt stressed due to unusual happenings exhibited lower odds of depression than those with no such stress, but it was not statistically significant (Table 5).

With regard to anxiety, stress due to sickness or injury of oneself or others showed highest odds (OR, 2.177; 95% CI, 1.802–2.629) followed by unusual happenings; interpersonal relationships; financial problems; work, job or school; and a change in

relationships. Stress due to change or lack of change in routine exhibited lower odds of anxiety than those without this stressor, but the difference was not statistically significant (Table 5).

When calibrated for age, gender, stress causes, depression and anxiety symptoms, logistic regression analysis revealed that the OR for developing suicidal ideation was higher in stressed participants than in those without stress, regardless of the specific cause of stress. The participants who had financial problems had the highest OR for developing suicidal ideation, followed by interpersonal relationships; a change in relationships;

sickness or injury of oneself or others; work, job or school; unusual happenings and change or lack of change in routine (Table 5).

DISCUSSION

In this research, we sought to identify major stress causes and their correlation with depression, anxiety and suicidal ideation by examining data from 189,965 participants who had received health screenings. Of the total participants, 5.9% (3.7% of the males and 10.1% of the females) belonged to the depression group, based on having CES-D scores of 21 or higher. In a study of 3,013 employees based in Incheon, Korea, 26.1% of males and 28.7% of females were categorized into the depression group based on having CES-D scores of 16 or higher (12). Likewise, in a study that examined 50,032 Korean employees in 2011, 39% of the entire group (40.7% of males and 36.5% of females) scored 12 points or lower on the WHO-5 Wellbeing Index (25). A study of 8,522 employees of 329 Korean companies found that 15.9% of the employees were depressed, based on having CES-D scores of 21 or higher (13). The varying proportions of subjects in the depression groups of these different studies may be related to the different CES-D cutoff scores used, different tools employed for measuring symptoms, the potential to include false positives or false negatives because they included self-reported data. According to 2011 epidemiologic research from the Korean Ministry of Health and Welfare on mental illness among adults aged 18 to 74, the annual prevalence of major depressive disorder in the general population was 3.1% (26). Considering that the 2011 study examined the general population and only included major depressive disorder while excluding illnesses in which other depression symptoms may develop, such as bipolar disorder, our findings are quite similar.

The anxiety group that scored 22 or higher on the BAI represented 2.9% of the total study population (1.9% of males and 4.8% of females). This result is in line with previous research involving 73,975 Korean employees, in which the anxiety group with BAI scores of 22 or higher accounted for 2.3% of the study population (11).

In our research, the annual prevalence of suicidal ideation was 5.7%, while the 2011 epidemiologic survey reported a rate of 3.7% (26). The prevalence of suicidal ideation was higher in this study population than in the general population. Research from the Korea Statistics Office on causes of death from 2012 to 2014 revealed that death by suicide was most prevalent among those who were jobless, students or homemakers (9), and that being jobless in particular is a risk factor for committing suicide (27). Given these facts, it is notable that the prevalence of suicidal ideation was higher in employees than in the general population. This suggests the need to take measures to help employees manage stress and prevent them from attempting suicide.

As for stress causes, work, job or school was the most common cause of stress, followed by interpersonal relationships and financial problems. When participants were categorized by gender and age, work, job or school and interpersonal relationships were most frequently chosen in that order in every group. These results agree with the results of social research by the Korea Statistics Office in 2014, which found that work life caused the most stress among the general population (8).

Meanwhile, as the age of female participants increased, the proportion reporting stress due to work, job or school decreased, while the proportions reporting stress due to interpersonal relationships and sickness or injury of oneself or others increased. A 2015 survey on the economically active population from the Korea Statistics Office indicated that female participation in economic activities was similar to male participation from age 20–29, but started to drop below male participation by a large margin after the age of 30 (28). In Korean society, this decreased participation of older female groups in economic activities can be attributed to marriage, childbirth and childcare. It can be assumed that older women who continue working are more professionally successful or are more satisfied with their jobs than men, which translates into a lower proportion of older women with work-related stress. In contrast, over 90% of men in the 30–39 and 40–49 age categories participated in economic activity (28), and in our study, 69.1% and 68.5% of male participants in these respective age categories chose work, job or school as the cause of their stress. According to a survey conducted by the Korea Statistics Office on causes of death from 2012 to 2014, the suicide rate dropped slightly overall, but maintained a rising trend among men in their 30s and 40s (9). These results call for across-the-board measures to reduce the level of work-related stress for men in their 30s or 40s.

