

<https://doi.org/10.33472/AFJBS.6.9.2024.3734-3750>



African Journal of Biological Sciences

Journal homepage: <http://www.afjbs.com>



Research Paper

Open Access

Mental Health of Public Healthcare Personnel During the Pandemic: Focusing on Depression, Anxiety, and Trait Anger

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Volume 6, Issue 9, 2024

Received: 09 March 2024

Accepted: 10 April 2024

Published: 20 May 2024

[doi:10.33472/AFJBS.6.9.2024.3734-3750](https://doi.org/10.33472/AFJBS.6.9.2024.3734-3750)

Abstract: This descriptive research study identifies the mental health status of public health personnel and verifies differences in their mental health according to their sociodemographic characteristics during the coronavirus disease (COVID-19) pandemic. The participants were 117 public health personnel in Korea, including health professionals, medical technicians, and nurses; data were collected from October 1 to 31, 2022. Based on the cut-off points for depression and anxiety, the study results show levels of mild depression at 12.0%; moderate depression at 6.0%; severe depression at 1.7%; mild anxiety at 31.6%; moderate anxiety at 4.3%, and severe anxiety at 4.3%. The higher the level of depression, the higher the level of anxiety and trait anger; and the higher the level of anxiety, the higher the level of trait anger. Among the participants, 19.7% and 13.7% had thoughts about wanting to die in the past year, because of the COVID-19 situation, respectively. When the participants experienced stress or psychological pain, 23.1% had no way to relieve it and did not express it. Among those who described their thoughts, one participant expressed a desire for "self-injury." In addition, 83.8% expressed the need for mental health services to help with psychological distress caused by the pandemic. Moreover, 47.0% wanted to receive counseling, psychological treatment, or help for stress or psychological pain in the past year. The results indicate that the COVID-19 pandemic affected the participants' depression, anxiety, and trait anger; -thus, measures are needed to manage their depression and anxiety and prevent these from turning into anger. Hopefully, public perception of public health professionals will change and plans will be put in place for mental health management and the development of various programs so that during any future pandemic, the mental health of such critical personnel can be better supported.

1. Introduction

Coronavirus disease (COVID-19) is a novel infectious disease that began in December 2019 with an outbreak of mass pneumonia of unknown cause in Wuhan City, Hubei Province, China. At the time, it was referred to as a novel COVID-19 owing to the lack of information and data on the virus. However, around February 2020, the World Health Organization (WHO) designated it as COVID-19. Simultaneously, the Korea Centers for Disease Control and Prevention named it Coronavirus infection-19 (Corona-19).

The WHO had declared COVID-19 a Public Health Emergency of International Concern (PHEIC) on January 30, 2020, citing its serious public health impact and high risk of cross-country transmission [1]. Due to the prolonged COVID-19 pandemic, average depression and anxiety in major Organization for Economic cooperation (OECD) countries have increased more than threefold, with Korea ranking first in depression and fourth in anxiety among 15 OECD countries [2]. In one COVID-19 study, 60.2% of the participants expressed anxiety, 21.6% expressed anger, 3.7% expressed sadness, and 1.7% expressed hatred, largely caused by disconnection and a lack of communication [3].

The fears and stressors that have persisted during the COVID-19 pandemic have caused long-term problems for individuals and families in many communities. These raise the possibility of intensified emotional states, such as anger and aggression, toward the government and frontline workers, distrust of information from the government and other authorities, and negative consequences, such as anger and aggression in the community. As a result, frontline workers have experienced additional stress during the pandemic. This includes constant tension and vigilance due to strict disease prevention measures [4], the burden put on related work from the beginning of the epidemic, and fear of infection from screening tests, caring for confirmed patients, and quarantine measures, among other aspects. These have added to other daily life tensions and stressors [5]. AI has the potential to revolutionize the field of physiological well-being by providing personalized mental health support, facilitating remote counseling and therapy, predicting mental health risks, and building community resilience in the face of disaster experiences. By leveraging AI technologies effectively, individuals and communities can better navigate the challenges of infectious disease disasters and emerge stronger and more resilient in the aftermath [6].

Mental responses to disaster experiences can be divided into primary and secondary stressors. Primary stressors include witnessing someone's death or injury due to a disaster or feeling threatened and fearful. Secondary stressors include indirect experiences that persist for a long time, even after an event ends, and cause mental health problems [7]. An infectious disease disaster is a biological disaster that creates experiences with social isolation due to the infection, distancing to prevent disease transmission, and the severance of interpersonal relationships [8]. In this situation, fear for the safety of loved ones becomes evident among frontline workers who are in charge of quarantines. Consequently, they become more afraid of infecting their family members than they are of being infected [9]. Currently, COVID-19 has subsided to some extent; however, there is no guarantee that a similar pandemic will not occur in the future.

