

A cross-sectional study on the psychological changes of medical personnel in hospitals who experienced special COVID-19 situations

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Abstract

COVID-19 pandemic led to an increase in psychological problems; health professionals with higher exposure to risk of infection suffer psychological changes. This study aimed to investigate the level of anxiety, anger, and depression among health professionals in COVID-related special circumstances. A mass COVID-19 outbreak occurred in a general hospital in Korea. In total, 149 frontline and non-frontline health professionals involved in this were surveyed. Their anger, anxiety, and depression were assessed using the State-Trait Anger Expression Inventory, General Anxiety Disorder-7, and the Korean Screening Tool for Depressive disorders. By occupation, health professionals showed relatively higher anxiety and depression than non-health professionals. By type of work, frontline staff showed a higher level of depression than non-frontline staff. The results confirmed that healthcare staff underwent psychological changes during the COVID-19 pandemic. It is important to raise awareness on post-traumatic stress disorder affecting health professionals during the COVID-19 pandemic.

Introduction

The coronavirus disease 2019 (COVID-19), a respiratory infection caused by a novel coronavirus (SARS-CoV-2), was first documented in Wuhan, Hubei, China, in December 2019 and has spread globally. As of September 9, 2020, there was a cumulative total of 27.4869 million confirmed cases and 894,900 deaths worldwide¹

In 2003, the outbreak of severe acute respiratory syndrome (SARS) had affected 8,096 patients and led to the death of 774 patients worldwide from November 1, 2002, to July 31, 2003² Of these deaths, 346 were of patients in Taiwan, 105 of whom were health professionals. The pandemic had a tremendous impact on people's daily lives due to stay-at-home policies and school and store closures. Consequently, it provoked mental health problems such as anxiety about infection and depression.

Although COVID-19 has a low mortality rate, several anti-COVID-19 measures have been implemented due to the high infection rate, such as foreign travel bans, shortened restaurant operation hours, prohibition of social gatherings involving five or more people, mandatory use of face masks, social distancing, and two-week mandatory quarantine for people with confirmed infection. Changes in daily life resulting from these prevention measures may impact mental health¹ Moreover, physical and mental suffering from sequelae persist even after recovering from COVID-19, and the persistence of the pandemic may lead to serious health problems⁴.

Post-traumatic stress disorder (PTSD) can also occur among various mental health problems as an aftereffect of large-scale infectious diseases; it is a mental or psychological disorder that manifests following direct or indirect exposure to a shocking traumatic event⁵. A 2005 study on PTSD in 1,394 SARS survivors in Hong Kong reported that 47.8% of the participants had an onset of PTSD at some point after contracting SARS. Some of these survivors continued to suffer from PTSD 30 months after contracting SARS⁶. In addition, a study exploring long-term mental disorders among SARS survivors

reported that most survivors were diagnosed with PTSD after contracting SARS, and many of them also developed other mental disorders, such as panic disorder. These results show that the mental health problems provoked by PTSD following the SARS infection persisted over a long duration⁷.

COVID-19 diagnosis which, either confirms the disease or throws suspicion on individuals and socially stigmatizes them⁸. In particular, a study on PTSD, especially on symptoms such as avoidance and disturbance of sleep among health professionals after an outbreak, Kim and Park (2017)⁹ reported that the professionals such as doctors, nurses, lab specialists handling virus cases, who work most closely with the infection suffer from more severe forms of PTSD. Similarly, studies also examine the relation of PTSD with job-related variables. There is a study on the effects of occupational hazards among social workers¹⁰, and another study examines the physical and mental health and quality of life of firefighters¹¹.

During the beginning of Pandemic in Korea, vaccines were not available and a proper treatment was not found for the globally spreading COVID-19. Healthcare workers are bound to work most closely to the infection, as their work involves making a diagnosis of suspected cases and treating confirmed patients. As their infection risk is also high due to the nature of the virus, health professionals are susceptible to PTSD, including anxiety symptoms.

The majority of health professionals who directly encountered SARS survivors and who suffered from stress¹² have sustained a significant impact on their mental health due to the COVID-19 pandemic. A study reported that the incidence of insomnia was markedly higher among health professionals than among the general population¹³. A previous study that was conducted among health professionals in hospitals that treated Middle East respiratory syndrome (MERS) patients observed that the prevalence of both depression and PTSD symptoms was higher among health professionals than among the general public¹⁴. Nevertheless, previous studies on COVID-19 primarily focused on mental and job stress in health professionals, with some of them examining the impact of special COVID-19 circumstances, such as a mass outbreak within a hospital and PTSD among health professionals.

