

# Prevalence and correlates of suicidal ideation in Korean Firefighters: a nationwide study

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## Research article

**Keywords:** Firefighters, suicidal ideation, prevalence, occupational stress, emotional labor

**Posted Date:** October 16th, 2019

**DOI:** <https://doi.org/10.21203/rs.2.12082/v2>

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**Version of Record:** A version of this preprint was published on December 30th, 2019. See the published version at <https://doi.org/10.1186/s12888-019-2388-9>.

# Abstract

**Background:** It is generally known that firefighters are at an increased risk of suicide. However, the prevalence or correlates of suicidal ideation in firefighters have not been thoroughly explained to date. The aim of this study was to measure the 1-year prevalence of suicidal ideation in firefighters and to investigate the correlates of past-year suicidal ideation among the demographic, occupational and clinical characteristics. **Method:** A web-based survey was conducted using a self-reported questionnaire. A total of 45,698 Korean firefighters were included for analysis. Prevalence of suicidal ideation in the past year was calculated and its correlates were elucidated using a multivariable logistic regression analysis. **Results:** The 1-year prevalence of suicidal ideation was 10.66% in Korean firefighters. Recent traumatic experience, high levels of occupational stress from physical work environment and emotional labor, as well as current duty of officer were significant correlates of suicidal ideation in the previous year, even after controlling the effect of PTSD and depressive symptoms. With respect to demographic factors, female gender, and divorced/separated/widowed marital status were associated with suicidal ideation in the previous year in firefighters. **Conclusions:** More firefighters experienced recent suicidal ideation than the general population and there were risk factors related to the role of firefighters in Korea. Intervention and policies that manage these risk factors are necessary for the prevention of suicide in firefighters.

## Background

Suicide and associated behaviors are major public mental health issues around the world. Suicide is one of the leading causes of death worldwide for adults [1]. South Korea, in particular, is a country with a markedly high rate of suicide for the past several years. According to the World Health Organization, the suicide rate in South Korea was 26.9 per 100,000 persons, ranking 4<sup>th</sup> highest in the world. [2, 3]. One way to prevent suicide is to identify the risk factors associated with increased suicidal behaviors including ideation, plan, and attempt, since they have been found to be predictors for completed suicide [4-6]. Especially, suicidal ideation is strongly associated with a variety of psychological difficulties and subsequent suicide attempts [7, 8]. Therefore, factual survey and investigation of suicidal ideation of various populations are needed to prevent suicide.

One occupation group that particularly deserves such attention is firefighters because they frequently experience traumatic events that may increase suicidal behaviors [9, 10]. It was recently reported that the number of firefighters who died from suicide was greater than the number who died in the line of duty in United States [11]. In South Korea, there were also more suicides than on-the-work deaths in firefighters during the last decade, according to an informal report from the National Fire Agency. However, the rate of suicide and suicidal behaviors among firefighters are markedly less understood compared with other groups of first responders, such as police officers [12]. One previous study has tried to determine the career prevalence of suicidal behaviors, including suicidal ideation, plans, and attempts by analyzing data obtained from a sample of 1,027 current and retired firefighters in the United States (US). This study reported very high rate of suicidal ideation, plan, and attempt in US firefighters compared with the general population [13]. Since this study, however, has taken on integrated population ranging from volunteer to

retired firefighters in US, it is necessary to conduct research on firefighters who are currently working as professional in other countries. In addition, the study employed a retrospective survey on whole career of participants, so it is highly possible that the participants' perspective on their suicidal behaviors may have been skewed. In order to investigate suicidal ideation related to firefighters' work and various correlates of it, research on data of recent suicidal ideation is needed.

Psychiatric symptoms, such as depression, posttraumatic stress disorder (PTSD) symptoms [14, 15], and sleep disturbances [16], were revealed to be major risk factors associated with suicidal behaviors in firefighters. In addition, lower rank, fewer years of firefighter service, active duty military status, history of professionally responding to suicidal attempt or death cases, and membership in an all-volunteer department were reported as occupational correlates of suicidal ideation among firefighters [13]. However, it is still uncertain whether and how work-related stress in their occupational environment impacts suicidal ideation in firefighters, despite attempts to identify the predictors for suicidal behaviors in this population. Previous epidemiological studies showed that a potential relationship between occupational stress and suicidal ideation in emergency workers. Specifically, job-related emotional exhaustion and bullying at work were associated with suicidal ideation in Norwegian ambulance personnel [17]. Also, having been harassed at work was associated with suicidal ideation among physicians in academic medicine [18]. Considering these findings, occupational stress might be associated with suicidal ideation in such population.