Although most stress causes were significantly associated with depression, anxiety and suicidal ideation, the influence of unusual happenings on depression was not significant, nor was the influence of a change or lack of change in routine on anxiety. Since unusual happenings referred to crime, natural disasters or accidents that are not faced commonly in daily life, just 1.5% of the entire group chose this as a cause of stress, and a mere 4% of participants said that a change or no change in routine was the source of stress. The relatively small sample sizes for these two causes of stress might have affected the significance of the results.

Interestingly, the top three causes of stress that were strongly associated with depression (a change in relationships, interpersonal relationships and financial problems) also were associated more strongly with suicidal ideation than other causes. In a 2011 study from the Korea Statistics Office on the intensity of stress by cause, interpersonal relationships and financial problems were found to impose relatively stronger pressure on people than other causes (29). Earlier studies reported that inter-

personal relationship issues were associated with suicidal ideation and serious attempts at suicide (30,31), and that financial loss was associated with suicidal ideation (32) and could lead to suicide even in individuals without mental illness (33). The Korea Statistics Office reported in 2015 that financial problems and bad relationships with family, friends or colleagues were the most common causes of suicidal ideation (34). In a 2011 study on suicide, the Ministry of Health and Welfare also revealed that, aside from psychiatric symptoms, interpersonal relationships and financial problems were the main causes of suicide attempts (35). The result of this study suggest that the stress related to interpersonal relationships and financial problems, to which people are more sensitive than other causes, was associated more strongly with depression and suicidal ideation than other causes.

Since stress reduces workers' professional capabilities (36), controlling the stress levels of employees should be considered an important way of improving their performance. As this research demonstrates, work was the largest cause of stress among employees, regardless of gender and age, and yet the causes most strongly associated with depression and suicidal ideation (major psychiatric symptoms) were interpersonal relationships and financial problems. In this sense, along with efforts to reduce work-related stress by improving organizational systems and corporate culture, efforts to reduce stress related to everyday life such as stress due to interpersonal relationships and financial problems is also important.

To the best of our knowledge, no previous study has examined the major stress causes of Korean employees classified by gender and age and their association with depression, anxiety and suicidal ideation; thus, the novelty of this study is noteworthy. The fact that we examined a large group (189,965 subjects) adds to its value. The limitations of this study include the fact that a self-report questionnaire was used to evaluate depressive and anxiety symptoms. Since the symptoms were not examined by a clinical professional with a structured interview, it is difficult to explain the association between the stressors and depression and anxiety disorders, which are psychiatric diagnoses based on the DSM-5. Furthermore, considering that the medical checkups in this study were provided by employers, some employees may not have responded truthfully to the questionnaire with regard to mental health. Second, aside from age and gender, other demographic factors that may affect depression, anxiety and suicidal ideation were not provided and therefore were not reflected in the analysis. Future studies in large groups should include a variety of demographic characteristics to determine the association between stress and major psychiatric symptoms. Third, the participants were employees who received regular checkups at the Health Screening Center of Kangbuk Samsung Hospital, so they may not represent all Korean employees. Still, as this study examined a large number of

participants (approximately 190,000), there should be less concern about generalizing these findings to the entire working population compared to previous studies. Fourth, although work-related stress can have multiple components, such as excessive workload, insufficient job control, interpersonal conflict in the workplace, inadequate peer or organizational support, lack of job security and unsatisfactory compensation, all of these components were analyzed as a single stressor in this study. This is an important limitation of our study. Therefore, there is a need for caution when applying the results of this study to various workplaces with varying work conditions. Finally, this was a cross-sectional study, so the causation between stress causes and depression, anxiety and suicidal ideation could not be determined.

In conclusion, work was a significant cause of stress for Korean employees. However, sickness or injury was associated more strongly with anxiety symptoms than work, while interpersonal relationships and financial problems were associated more strongly with depression and suicidal ideation than work. With this in mind, it will be helpful to provide stress-management programs to enhance employees' mental health and professional performance.

DISCLOSURE

The authors have no potential conflicts of interest to disclose.

AUTHOR CONTRIBUTION

Conceptualization: Shin YC, Lim SW. Formal analysis: Lee D. Investigation: Lee D, Lim SW. Writing - original draft: Lee D, Lim SW. Writing - review & editing: Shin YC, Lim SW.

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