To prepare for this future, more information is needed on the state of the mental health of public health personnel in charge of screening tests, caring for confirmed cases, and quarantine measures. Public health personnel are technically public officials, different from those in general administration [10], who are in charge of environmental sanitation, food sanitation, public health, occupational health, and quarantine. Hyun et al. [10] compared job stress, health promotion behaviors, and quality of life between health and administrative personnel and showed that job stress was higher and quality

of life was lower for health personnel than for administrative personnel. After examining the results of the mental health status of public health personnel and analyzing the relationships between the variables, we intend to use this information to recommend the development of a mental health service program for such personnel in the future.

To investigate the mental health status of public health personnel in Korea during the COVID-19 pandemic, we proceeded as follows. First, we identified the degrees of depression, anxiety, and trait anger among the public health personnel. Next, we examined differences in their degrees of depression, anxiety, and trait anger according to their general characteristics. Finally, we identified any correlations between the variables—depression, anxiety, and trait anger.

2. Theoretical Background

2.1. Public health officials

Public health personnel are public professionals in technical positions different from general administration [10]. They are responsible for environmental sanitation, food sanitation, public health, and industrial health, along with administrative work at each agency under the Ministry of Health and Welfare, public health centers, district offices, hospitals, and medical centers in Korea. They are in charge of duties such as citizen health and quarantines. During the COVID-19 pandemic, public health professionals have been responsible for guidance on quarantine rules for restaurants and bars, publicity and inspection of compliance, epidemiological investigation of COVID-19 confirmed cases and contacts, and the identification and management of self-quarantined people. Information on, publicity of, and inspection of quarantine rules for Korea vary depending on the stage of social distancing. Because of the nature of the facilities under review, their work is often performed independently at night, which can constrain their personal lives.

2.2. COVID-19

Since COVID-19's in Wuhan, China, in December 2019, it spread throughout China and worldwide. On May 11, 2019, the WHO declared a pandemic (global pandemic) for the third time in history, following the Hong Kong flu in 1968, and the swine flu in 2009. In Korea, on February 23, the infectious disease crisis alert [interest (overseas epidemic) → caution (inflow into the country) → alert (limited spread in the country) → serious (national spread)] was raised from “alert” to “serious,” the highest level. To prevent community transmission, the Korean government recommended social distancing as of March 22, 2019.

In disaster situations, such as the COVID-19 pandemic, people often experience psychological issues, including anxiety and fear. During “social distancing,” the term “Corona blue” emerged as an issue. This was coined to combine “Corona-19” and “depression (blue).” It refers to depression or lethargy caused by changes in daily life due to the prolonged COVID-19 pandemic. This phenomenon appeared as restrictions on daily life increased, such as reduced interactions with other people and more time spent at home alone [5]. Since “Corona blue” could increase suicidal tendencies, people needed to be made aware of the “warning signals” to prevent such outcomes [11].

2.3. Mental health

2.3.1. Depression

Depression is a state of sadness or loss of interest in previously enjoyed activities [12]. It has been found that when depressive symptoms suddenly appear, the events that cause serious stress occur before such symptoms [13].

People on the frontline, such as the corona quarantine, have been under pressure for a long time from a sense of responsibility and mission. According to a survey of quarantine personnel at public

health centers in Korea, the risk of depression was over 33% and fatigue increased due to prolonged COVID-19, resulting in burnout syndrome. Thus, there is a pressing need to prepare a plan that supports those in the field through psychological counseling [11].

2.3.2. Anxiety

Frontline workers have been under additional stress during the pandemic. They have had to follow strict procedures that create constant tension, including being vigilant and acting spontaneously and autonomously, while recognizing that isolation makes it difficult to provide comfort to those who are sick or in danger [14]. In addition, from the beginning of the COVID-19 pandemic, there has been the added burden of being asked to handle COVID-19-related work and the fear of infection. Tension and stress became more prevalent as such personnel worked on screening tests, cared for confirmed patients and managed quarantine measures and disease control tasks. Through this process, frontline workers were often more afraid of infecting their family members than themselves [9]. Such anxiety can lead to changes in sleeping or eating patterns, difficulty in concentrating as well as changes in daily life, such as the increased use of drugs and tobacco [15]. In these circumstances, frontline workers, such as health professionals, need to take care of themselves and maintain a balanced view of the situation. They need to find ways to dispel their anxieties and take reasonable measures to protect themselves by distinguishing between what they can and cannot control.