Several occupational stressors unique to firefighters are necessary to be investigated. First, traumatic experience while on duty might be the highest risk factor related to suicidal ideation. Traumatic experiences in firefighters have been widely acknowledged as a major risk factor for various mental disorders. The severity of PTSD symptoms and traumatic experience were positively related with the risk of lifetime suicidal ideation and attempts [14]. However, it remains unknown whether and how a recent exposure to traumatic event impacts suicidal ideation in firefighters. Second, occupational stress from risky or hostile environment of workplace might also be a risk factor for suicidal ideation in firefighters [19, 20]. Especially, firefighters routinely suffer from physical danger on duty, outdoor work regardless of the weather, heavy firefighting equipment, and irregular work hours. Investigations are needed determining on whether occupational stress related to the characteristics of the physical work condition is one of the correlates of suicidal ideation in firefighters. In addition, emotional labor might also be one of the occupational stressors, given the emotionally taxing job environment of firefighters. Emotional labor is defined as the process by which workers have to control their feelings in accordance with the organizational demands and occupational role [21-23]. Firefighters have to hide their own emotions when they face sickness, death, suicide, and violent accidents. Moreover, it has been reported that Korean firefighters usually suffer from emotional labor similar to those in customer-service industry due to the aggressive and/or picky nature of civil petitioners [24]. Considering the previous findings that emotional labor has a negative impact on mental health among workers [25-29], it is needed to investigate whether emotional labor is associated with suicidal ideation in firefighters.

In this study, we conducted a nationwide survey on past-year suicidal ideation and its correlates among 45,698 firefighters in South Korea. The purpose of this study was twofold: 1) to determine the 1-year prevalence of suicidal ideation in firefighters and 2) to investigate whether and how demographic characteristics (age, sex, marital status, and religion), occupational factors (current duty, traumatic experience in the previous year, stress from physical work condition, and emotional damage from emotional labor), and clinical symptoms (PTSD and depression) are correlated with past-year suicidal ideation in this population.

## Methods

### Participants

This nationwide cross-sectional study was conducted between February 2018 and March 2018 via a self-reported online survey among Korean firefighters. A total of 45,719 firefighters in South Korea participated in the survey and completed the self-reported questionnaire, including their suicidal ideation in the past year as well as demographic characteristics and occupational factors, such as traumatic experience in the past year, occupational stress, and emotional labor, and clinical factors, including PTSD and depression symptoms. Among the total, 21 were excluded from the final analyses due to a coding error during the survey. Thus, the final analyses included a total of 45,698 firefighters. Survey respondents were apprised of the anonymous and voluntary nature of the self-reported online survey.

### Measures

#### *Demographic and occupational characteristics*

Demographic and occupational characteristics were obtained using a self-reported questionnaire. Demographic characteristics included age, sex (male or female), marital status (married, never married, or divorced/separated/widowed), and religion (yes or no). Occupational characteristics included length of work (years), and current duty. The roles of firefighters include fire suppression, special investigation of the cause of fire, paramedics providing emergency medical care, rescuing people who are trapped or in medical emergencies, training other firefighters, and others [30]. For analysis, the roles were categorized into the following: fire suppression, emergency medical services (EMS: includes paramedics and rescue), and officers (including administrators, special investigators, trainers of firefighters, and communicational and informational system operators).

#### *Suicidal ideation in the past year*

Suicidal ideation in the previous year was assessed using an item of the Suicidal Behavior Questionnaire-Revised (SBQ-R) [31]. The SBQ-R is a brief self-reported questionnaire to inquire about different aspects