In February 2021, there was a mass outbreak of COVID-19 inpatient wards from the seventh to the ninth floors of the main building of a general hospital in Seoul¹⁵, and meticulous frontline tracing was performed on health professionals, patients, family caregivers, and paid caregivers for more than a month to screen close frontline individuals and confirmed patients. A total of 218 patients were diagnosed with the infection.

Thus, the present study aimed to investigate the effects of this incident on the healthcare and non-healthcare staff. In particular, the healthcare staff was divided into frontline health professionals and non-frontline health professionals to compare their levels of anxiety, anger, and depression. We hypothesized that frontline staff would display a higher level of anxiety, depression, and anger than non-frontline staff.

Methods

Participant selection

The study setting is a government-designated safety hospital that transports and treats COVID-19 patients. The study population comprised staff of this hospital, who were divided into frontline healthcare staff, frontline non-healthcare staff, non-frontline healthcare staff, and non-frontline non-healthcare staff. We undertook a survey using questionnaires that assessed their psychological changes during the COVID-19 period.

A total of 149 participants were enrolled, including 85 frontline healthcare, 39 frontline non-healthcare, 13 non-frontline healthcare, and 12 non-frontline non-health care staff members. The study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. The study was approved by the Soonchunhyang University Hospital Institutional Review Board [No. 2020-05-015]. For all studies related to human subjects, freely given written informed consent was obtained from participants.

Survey method

After selecting the participants, the questionnaires were delivered directly to each group, with objectives and instructions for the survey. The self-report questionnaire was completed between March 22 and March 29, 2021.

Survey contents

The survey assessed the levels of frustration, anger, and anxiety and the changes in participants' concentration and sensitivity during the pre-COVID-19 period. Furthermore, as for those who had been quarantined or treated for COVID-19, we asked them about major symptoms, whether they had talked to their family or friends via video calls or text messages during quarantine or treatment, and whether they had played online games, exercised, or engaged in other activities during quarantine or treatment.

In addition, data on general characteristics, such as cohabiting with family members during the COVID-19 period (minor child or elderly members ≥ 65 years), psychiatric counseling and treatment history, chronic disease, and loss of income due to COVID-19 were also collected to analyze whether these factors had an impact.

Instruments

State-Trait Anger Expression Inventory (STAXI)

We used the Korean version of the STAXI (STAXI-K). It contained 10 items asking about participants' mood, such as feelings associated with COVID-19, and each item was rated on a four-point scale consisting of 1 "never," 2 "sometimes," 3 "frequently," and 4 "always." The total score ranged from 0 to 40, with the range close to 40 meaning higher levels of anger and the range close to 0 meaning lower levels. The cutoff line set for anger was over to 14 in this study.

Generalized Anxiety Disorder 7-item Scale (GAD-7)

The GAD-7 was used to measure anxiety symptoms and severity. The scale comprised seven items inquiring about participants' experiences related to becoming agitated, easily frustrated, or afraid due to COVID-19, and each item was rated on a four-point scale consisting of 1 "never," 2 "a few days," 3 "more than half of the time," and 4 "almost every day." The total score ranged from 0 to 28, with a higher score indicating greater anxiety due to COVID-19. The cutoff for anxiety was set at 10 in this study.

Korean Screening Tool for Depressive disorders (K-DEP)

The K-DEP was used to measure depression. This scale comprises 12 items about the severity of depression-related symptoms, such as depressed mood, reduced concentration, and attachment to life. Each item is rated on a five-point scale consisting of 1 "not at all true," 2 "slightly true," 3 "moderately true," 4 "considerably true," and 5 "extremely true." The total score ranged from 0 to 60, with a higher score indicating greater depression due to COVID-19. The cutoff for depression was set at 10 in this study.

Data processing and statistical analysis

Participants' characteristics were derived as frequencies and percentages. The differences between quarantined and non-quarantined staff were analyzed using the chi-squared test, and the differences in anger, depression, and anxiety among job groups were analyzed using analysis of variance (ANOVA) followed by Bonferroni post-hoc analysis. All statistical analyses were performed using R version 4.0.5, and statistical significance was set at < 0.05 for a two-tailed test.