2.3.3. Trait anger

Anger is an unpleasant emotion resulting from the realization that one's desires are frustrated or considered socially unjust [16]. Anger can be divided into a state of anger and trait anger. Trait anger is an individual's general tendency towards anger and is the difference between individuals who experience anger more readily and those who do not. Trait anger intensifies one's state of anger easily and is closely related to the expression of dysfunctional anger [10]. Thus, how one expresses anger is important. It is an important concept in measuring an individual's experience with anger [17].

During the height of the COVID-19 pandemic, there was excessive anger and disgust towards confirmed patients, and cases of "Corona red" (anger due to stress overload caused by the prolonged COVID-19 pandemic) increased [5]. To reduce Corona red and avoid such anger during future pandemics, society needs to find ways to reduce excessive anxiety about such diseases based on scientific evidence while changing quarantine strategies. Additionally, plans need to be put in place for increasing socioeconomic activities on the premise of responsible personal hygiene management [18].

3. Methods

3.1. Research design

In our study, we first identified levels of depression, anxiety, and characteristic anger in public health personnel. We then verified differences in their levels of depression, anxiety, and anger according to their sociodemographic characteristics.

3.2. Research participants

Participants were health professionals, medical technicians, and nursing staff working at health centers and district offices in 15 districts in Busan Metropolitan City, Korea. The minimum sample size required for the F test was calculated using the G* Power software (G* Power 3.1.9.2, Heinrich-Heine-University, Düsseldorf, Germany). When the significance level was 0.05, the effect size 0.30, and the power 0.80, the required sample size was at least 82. Therefore, we set the number of participants at 100, considering a dropout rate of 20%. We collected data from 120 participants, and

used responses from 117 for our final measurement analysis, after excluding three who responded insincerely to the main measurement values.

3.3. Data collection

We collected our data at 15 district public health centers and district offices in Busan Metropolitan City, Korea from October 1 to 31, 2022. We visited each public health center and district office, explained the purpose of the study to the potential participants, promised anonymity and confidentiality, and obtained written consent from those who chose to participate. The questionnaires were collected immediately after the responses were completed. It took about 10 to 15 minutes to fill out the questionnaire, and a gift certificate worth 10,000 won was provided as a token of appreciation.

3.4. Ethical considerations

Our study received ethical approval from the Bioethics Committee of Dongseo University (approval number 1041493-A-2022-00). As per the approval, the collected data would not be used for purposes other than the research; participants would be informed that they could terminate their participation at any time; all personal information would be treated anonymously during the analysis process; and the collected data would be stored in a password-protected site where only the researchers could access it.

3.5. Research tools

3.5.1. Depression

To measure the level of depression among public health personnel, we used the PHQ-9 (Patients Health Questionnaire-9) developed by Spitzer, Kroenke, and Williams [19], along with the “Korean version of the Depression Screening Tool” standardized by An et al. [20]. The PHQ-9 comprises nine questions that emotions and behaviors over the past two weeks, with the score for depression ranging from 0 to 27 on a four-point Likert-type scale (0=not depressed to 3=very depressed). A score of 10 or higher, 15 or higher, and 20 or higher indicates mild, moderate, and severe depression, respectively. In the study by An et al. [20], Cronbach’s α was 0.91, and in our study, Cronbach’s α was 0.84.

3.5.2. Anxiety

To measure the level of anxiety among public health personnel, Spitzer et al. [21] found that the Generalized Anxiety Disorder items, included in the Diagnostic and Statistical Manual of Mental Disorders, fourth edition, had a high correlation with existing anxiety items. The Generalized Anxiety Disorder-7 (GAD-7) uses seven items and has been adapted and distributed free of charge by Kim [21]. The responses are rated on a four-point Likert-type scale (0=not anxious to 3=very anxious), with scores ranging from 0 to 21 for anxiety. A score of 5 or higher, 10 or higher, and 15 or higher indicates mild, moderate, and severe anxiety, respectively. At the time of its development, assessing its reliability, Cronbach’s α was 0.89, Cronbach’s α was 0.86 in the study by Kim [21], and Cronbach’s α was 0.91 in our study.

3.5.3. Trait anger

For measuring the level of trait anger, we used the State-Trait Anger Expression Inventory

(STAXI) developed by Spielberger [23] and translated and modified into Korean by Chon et al. [24]. A 10-item characteristic anger scale measures general anger tendencies. The responses are rated on a four-point Likert-type scale (1=almost never to 4=always), with trait anger scores ranging from 10 to 40 points; higher scores indicate higher levels of trait anger. In the study by Chon et al. [24], assessing reliability, Cronbach’s α was 0.82 and in our study, Cronbach’s α was 0.92.