of suicidal behaviors. Item 1 explores whether the respondents have ever thought about or attempted suicide in his/her lifetime. Item 2 evaluates how often the respondents have thought about suicide over the past twelve months. Item 3 inquires about threats of suicide attempts, and item 4 explores the self-reported likelihood of suicidal behaviors in the future. In this study, we used item 2 to assess past-year suicidal ideation in participants. Item 2 reads “How often have you thought about killing yourself in the past year?” Participants responded to this on a 5-point Likert scale: 1-never; 2-rarely (1 time); 3-sometimes (2 times); 4-often (3-4 times), and 5-very often (5 or more times). A score of greater than 2 on Item 2 was indicated as having suicidal ideation more than once in the past year. According to the validation study for the SBQ-R, item 2 had the largest effect size followed by item 1 for differentiating between suicidal-risk and non-suicidal participants in both clinical and nonclinical adult samples [31]. The correlation coefficient of SBQ-R item 2 with PHQ-9 item 9, which reads “thoughts that you would be better off dead or of hurting yourself in some way” was  $r = 0.499$  ( $p < 0.001$ ). Additionally, the correlation coefficient between SBQ-R item 2 and the total score of PHQ-9 was  $r = 0.479$  ( $p < 0.001$ ).

### ***The presence of recent exposure to traumatic events***

Exposure to traumatic events during the previous year was identified by using the self-reported measure – developed by Beaton et al. – which assessed the duty-related incident stressors [32]. Twenty-two items were selected among the original 33 incident stressors based on the previous result of rating the stressfulness of the 33 stressors [32]. We excluded two stressors related to gunshots due to the generally low incidence of gunshot incidents in South Korea due to strict gun control laws. In South Korea, only government-authorized personnel can own or carry guns. Gun culture is notably absent outside of the military and gun ownership and death ranks among the lowest in the world [33]. ‘Witness duty-related death of co-worker’ and ‘co-worker firefighter fire fatality (not witnessed)’ were changed to ‘witness duty-related death or suicide of co-worker’ and ‘co-worker death or suicide (not witnessed), respectively. Finally, three additional stressors, ‘remove the body of suicide victim’, ‘remove a severely decayed corpse’, and ‘involved in a safety accident that received public spotlight’ which were reported to be frequently encountered and associated with high level of stress in Korean firefighters were added (Table S1). Participants were asked whether they were exposed to each stressor in the previous year. More than one exposure to traumatic events in the previous year was regarded as having recent exposure to traumatic events.

### ***Occupational stress from physical work environment***

Occupational stress from physical work environment was measured using the subscale, ‘Difficult Physical Environment’ of the Korean Occupational Stress Scale (KOSS) [34], which was developed and validated using a nationwide epidemiological study to estimate the job stress of Korean employees. The KOSS was based on the most commonly used job stress questionnaires such as the Job Content

Questionnaire [35], National Institute of Occupational Safety and Health job stress questionnaire [36] and Occupational Stress Index [37]. The KOSS has eight subscales (Difficult Physical Environment, High Job Demand, Insufficient Job control, Inadequate Social Support, Job Insecurity, Organizational Injustice, Lack of Reward, and Discomfort in Occupational Climate). The “Difficult Physical Environment” of the KOSS has three items, each of which was rated on a 4-point Likert scale (1: strongly disagree to 4: strongly agree) and higher scores represented higher levels of occupational stress from physical environment. Table S2 shows each item of the “Difficult Physical Environment” subscale of the KOSS. The internal consistency of “Difficult Physical Environment” of KOSS based on the presented sample was  $\alpha = 0.464$ .

### ***Emotional labor***

The level of emotional labor was measured by the Korean Emotional Labor Scale (KELS) [38]. KELS was developed to measure the emotional labor of Korean workers, and was validated with a nationwide random sample of 1,042 Korean employees by the Korean Occupational Safety & Health Agency. It was based on the literatures related to emotional labor [21-23, 39], emotional labor scales, such as Emotional Labor Inventory [6], Emotional Labor Scale [40], and Frankfurt Emotion Work Scale [41], as well as a focused group interview. The KELS has five subscales (Effort to Control Emotion, Organizational Monitoring System, Demands of Emotional Labor, Emotional Damage, and Organizational Support System). Each item in the questionnaire was rated on a 4-point Likert scale, from 1 (not at all) to 4 (very much), and higher scores represented higher levels of stress from emotional labor. The current study included only the subscale, “Emotional Damage” which measures the severity of emotional hurt due to emotional labor. We regarded the subscale score as proxies for emotional labor in firefighters, because the “Emotional Damage” is a factor that explained the most variance of the KELS in the results of a factor analysis in the study developing the scale [38]. Table S2 shows each item of the “Emotional Damage” subscale of the KELS. The internal consistency of “Emotional Damage” of KELS based on the presented sample was  $\alpha = 0.947$ .