Results

The study population comprised 52 individuals aged 20–29 years (34.9%), 56 individuals aged 30–39 years (37.6%), 26 individuals aged 40–49 years (17.5%), and 15 individuals aged 50–59 years (10.1%). Twenty-three patients were men (15.4%), and 126 were women (94.6%). Household size was classified on the basis of 1 ($n = 49$, 32.9%), 2 ($n = 34$, 22.8%), 3 ($n = 36$, 24.2%), 4 ($n = 20$, 13.4%), or 5 ($n = 10$, 6.7%) members. Forty-three lived with a minor child (28.9%), while 21 lived with an elderly member aged–65 years and over (14.1%).

The types of chronic diseases reported were hypertension ($n = 5$, 3.4%), hyperlipidemia ($n = 3$, 2.0%), pulmonary disease ($n = 1$, 0.7%), allergy ($n = 5$, 3.4%), and other ($n = 3$, 2.0%). Three patients (2.0%) took psychiatric counseling, and two (1.3%) took antipsychotic medications. Twenty-one patients (14.1%) had a partial loss of income due to COVID-19, and 37 (24.8%) had been under self-quarantine in Table 1.

Table 1

Demographic and general characteristics of the study population (n = 149). Values are presented as number (%) Chronic disease divided multiple selection

Variables/Questionnaire	Categories/Answer	Values
Age (years)	20s	52(34.9)
	30s	56(37.6)
	40s	26(17.5)
	50s	15(10.1)
Gender	Male	23(15.4)
	Female	126(84.6)
Household size	1	49(32.9)
	2	34(22.8)
	3	36(24.2)
	4	20(13.4)
	≥ 5	10(6.7)
Cohabitation with a minor child	Yes	43(28.9)
	No	106(71.1)
Cohabitation with an elderly aged 65 years and over	Yes	21(14.1)
	No	128(85.9)
Chronic disease ^a	Hypertension	5(3.4)
	Hyperlipidemia	3(2.0)
	Pulmonary disease	1(0.7)
	Allergy	5(3.4)
	Other	3(2.0)
Psychiatric counseling	Yes	3(2.0)
	No	146(98.0)
Use of antipsychotic medications	Yes	2(1.3)
	No	147(98.7)
Loss of income	Yes	21(14.1)
	No	128(85.9)

Variables/Questionnaire	Categories/Answer	Values
Self-quarantine	Yes	37(24.8)
	No	112(75.2)

There were no differences in anger among the four groups of staff ($p = 0.11$), but levels of anxiety ($p = 0.01$) and depression ($p < 0.05$) differed among them. There were no statistically significant differences in anger, anxiety, and depression between the quarantined and non-quarantined groups ($p = 0.7$) in Table 2.

Table 2
ANOVA results of participants' responses to the anger, depression, and anxiety surveys by quarantine type. Values are mean \pm standard deviation, unless otherwise stated.

Categories	Variables	Anger	Anxiety	Depression
		STAXI	GAD-7	K-DEP
Position	Frontline healthcare staff	16.2 \pm 6.8	4.7 \pm 4.8	8.9 \pm 9.4
	Non-frontline healthcare staff	14.2 \pm 7.6	3.3 \pm 3.9	3.8 \pm 4.3
	Frontline non-healthcare staff	14.5 \pm 5.8	2.9 \pm 4.9	4.8 \pm 7.0
	Non-frontline non-healthcare staff	12.5 \pm 2.0	2.7 \pm 3.1	3.8 \pm 4.4
	p-value	0.11	0.01**	< .001***
Self-quarantine	Yes	15.6 \pm 6.5	4.1 \pm 4.6	7.1 \pm 7.2
	No	15.1 \pm 6.4	3.8 \pm 4.7	6.7 \pm 8.7
	p-value	0.7	0.7	0.7
^a STAXI: State-Trait Anger Expression Inventory;				
^b GAD-7: Seven-Item Generalized Anxiety Disorder Scale;				
^c K-DEP: Korean Screening Tool for Depressive disorder				

To analyze the differences by job group and type of work, we compared frontline and non-frontline staff and healthcare and non-healthcare staff. There were no statistically significant differences between frontline healthcare staff and frontline non-healthcare staff ($p > 0.05$) who had direct contact with patients. However, frontline healthcare staff displayed a statistically significant higher level of depression than frontline non-healthcare staff ($p = 0.006$).