3.6. Data analysis

We used IBM SPSS software version 25.0 (IBM Corp., Armonk, NY, USA) in our study. The analysis method was as follows. First, the demographic and job-related characteristics of the participants were investigated using real numbers and percentages. Second, their degrees of depression, anxiety, and trait anger were analyzed using means and standard deviations. Third, a t-test and analysis of variance (ANOVA) were used to test the differences in the degrees of depression, anxiety, and trait anger according to their sociodemographic and job-related characteristics. Fourth, the relationships between participants’ depression, anxiety, and trait anger were analyzed using Pearson’s correlation coefficients.

4. Results

4.1. Sociodemographic characteristics

The participants’ sociodemographic characteristics are listed in Table 1.

Table 1. Participants’ sociodemographic characteristics

Variables	N (%)	
Gender	Male Female	15 (12.8) 102 (87.2)
Age (year)	20~29 30~39 40~49 50 years or more	36 (30.8) 43 (36.8) 16 (13.7) 22 (18.8)
Public career (years)	Less than 1 year More than 1 year and less than 3 years More than 3 years and less than 5 years More than 5 years and less than 10 years More than 10 years and less than 20 years More than 20 years and less than 30 years Over 30 years	19 (6.2) 32 (27.4) 16 (13.7) 16 (13.7) 12 (10.3) 15 (12.8) 7 (6.0)
Job type	Health professional Medical technician Nursing job	46 (39.3) 30 (25.6) 41 (35.0)
Current responsibility†	Infectious disease response Pharmacy management Health promotion Checkup Mental health Food hygiene Family health Dementia policy project Health care Public health Infant support project	87 (74.4) 11 (9.4) 7 (6.0) 3 (2.6) 2 (1.7) 2 (1.7) 1 (0.9) 1 (0.9) 1 (0.9) 1 (0.9) 1 (0.9) 1 (0.9)

The most stressful task†	None Responding to complaints related to COVID-19 Structural issues related to COVID-19 work Others	8 (6.8) 77 (65.8) 8 (6.8) 24 (20.5)
Presence of a confirmed case of COVID-19‡	None I was a confirmed patient in the past. A family member has been a confirmed case in the past. A family member is undergoing treatment. A friend or acquaintance was a confirmed case in the past. A friend or acquaintance is in treatment. A work colleague was a confirmed case in the past. A co-worker is currently undergoing treatment.	4 (3.4) 77 (24.1) 89 (27.8) - 70 (21.9) 1 (0.3) 75 (23.4) 4 (1.3)
Anxiety caused by COVID-19	Not anxious A little anxious Very anxious	79 (67.5) 37 (31.6) 1 (0.9)
Depression due to COVID-19	Not depressed A little depressed Very depressed	65 (55.6) 48 (41.0) 4 (3.4)
Stress due to COVID-19	I don't feel any stress at all. I don't feel stressed. Feeling moderately stressed. Feeling stressed. Feel very stressed.	12 (10.3) 16 (13.7) 41 (35.0) 37 (31.6) 11 (9.4)
Degree of disruption to daily life due to COVID-19	No trouble at all. No trouble. Moderate. There is a problem. Very disturbing.	9 (7.7) 18 (15.4) 37 (31.6) 38 (32.5) 15 (12.8)
Changes in sleep quality due to COVID-19	Got very good. Got better. No change. Got worse. Got very bad.	- - 74 (63.2) 36 (30.8) 7 (6.0)
Thoughts of wanting to die in the past year	Yes No	23 (19.7) 94 (80.3)
Thoughts of wanting to die because of the COVID-19 situation	Yes No	16 (13.7) 101 (86.3)
How to relieve stress or psychological pain‡	Talk to co-workers. Talk to boss. Immerse in hobbies. Have a drink. Talk with family. Rely on religion. Keep it to myself and don't express it. There is no particular solution. Other (counseling in the workplace, talk to my lover, sleep, self-harm)	57 (24.9) 3 (1.3) 35 (15.3) 36 (15.7) 52 (22.7) 9 (3.9) 13 (5.7) 14 (6.1) 10 (4.4)
The need for mental health services to help with psychological distress due to the COVID-19 situation.	No need at all. Generally not needed. Generally required. Very needed.	- 19 (16.2) 76 (65.0) 22 (18.8)
A feeling of needing counseling, psychotherapy, or help for stress or psychological distress over the past year.	Yes No	55 (47.0) 62 (53.0)
Experience using services to care for your own mental health due to COVID-19. ‡	None. Personal Internet browsing or mobile phone application experience.	84 (69.4) 13 (10.7)

	Experience in using services provided by the government and public.	9 (7.4)
	Psychological counseling experience in medical institutions.	12 (10.7)
	Other (tarot, temple stay, counseling in the workplace)	2 (1.8)

†self-written

‡duplicate response

4.2. Degrees of depression, anxiety, and trait anger

On examining the cut-off points for depression and anxiety among the participants: mild depression was 12.0%, moderate depression was 6.0%, and severe depression was 1.7%; furthermore, mild anxiety was 31.6%, and moderate anxiety and severe anxiety were 4.3% each. The degree of trait anger was 18.65 (5.99) (see Table 2).