### ***PTSD symptoms***

PTSD symptoms were assessed with the Korean version of PTSD Checklist-for the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (PCL-5) [42]. The PCL-5 is a 20-item self-reported measure evaluating the degree to which an individual has been bothered in the past month by DSM-5 (Diagnostic and Statistical Manual of Mental Disorders, 5<sup>th</sup> edition) PTSD symptoms [43]: intrusions, avoidance, negative alteration in cognition and mood, and alterations in arousal and reactivity. We instructed the participants to choose and describe the most traumatic event from a list of traumatic events and fill out the PCL-5 with this event in mind. Each item was measured on a 5-point Likert scale (0: not at all to 4: extremely). Higher scores indicated higher severity of PTSD symptoms. Items 1- 5

correlated with symptoms within Cluster B (intrusions); items 6 - 7 with Cluster C (avoidance); items 8 - 14 with Cluster D (negative alteration in cognition and mood); and items 15 - 20 with Cluster E (alterations in arousal and reactivity). The internal consistency of PCL=5 based on the presented sample was  $\alpha = 0.961$ . Participants were considered to be experiencing the symptom when recording a score of 2 or higher (moderately to extremely) in each item. According to an algorithm-derived PTSD diagnosis method, we defined probable PTSD as having the required number of symptoms in each cluster of the DSM-5 criteria: 1 B item, 1 C item, 2 D items, and 2 E items.

### ***Depression symptoms***

Depression symptoms were assessed using the Korean version of Patient Health Questionnaire-9 (PHQ-9) [44, 45]. Respondents rated 9 items, based on the DSM-IV criteria of major depressive disorder, measured on a 4-point Likert scale (0: not at all to 3: nearly every day) based on their experiences during the past two weeks. The PHQ-9 total score ranged from 0 to 27; higher scores indicated a greater severity of depressive symptoms. The internal consistency of PHQ-9 based on the presented sample was  $\alpha = 0.905$ . The total score of over 15 was defined as probable depression [45].

### **Statistical Analysis**

Descriptive statistics were used to analyze the demographic, occupational, and clinical characteristics of participants as well as to calculate the 1-year prevalence of suicidal ideation. Chi-square test and *t*-test were used to examine whether there were differences in the demographic, occupational, and clinical characteristics between firefighters with and without suicidal ideation in the past year. Multivariable logistic regression analysis was used to examine the demographic (age, sex, marital status, and religion), occupational (current duty, recent traumatic experience, occupational stress, and emotional labor), and clinical (probable PTSD and depression) characteristics as correlates of suicidal ideation in the previous year. The dependent variable was suicidal ideation in the past year. In the logistic regression analysis, 143 participants with missing data were excluded; thus, a total of 45,555 participants were included in the analysis. The results were shown as odds ratios (ORs) and 95% confidence intervals (CIs). The data were analyzed using IBM SPSS Statistics ver. 22.0 software (IBM Corp., Chicago, IL, USA). A two-tailed *p*-value < 0.001 was considered statistically significant.

## **Results**

The mean age of all 45,698 participants was 42.51 years (standard deviation, SD = 9.10), and 92.6% of them were males. The average length of work was 13.4 years (SD = 9.43). As a current duty, fire suppression, EMS, and officers were 41.57%, 32.10%, and 26.33% respectively. In the past year, 62.52% of participants experienced traumatic events. A total of 4,871 (10.66%) firefighters had suicidal ideation

more than once in the past year. With respect to clinical characteristics, a total of 1,202 firefighters (2.63%) were identified as having probable PTSD using PCL-5, and 561 firefighters (1.23%) were identified as having probable depression using PHQ-9.

The results in Table 1 showed that there were differences in the demographic, occupational, and clinical characteristics between firefighters with and without suicidal ideation in the past year. The association of suicidal ideation in the previous year with demographic, occupational, and clinical characteristics was investigated by using a multivariable logistic regression model. The results are shown in Table 2. Suicidal ideation in the past year was associated with the female gender (OR = 1.484, 95% CI = 1.328 – 1.657) and with relationship status as being divorced/separated/widowed (OR = 1.724, 95% CI = 1.432 – 2.076). As current duty, officers were more likely to be related with suicidal ideation in the past year (OR = 1.488, 95% CI = 1.366 – 1.622), compared with fire suppression. The presence of recent trauma (OR = 1.847, 95% CI = 1.709 – 1.997), higher occupational stress (OR = 1.191, 95% CI = 1.164 – 1.219), higher emotional labor (OR = 1.095, 95% CI = 1.087 – 1.103), probable PTSD (OR = 4.008, 95% CI = 3.499 – 4.591), and probable depression (OR = 8.916, 95% CI = 7.201 – 11.039) were also significantly associated with suicidal ideation in the past year.