There were no statistically significant differences in anger, anxiety, and depression between non-frontline healthcare staff and non-frontline non-healthcare staff who did not have direct contact with patients ($p > 0.05$). In terms of job group, there were no significant differences in anger between healthcare and non-healthcare staff ($p = 0.066$). However, healthcare staff showed statistically significant higher anxiety ($p =$

0.037) and depression ($p = 0.005$) than non-healthcare staff. In terms of the type of work, there were no statistically significant differences in anger and anxiety between frontline (healthcare/non-healthcare) and non-frontline (healthcare/non-healthcare) staff ($p > 0.05$), but depression ($p = 0.002$) was statistically significantly higher among frontline staff who had direct contact with patients in Table 3.

Table 3
ANOVA results of participants' responses to the anger, depression, and anxiety surveys by job type. Values are mean \pm standard deviation, unless otherwise stated.

Categories	Variables	Anger	Anxiety	Depression
		STAXI	GAD-7	K-DEP
Position	Frontline healthcare staff	16.2 \pm 6.8	4.7 \pm 4.8	8.9 \pm 9.4
	Frontline non-healthcare staff	14.5 \pm 5.8	2.9 \pm 4.9	4.8 \pm 7.0
	p-value	0.139	0.05	0.006
	Frontline non-healthcare staff	14.2 \pm 7.6	3.3 \pm 3.9	4.8 \pm 7.0
	Non-frontline non-healthcare staff	12.5 \pm 2.0	2.7 \pm 3.1	3.8 \pm 4.4
	p-value	0.450	0.661	0.964
	Healthcare staff	15.9 \pm 6.9	4.5 \pm 4.7	8.2 \pm 9.0
	Non-healthcare staff	14.0 \pm 5.2	2.8 \pm 4.5	4.6 \pm 6.5
	p-value	0.066	0.037	0.005
	Frontline staff	15.6 \pm 6.5	4.0 \pm 4.9	7.5 \pm 8.8
	Non-frontline staff	13.4 \pm 5.5	3.0 \pm 3.5	3.8 \pm 4.3
	p-value	0.082	0.207	0.002
STAXI: State-Trait Anger Expression Inventory.				
GAD-7: Seven-Item Generalized Anxiety Disorder Scale.				
K-DEP: Korean screening Tool for Anxiety disorders.				

There were no statistically significant differences in anger, anxiety, and depression between the quarantined and non-quarantined groups ($p > 0.05$). Based on a cutoff of 14 or higher for anger (STAXI-K), 18 (48.6%) in the quarantined group and 48 (42.9%) in the non-quarantined group experienced anger. Based on a cutoff of 10 or higher for anxiety (GAD-7), 3 (8.1%) in the quarantined group and 14 (12.5%) in the non-quarantined group experienced anxiety. Based on a cutoff of 14 for depression (K-DEP), 5 (13.5%) in the quarantined group and 21 (18.8%) in the non-quarantined group experienced depression in Table 4.

Table 4
The prevalence of anger, anxiety, and depression based on cutoff scores.
Values are n (%) unless otherwise stated.

	Quarantined (n = 37)	Non-quarantined (n = 112)	p-value
Anger	18(48.6)	48(42.9)	0.7
Anxiety	3(8.1)	14(12.5)	0.6
Depression	5(13.5)	21(18.8)	0.7

Discussion

Main finding of this study

This study investigated differences in the levels of anger, depression, and anxiety by job group and type of work among healthcare professionals engaged in different capacities in the context of a COVID-19 mass outbreak in a general hospital. Results indicated that anger did not significantly differ according to job group and the type of work. Anxiety was higher among healthcare staff than among non-healthcare staff. Moreover, depression was higher among frontline healthcare staff than among non-frontline healthcare staff.

What is already known on this topic

A study of nursing staff who provided direct care with MERS (Middle East respiratory syndrome) patients reported 22.2% of PTSD and 27.8% of partial PTSD¹⁶. A study on the mental health of COVID-19 healthcare providers reported that approximately 29% of the participants displayed extreme tension, depression, and anxiety, while 2.2–14.5% of them developed stress-related mental health problems¹⁷.