Table 2. Degrees of depression, anxiety, and trait anger

Variables	Min-Max	M (SD)	Item Mean	Range	Cut-off point (n, %)	
Depression	0-24	6.33 (4.72)	0.70	10~40	Mild depression	14 (12.0)
					Moderate depression	7 (6.0)
					Severe depression	2 (1.7)
Anxiety	0-19	4.44 (4.08)	0.63	5~25	Mild anxiety	37 (31.6)
					Moderate anxiety	5 (4.3)
					Severe anxiety	5 (4.3)
Trait anger	10-36	18.65 (5.99)	1.87	24~96		

4.3. Depression according to general characteristics

Table 3 shows the degree of depression according to participants' sociodemographic characteristics.

Table 3. Depression according to participants' sociodemographic characteristics

Characteristics	Categories	Depression		
		M (SD)	t or F	p
Anxiety caused by COVID-19	Not anxious.	5.61 (4.46)	3.40	0.037
	A little anxious.	7.73 (4.99)		
	Very anxious.	12.00		
Stress due to COVID-19	I don't feel any stress at all. ^a	6.33 (5.82)	3.95	0.005 a,d,e>b,c
	I don't feel stressed. ^b	5.06 (3.40)		
	Feeling moderately stressed. ^c	4.98 (3.13)		
	Feeling stressed. ^d	7.14 (5.21)		
	Feel very stressed. ^e	10.55 (5.99)		
Degree of disruption to daily life due to COVID-19	No trouble at all.	5.44 (5.13)	2.69	0.035
	No trouble.	6.33 (3.97)		
	Moderate.	4.57 (3.12)		
	There is a problem.	7.55 (5.91)		
	Very disturbing.	8.13 (4.19)		
Changes in sleep quality due to COVID-19	Got very good.	-	7.36	0.001 b,c>a
	Got better.	-		
	No change. ^a	5.23 (3.95)		
	Got worse. ^b	7.75 (4.77)		
	Got very bad. ^c	10.71 (7.74)		
Thoughts of	Yes	8.96 (4.99)	9.45	0.003

wanting to die in the past year.	No	5.69 (4.46)		
Thoughts of wanting to die because of the COVID-19 situation.	Yes No	9.38 (5.15) 5.85 (4.50)	8.14	0.005
A feeling of needing counseling, psychotherapy, or help for stress or psychological distress over the past year.	Yes No	7.78 (5.24) 5.05 (3.83)	10.54	0.002
Experience using services to care for your own mental health due to COVID-19.	None.	5.68 (4.11)	3.99	0.021
	Personal Internet browsing or mobile phone application experience.	9.69 (7.22)		
	Experience in using services provided by the government and public.	7.67 (2.92)		
	Psychological counseling experience in medical institutions.	8.15 (6.66)		
	Others.	8.00 (9.90)		

4.4. Anxiety according to general characteristics

Table 4 shows the degree of anxiety based on participants' sociodemographic characteristics.

Table 4. Anxiety according to participants' sociodemographic characteristics

Characteristics	Categories	Anxiety		
		M (SD)	t or F	p
Age (years)	20~29 ^a	3.44 (3.57)	2.96	0.035 b,c,d>a
	30~39 ^b	4.02 (3.67)		
	40~49 ^c	6.75 (3.97)		
	50 years or more ^d	5.18 (5.07)		
Depression due to COVID-19	Not depressed.	2.74 (3.01)	16.96	<0.001 b,c>a
	A little depressed.	6.38 (4.07)		
	Very depressed.	8.75 (6.60)		
Stress due to COVID-19	I don't feel any stress at all. ^a	3.58 (4.93)	5.31	0.001 d,e>a,b,c
	I don't feel stressed. ^b	2.88 (2.87)		
	Feeling moderately stressed. ^c	3.39 (2.64)		
	Feeling stressed. ^d	5.32 (4.12)		
	Feel very stressed. ^e	8.55 (5.84)		
Degree of disruption to daily life due to COVID-19	No trouble at all.	2.67 (3.08)	3.88	0.005
	No trouble.	3.67 (4.20)		
	Moderate.	3.11 (2.80)		
	There is a problem.	6.24 (4.61)		
	Very disturbing.	5.13 (4.22)		
Changes in sleep quality due to COVID-19	Got very good.	-	10.75	<0.001 b,c>a
	Got better.	-		
	No change. ^a	3.28 (3.08)		
	Got worse. ^b	6.00 (4.52)		
	Got very bad. ^c	8.57 (5.97)		
Thoughts of wanting to die in the past year.	Yes	6.13 (4.16)	5.12	0.026
	No	4.02 (3.97)		
Thoughts of wanting to die because of the COVID-19 situation.	Yes	6.81 (4.39)	6.60	0.011
	No	4.06 (3.92)		