## Discussion

This is, to the best of our knowledge, the first nationwide epidemiological study to investigate the 1-year prevalence of suicidal ideation in firefighters. In this study, we found that 10.66% of Korean firefighters reported having suicidal ideation in the past year, which is higher than in the Korean general population. A nationwide study conducted by the Korean Epidemiologic Catchment Area Study Replication (KECA-R) in 2016 showed that the 1-year prevalence of suicidal ideation in the Korean general population was 2.9% using the Korean version of the Composite International Diagnostic Interview [46]. From this, we may suppose that more firefighters experience suicidal ideation during their active duty period than the general population with other occupations, indicating that there might be risk factors unique to the role of firefighters.

A previous study reported the career prevalence of suicidal behaviors among American firefighters [13]; it reported that the career prevalence of suicidal ideation, plan, and attempt was 46.8%, 19.2%, and 15.5%, respectively. These figures are much higher compared with our results. This difference might be attributable to several reasons. First, their data was obtained from a relatively small sample – 1,027 firefighters – while our data was obtained from a relatively large sample size of 45,698 firefighters. Second, their study has taken on integrated population ranging from volunteer to retired firefighters, and showed that volunteers were more likely to report suicidal behaviors than full-timers. However, in our study, only full-time firefighters currently working as professionals were analyzed. Third, their study included firefighters with various races and ethnicity residing in the US, while in our study, only Korean – one race and ethnicity – firefighters were enrolled. Stanley et al recruited White, Hispanic, Latino, Native American and Alaska Native firefighters; and being Native American or Alaska Native was a key factor

associated with increased risk for suicidal behaviors. Finally, we analyzed firefighters' suicidal ideation only in the past year, while Stanley et al on the suicidal ideation in whole career years of firefighters.

In this study, we also investigated the correlates of suicidal ideation in the past year among firefighters. Results showed that PTSD and depressive symptoms were factors most strongly correlated with suicidal ideation in the previous year among demographic, occupational, and clinical characteristics. It is consistent with the previous findings that PTSD and depression were linked to suicidal behaviors [14, 15, 47-50]. Notable finding of this study was that occupational factors were associated with suicidal ideation of firefighters, even after controlling the effect of PTSD and depressive symptoms. First of all, we found that a recent exposure to traumatic event significantly heightened the possibility of developing suicidal ideation in the past year. Traumatic experience is a well-known risk factor for posttraumatic stress disorder (PTSD) and depression. However, the effect of traumatic experiences on suicidal behaviors among firefighters has not been fully investigated. These findings suggest that firefighters who experienced a recent traumatic event could be at higher risk for developing suicidal ideation, despite the lack of PTSD or depressive symptoms immediately following the traumatic event.

Second, we found a significant association of occupational stress from physical work condition with suicidal ideation in firefighters. There is accumulated evidence that job-related stress is linked to mental health problems in emergency workers as well as general employees [51-54]. Especially, a previous study conducted in four countries – Korea, China, Australia, and Germany – reported that occupational stress, such as job strain, organizational injustice, and effort-reward-imbalance was associated with suicidal ideation [20]. Recently, the association between suicidality and occupational stress such as discrimination, inadequate pay, disruption of sleep, and concern about serious injury was reported among firefighters [19]. However, it has not yet been investigated whether occupational stress from a difficult physical environment of workplace is associated with suicidal ideation in workers. Our findings provide evidence that working in an unsafe environment or suffering from physical danger on duty could heighten the possibility of suicidal ideation in firefighters.