Psychological changes among healthcare personnel in a hospital that suffered a mass outbreak should be discussed from various perspectives. First, since the presence of an index patient within the facility and the subsequent spread of the infection is beyond control, with difficulties in halting the spread of the infection even if response measures are implemented immediately after its onset, healthcare personnel may develop a sense of helplessness as a result. Second, while healthcare staff fully dedicate themselves to promoting the public's health by striving to treat and prevent the spread of the infectious disease, they may develop depression and diminished confidence due to the stigma linked to potential COVID-19 exposure. Moreover, their concerns and fear of contracting the infection themselves, and also spreading it to their family or people around them, must also be taken into consideration.

What this study adds

The findings of this study present significant social implications, denoting that society must pay attention to the possibility of PTSD among healthcare workers during an epidemic or pandemic, such as COVID-19, and that a viable management system must be developed to address the condition. First, to

promote a system for early detection, treatment, and management of mental health problems among health care providers, PTSD of medical workers after COVID-19 is to be publicized. To eliminate restrictions on promotions at work due to prejudice such as social stigma against mentally ill people, or prejudice against family and relatives, PTSD is to be considered as no longer an individual problem but as a social problem, requiring various institutional and policy changes and support.

Second, the government should lead efforts and collaborate with healthcare organizations to develop a self-evaluation app and care and management system for PTSD among COVID-19 healthcare staff. This would enable the active monitoring as well as early detection and treatment of COVID-19-induced PTSD among healthcare workers.

Third, self-evaluation should be further promoted to develop big data according to job group and the type of work and to acquire data of specific cases, based on which professional opinions and treatment modalities should be developed in collaboration with diverse specialists and healthcare providers. These data should be utilized to continually upgrade the system.

One of the limitations of this study is that we could not include diverse professionals and types of work, such as medical faculty and nurses who worked in the COVID-19 screening center, according to various factors, such as the regulations of infection control in hospitals. Subsequent studies should attempt to develop a viable PTSD measurement and management system tailored to the job features of healthcare workers in various specialties, such as surgery and internal medicine.

This study surveyed and statistically analyzed the levels of anxiety, anger, and depression in healthcare staff exposed to a special COVID-19-related situation, namely, a mass outbreak of the infection in a general hospital. However, we did not use a questionnaire to survey the level of psychological recovery, such as the Conner-Davidson Resilience Scale (CD-RISC). Additionally, because of the cross-sectional nature of our study, we could not establish a causal relationship between the mass outbreak and healthcare workers' anxiety, anger, and depression. For this reason, we have a plan to conduct a follow-up survey on the same group.

Changes in PTSD among healthcare providers, particularly frontline healthcare providers who are at an elevated risk for PTSD due to the nature of their professional role, should be actively monitored during epidemics and pandemics such as SARS, MERS, and COVID-19. Moreover, proactively providing periodic psychological counseling, places of rest, periodic job training for those with high infection risk, implementing shortened work hours as well as establishing a special support team, as necessary, may also be effective measures.

Despite these limitations, the results of this study are useful as baseline data for research on the psychological changes that healthcare workers could experience in special situations, such as a mass outbreak of COVID-19 in a single facility.

Declarations

Data availability

The datasets generated and/or analysed during the present study are available from the corresponding author upon reasonable request,

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Author contributions

The authors contributed to the manuscript equally.

Competing interests

The authors declare no competing interests.

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Tables

Table 1 Demographic and general characteristics of the study population (n=149). Values are presented as number (%) Chronic disease divided multiple selection

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Table 2 ANOVA results of participants' responses to the anger, depression, and anxiety surveys by quarantine type. Values are mean \pm standard deviation, unless otherwise stated.

Categories	Variables	Anger	Anxiety	Depression
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	p-value	0.11	0.01**	<.001***
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	p-value	0.7	0.7	0.7

^a STAXI: State-Trait Anger Expression Inventory;

^b GAD-7: Seven-Item Generalized Anxiety Disorder Scale;

^c K-DEP: Korean Screening Tool for Depressive disorder

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	Non-frontline non-healthcare staff	12.5±2.0	2.7±3.1	3.8±4.4
	p-value	0.450	0.661	0.964
	Healthcare staff	15.9±6.9	4.5±4.7	8.2±9.0
	Non-healthcare staff	14.0±5.2	2.8±4.5	4.6±6.5
	p-value	0.066	0.037	0.005
	Frontline staff	15.6±6.5	4.0±4.9	7.5±8.8
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Table 4 The prevalence of anger, anxiety, and depression based on cutoff scores. Values are n (%) unless otherwise stated.

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Anxiety	3(8.1)	14(12.5)	0.6
Depression	5(13.5)	21(18.8)	0.7