A feeling of needing counseling, psychotherapy, or help for stress or psychological distress over the past year.	Yes No	5.47 (4.47) 3.51 (3.48)	7.06	0.009
Experience using services to care for your own mental health due to COVID-19.	None. Personal Internet browsing or mobile phone application experience. Experience in using services provided by the government and public. Psychological counseling experience in medical institutions. Others.	3.81 (3.39) 7.38 (6.60) 7.00 (2.60) 5.15 (5.13) 8.50 (10.61)	4.78	0.010

4.5. Trait anger according to general characteristics

Table 5 shows the degree of trait anger according to the participants’ sociodemographic characteristics.

Table 5. Trait anger according to participants’ sociodemographic characteristics

Characteristics	Categories	Trait anger		
		M (SD)	t or F	p
Anxiety caused by COVID-19	Not anxious. A little anxious. Very anxious.	17.53 (5.80) 20.70 (5.59) 31.00	6.19	0.003
Depression due to COVID-19	Not depressed. A little depressed. Very depressed.	16.94 (5.53) 20.42 (5.78) 25.25 (6.13)	8.05	0.001 b,c>a
Degree of disruption to daily life due to COVID-19	No trouble at all. No trouble. Moderate. There is a problem. Very disturbing.	20.67 (8.66) 17.78 (5.80) 16.73 (4.63) 19.26 (5.94) 21.67 (6.41)	2.47	0.048
Thoughts of wanting to die in the past year.	Yes No	21.91 (6.24) 17.85 (5.68)	9.10	0.003
Thoughts of wanting to die because of the COVID-19 situation.	Yes No	22.81 (6.21) 17.99 (5.71)	9.63	0.002

4.6. Relationships between Depression, Anxiety, and Trait Anger

Depression was positively correlated with anxiety ($r=0.78, p<0.001$) and trait anger ($r=0.43, p<0.001$), whereas anxiety was positively correlated with trait anger ($r=0.45, p<0.001$) (Table 6).

Table 6. Correlations among Depression, Anxiety, and Trait Anger

Variables	Depression	Anxiety
Anxiety	0.78 (<0.001)	

Anger	0.43 (<0.001)	0.45 (<0.001)
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5. Discussion

Of the 117 participants in this study, most were women (n=102). The average age was 36.74±10.22 years old, and the total average service experience was 8.56±10.02 years based on the participants' job characteristics. Of these, 39.3% were health professionals, 25.6% were medical technicians, and 35.0% were nurses. Their main responsibilities included responding to infectious diseases, pharmaceuticals, health promotion, examinations, mental health, food hygiene, family health, dementia policy projects, health management, community health, and providing support for infants and toddlers. However, for most (n=87), their main responsibility at the time of the survey was responding to the infectious disease. The work tasks that caused the most stress included responding to civil complaints related to COVID-19, other COVID-19 issues, and structural problems related to COVID-19 work. In terms of the civil complaints, this meant responding to many emotional appeals, such as violent phone calls, angry citizens, appeals for sympathy, abusive language, complaints of noncooperation with epidemiological investigations, resistance to self-isolation, and noncompliance with epidemiological investigations. In terms of structural problems, these included frequent divisions of duties, weekend and holiday work, and night shifts. Other matters included work mistakes, difficulties in human relations, manpower management, difficult tasks, and licensing/regulation of entertainment bars.

In terms of the questions we asked regarding their personal experience with COVID-19, they confirmed the COVID-19 patients familiar to them, including themselves, family members, or close acquaintances: 24.1% answered that they “were a confirmed case in the past but have been cured,” 21.9% that they had “friends or close acquaintances who were previously diagnosed with the disease but have been cured,” 0.3% that they had “a friend or close acquaintance currently being treated for a confirmed case;” 23.4% that “a colleague at work was a confirmed case in the past but was cured,” and 1.3% that “a colleague at work was currently being treated as a confirmed case.”

As both direct and indirect confirmation of COVID-19 can have a negative impact on mental health [25], more follow-up is necessary in a social disaster situation. The impact of having COVID-19 on oneself or in one's family or among acquaintances or colleagues is not simply from the severity of the symptoms but also from the recognition of the breakdown that will occur in daily life through social isolation during the quarantine period. This applies not only to public health personnel but also to the general public. We can assume that public health personnel in charge of responding to the infectious disease faced greater difficulties because of the nature of their duties.