Third, emotional labor as an occupational stress factor had a positive association with suicidal ideation in Korean firefighters. Firefighters have to stay calm and hide their own emotions when they face sickness, death, suicide, and violent accidents. Moreover, it has been reported that Korean firefighters usually suffer from emotional labor due to unreasonable demands from the aggressive or picky civil petitioners, presenting similar experiences with those in customer-service industry [24]. A recent study showed that emotional labor made firefighters vulnerable to mental problem by modulating the effect of traumatic experiences on PTSD symptoms [29]. Based on previous findings, it is possible that the high demand of emotional labor might be a risk factor for suicidal behaviors alone and by exaggerating the severity of PTSD.

The final occupational factor related to suicidal behaviors was the officer as a present job position among firefighters. Officer positions include administrators, special investigators, and communicational and informational system operators. Though firefighters in officer position may have less chance to be

exposed to traumatic experience during work, they may get highly stressed by high administration work load and pressure, less peer support, and lower salary (e.g. lower danger pay) compared with those in fire suppression or EMS.

Among demographic characteristics, we found that female gender was significantly associated with the risk of suicidal ideation in the past year. This finding is consistent with the previous report that the 1-year prevalence of suicidal ideation was greater in females than men [55]. Compared with other OECD countries, there are major gender gaps in earning, labor market participation, and representation in the government of Korea [56]. This gender discrimination in Korean society could partly explain the higher risk of suicidal ideation in female firefighters. Female firefighters may feel relatively more discomfort in the occupational environment with male dominance and patriarchy.

This study has several limitations. First, the cross-sectional design of the study limits its ability to confirm a causal relationship between suicidal ideation and the demographic, occupational, and clinical factors in firefighters. In the future, longitudinal studies should be conducted to confirm the causal relationship found in this study. The current study collected data from a web-based self-reported questionnaire. Self-report assessment has a wide range of tendencies for the participants to respond inaccurately to questions and the recall bias could have possibly influenced the results. Standardized interviews would provide a more accurate and detailed information regarding the prevalence and correlates of suicidal ideation in the population of firefighters. Furthermore, we used a single-item question to assess past-year suicidal ideation and thus, we did not measure a broad spectrum of current and previous suicidal thoughts. Further studies are necessary to investigate suicidal risk and its correlates using a comprehensive assessment of attitudes and behaviors related to suicide in firefighters.

## Conclusion

The 1-year prevalence of suicidal ideation was higher in firefighters than those in the general population. Female gender, divorced/separated/widowed marital status, current duty of an officer, recent traumatic experience, and high level of occupational stress and emotional labor were significant correlates of suicidal ideation in the past year even after controlling the effects of PTSD and depression. These findings suggest that keeping in mind and early detection of these correlates may be important in protecting firefighters from the risk of suicide. Longitudinal studies are needed to determine the causal relationships among these correlates, suicidal ideation, and completed suicide.

## Abbreviations

PTSD: posttraumatic stress disorder ; EMS: emergency medical services; SBQ-R: Suicidal Behavior Questionnaire-Revised; KOSS: Korean Occupational Stress Scale; KELS: Korean Emotional Labor Scale; PCL-5: PTSD Checklist-for the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders; PHQ-9: Patient Health Questionnaire-9; DSM-5 (Diagnostic and Statistical Manual of Mental Disorders, 5th

edition); OR: odds ratio; CI: confidence interval; KECA-R: Korean Epidemiologic Catchment Area Study Replication

## **Declarations**

### **Acknowledgements**

The authors would like to thank Ki Young Na, the Vice Director, and Eun Hee Choi of the office of Humanitarian and Public Healthcare Support, Seoul National University Bundang Hospital. We would like to express our gratitude to the following individuals for their dedication to this study: Jae Dong Hwang, the assistant fire chief and health management team manager; Woo Seok Kim, the fire captain; Kyeong Yeol Park, the fire sergeant; and Jeong Pil Sin, the senior firefighter at the Fire Policy Division in Health Management Team from National Fire Agency. We also would like to deeply thank Jina Park and Kyoung Bok Han from the Gyeonggi Disaster and Safety Headquarters.

### **Authors' contributions**

JK, HP, and JIK were involved in the conceptualization and implementation of the study. HP and SO analyzed the data. HP and JK drafted the manuscript, and BM reviewed the drafts of the manuscript. All authors read and approved the final manuscript.

### **Funding**

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

### **Availability of data and materials**

The datasets used and/or analyzed during the current study are available from the Fire Policy Division in Health Management Team from National Fire Agency of Korea on reasonable request.

### **Ethics approval and consent to participate**

Ethical approval was obtained from the Institutional Review Board of Seoul National University Bundang Hospital (IRB No: X-1807-483-907). As all data was entered in completely anonymized forms, consent to participate was not required.

### **Consent for publication**

As completely anonymized observational data was used (see "Ethics approval and consent to participate"), consent for publication was not required.

### **Competing interests**

The authors declare that they have no competing interests.

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## Tables

Table 1. The demographic, occupational, and clinical characteristics by suicidal ideation in the past year ( $N = 45,698$ )

	N (%) of $M \pm SD$		T or Chi-square
	Suicidal ideation	No suicidal ideation	
Age	43.01 $\pm$ 8.52	42.45 $\pm$ 9.16	$t = 4.31^*$
Sex			
Male	4,344 (89.18)	37,982 (93.03)	$\chi^2=91.42^*$
Female	527 (10.82)	2,845 (6.97)	
Marital status ( $N = 45,606$ )			
Married	3,753 (77.22)	30,813 (75.62)	$\chi^2=98.86^*$
Never married	929 (19.12)	9,195 (22.57)	
Divorced/separated/widowed	178 (3.66)	738 (1.81)	
Religion ( $N = 45,555$ )			
No	3,101 (63.96)	26,532 (65.18)	$\chi^2=2.81$
Yes	1,747 (36.04)	14,175 (34.82)	
Work length (year)	13.93 $\pm$ 8.97	13.30 $\pm$ 9.48	$t = 4.62^*$
Current duty			
Fire suppression	1,968 (40.40)	17,028 (41.71)	$\chi^2=28.68^*$
EMS	1,468 (30.14)	13,203 (32.34)	
Officer	1,435 (29.46)	10,596 (25.95)	
Recent trauma			
No	1,094 (22.46)	16.34 (39.27)	$\chi^2=525.01^*$
Yes	3,777 (77.54)	24,793 (60.73)	
Occupational stress	7.94 $\pm$ 1.62	7.07 $\pm$ 1.65	$t = 35.06^*$
Emotional labor	16.11 $\pm$ 4.66	12.58 $\pm$ 5.04	$t = 49.50^*$
Probable PTSD			
No	4,240 (87.05)	40,256 (98.60)	$\chi^2=2268.95^*$
Yes	631 (12.95)	571 (1.40)	
Probable Depression			
No	4,454 (91.44)	40,683 (99.65)	$\chi^2=2418.02^*$
Yes	417 (8.56)	144 (0.35)	

EMS : Emergency Medical Services; \*  $p < 0.001$

Table 2. Demographic, occupational, and clinical correlates of suicidal ideation in the past year ( $N = 45,555$ )

	B	SE	OR	95% CI	<i>p</i>
Age	0.007	0.002	1.007	1.003 - 1.012	0.002
Sex					
Male (reference)					
Female	0.394	0.056	1.484	1.328 - 1.657	< 0.001
Marital status					
Married (reference)					
Never married	0.000	0.049	1.000	0.909 - 1.101	0.997
Divorced/separated/widowed	0.545	0.095	1.724	1.432 - 2.076	< 0.001
Religion					
No (reference)					
Yes	-0.001	0.034	0.999	0.935 - 1.068	0.984
Current duty					
Fire suppression (reference)					
EMS	-0.271	0.043	0.762	0.701 - 0.829	< 0.001
Officer	0.398	0.044	1.488	1.366 - 1.622	< 0.001
Recent traumatic experience					
No (reference)					
Yes	0.614	0.040	1.847	1.709 - 1.997	< 0.001
Occupational stress	0.175	0.012	1.191	1.164 - 1.219	< 0.001
Emotional labor	0.091	0.004	1.095	1.087 - 1.103	< 0.001
Probable PTSD					
No (reference)					
Yes	1.388	0.069	4.008	3.499 - 4.591	< 0.001
Probable depression					
No (reference)					
Yes	2.188	0.109	8.916	7.201 - 11.039	< 0.001

EMS: Emergency Medical Services; B: regression coefficients; SE: Standard error of regression coefficient; OR: Odd Ratio; CI: Confidence Interval

## Additional Files

**Additional file 1: Table S1.** The list of traumatic events

**Additional file 2: Table S2.** The list of items on the Korean Occupational Stress Scale and the Korean Emotional Labor Scale

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Additionalfile2.pdf](#)
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