In a 2021 national mental health survey, the Korean Ministry of Health and Welfare reported that 17.6% of the people surveyed had experienced depression [26][35]. In the study by Lee and Kim [26], 55.8% of those surveyed had experienced anxiety and depression. A total of 44.4% of the public health personnel who participated in our study experienced depression, and 32.5% experienced anxiety. Based on these results, we can assume that the degrees of depression and anxiety experienced by the entire population, including health personnel, increased because of COVID-19. Owing to COVID-19, 76.0% of the participants in our study reported a negative stress level (moderately to very stressed), which is considerably higher than the 61.7% reported in the general public survey [26]. Looking at the differences in mental health status according to the degree of

stress, depression was found to be high even among those responding that they did not feel stress. This implies a need in future studies to investigate the relationships between stress awareness, personality characteristics, and depression. Anxiety increases when people feel stressed, and in a study that investigated the relationship between job stress and anxiety symptoms targeting office workers [27], the items of job demand, lack of job autonomy, job instability, organizational system, inadequate compensation, and workplace culture were found to be associated with anxiety. In this study, public health personnel had to stop most of their regular work during the COVID-19 pandemic and concentrate only on responding to the disease. Additional stress was created through factors such as overtime, weekend and holiday work, frequent division of work, and verbal abuse from citizens; all of which caused anxiety.

Moreover, 76.9% of the participants pointed to a greater degree of difficulty in daily life. In a study based on the 2020 Community Health Survey [28], changes in daily life, such as social distancing, changes in participation in sports or leisure activities, children's suspension from face-to-face schooling, changes in walking practice, and consumption of instant food and delivery food, were found to have an impact on mental health. These changes distorted daily life routines in the context of the pandemic.

Of the study participants, 36.8% also reported that their sleep quality worsened owing to COVID-19, resulting in increased levels of depression and anxiety. According to a study by Lee and Kim [25] and a press release by the Ministry of Health and Welfare, there has been a negative change in sleep quality in 30.6% of the public during the pandemic, indicating that many people suffer from sleep disorders in the context of an infectious disease. In addition, according to Kim et al. [29], depression and anxiety increase with the severity of sleep disorders. In particular, when looking at the result of an increase in characteristic anxiety, a state in which anxiety is continuously displayed, even in the absence of a specific object, event, or situation that causes the anxiety, sleep quality remains an important factor in maintaining a healthy mental health state.

Among the health personnel, 19.7% responded that they had thoughts about wanting to die in the past year, and 13.7% had thoughts about dying because of the COVID-19 situation. Such thoughts can be the result of depression, anxiety, or characteristics of anger. In a press release by the Ministry of Health and Welfare, 20.3% of the public said that they had thoughts of wanting to die in the past year, and suicidal thoughts when the COVID-19 situation soared from 4.6% to 12.4% [26]. In particular, 17.0% of people in their 10s (teenagers) and 20s, the disabled, the elderly, single-person households, nonregular workers, and women with a heavy burden of child-rearing and caring had suicidal ideas [11]. This points to a dire need for psychological support. Such support needs to be provided at the national level, along with follow-up management through the identification of mental health status and suicidal intentions, not only among the general public but among infectious disease response personnel as well.

In answering the question regarding how they relieved stress or psychological pain, 24.9% said "conversations with colleagues," the highest percentage, followed by "conversations with family" at 22.7%, "drinking alcohol" at 15.7%, and "immerse in hobbies" at 15.3%. Other respondents answered they found "no particular solution" (6.1%), they kept it inside and "did not express it" (5.7%), they relied on "religious life" (3.9%), "other methods" (4.4%), or "conversations with supervisors" (1.3%). In particular, "other methods" included counseling at work, talking to a lover, sleeping, and self-harm. In Kim's [30] study, 47.1% of the firefighters surveyed said they "talked to their colleagues" when experiencing stress or psychological pain, followed by becoming

“preoccupied with hobbies” at 46.3%, “talking to family” at 46.3%, “keep it inside and don’t express it” at 36.0%, and “there is no way to solve it” at 22.8%, showing similar patterns to those in our study. In particular, stating that “there is no way to relieve it” or “I do not express it,” cannot be regarded as relieving stress or psychological pain. The participants who described their thoughts or psychological stress when there was pain, expressed it as “self-injury.” There was a recent suicide by a public health person in the context of COVID-19, highlighting that even if we silently and faithfully carry out our work, we may not notice the pain inside and may not be able to recognize it because of differences in our dispositions, which are not expressed. However, it is the state’s responsibility to reflect on efficient policies, such as concern for its citizens, creating a friendly public atmosphere, and supporting job transitions, even during this tense and busy time. In the event of social disasters, such as COVID-19, as well as other pandemics, support through policies that consider these factors should be provided.

Regarding the need for mental health services to help with psychological distress caused by COVID-19, 65.0% of the respondents answered this was “somewhat necessary,” 18.8% answered “very necessary,” and 83.8% expressed some need for mental health services. Of the respondents, 47.0% said that they wanted to receive counseling, psychotherapy, or help with stress or psychological pain in the past year. Additionally, 10.7% had sought help using “personal internet search or mobile application use experience,” 10.7% had “experience with psychological counseling in medical institutions,” 7.4% had “experience with using government and public services,” and 1.8% replied “other.” Other included avenues such as tarot counseling, temple stays, and counseling services in the workplace. In a study by Kim [30], 22.8% of the firefighters surveyed responded that they needed counseling or treatment to overcome post-traumatic stress symptoms, and 11.8% responded that they had experience with psychological counseling or treatment. Compared with the post-traumatic stress symptoms detailed by the firefighters, the psychological distress detailed expressed by the public health personnel during the COVID-19 situation is equally concerning. Considering that the psychological pain caused by the COVID-19 situation is serious, and that people have been seeking help in various ways, there is an obvious need for the development of various programs to alleviate the psychological pain of public health personnel.

Examining the cut-off points for depression and anxiety in public health personnel revealed that mild depression, moderate depression, severe depression, mild anxiety, and moderate anxiety were 12.0%, 6.0%, 1.7%, 31.6%, and 4.3%, respectively. In a study using the clinical depression screening PHQ-9 scale and the GAD-7, the same tools used in this study, 17.6% of the entire population were at risk of depression and 31.9% in the generalized anxiety disorder risk group [25]. In our study, public health personnel showed a rate of depression of 19.7% and trait anxiety of 40.2%. The higher the level of depression among the health personnel, the higher their levels of anxiety and trait anger, and the higher their anxiety, the higher their level of trait anger. Depression and anxiety are highly correlated with anger [31]. These symptoms are related to generalized anxiety disorder [25] and tend to magnify the experience of anger. In our results, it is worth noting that public health personnel had moderate depression of 6.0%, severe depression of 1.7%, moderate anxiety of 4.3%, and severe anxiety of 4.3%. Thus far, social welfare services and psychological support measures for the vulnerable and the public in the COVID-19 situation [32], stress management measures for frontline workers (nurses, doctors, ambulance drivers, etc.) [4], mental health management for disaster psychological support workers [33], mental health management of public officials in charge of healthcare [34], among others, are being explored from various angles. However, it is evident that the

mental health of public health officials who are in charge of responding to infectious diseases has been overlooked.

The results of our study indicate that measures are needed to manage the level of depression and anxiety among public health personnel to prevent them from aggravating trait anger. Hopefully, we can change the public perceptions of public health personnel, advance plans for mental health management, and develop various support programs, so that the impacts on mental health we are seeing today from the COVID-19 pandemic do not recur in future social disasters.

6. Conclusion

Our study aimed to determine the mental health status of public health personnel, identify related factors, and suggest the need for a mental health improvement program. The results showed that levels of depression, anxiety, and trait anger among the public health personnel surveyed were higher than those in the general public. When there was stress or psychological pain, the participants tried to relieve these through various methods, but there were cases where thoughts of suicide were reflected. In particular, some participants attempted self-injury to escape pain; therefore, this situation should be addressed.

Among the public health personnel, 83.8% responded that they needed mental health services to help with psychological pain, implying the need to develop various programs. Our recommendation is for a variety of mental health improvement programs for public health personnel to be developed, providing mental relief for workers during social disasters in the future, such as infectious diseases, and the associated job stress.

Our study sampled public health personnel and included health professionals, medical technicians, and nurses at public health centers and district offices in 15 districts of Busan Metropolitan, Korea. Therefore, the results cannot be generalized to the entire country. Nonetheless, we contribute to the literature by offering meaningful results on their levels of depression, anxiety, trait anger, suicidal ideation, and help-seeking responses, providing a platform for further research.

Based on our findings, we make the following suggestions. First, additional studies targeting public health personnel are required that include variables that can help reduce mental health issues, such as depression, anxiety, and trait anger. Second, an in-depth study of individuals' tendencies to deal with stress is required. Third, governmental organizational changes are needed to improve the mental health of public health personnel and reduce suicidal ideations.

7. Acknowledgements

This work was supported by National Research Foundation of Korea (2022R1G1A1012877) and Changshin University Research Fund of 2022-074.

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