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**Master's Thesis in Nursing Science**

**Post-acute COVID-19 syndrome in  
previously hospitalized patients**

**Seoul National University  
Graduate School of Nursing  
Yoonsoo Eo**

# Post-acute COVID-19 syndrome in previously hospitalized patients

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이 논문을 간호학석사 학위논문으로 제출함

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## **Abstract**

With the prolongation of the COVID-19 pandemic, a growing number of individuals are experiencing sequelae after COVID-19 infection, also known as post-acute COVID-19 syndrome (PCS). However, there is a lack of literature that examines the symptoms in depth, such as the frequency, severity, and level of distress experienced by those who recovered from COVID-19.

This study aimed to describe the prevalence and characteristics of post-acute COVID-19 symptoms in detail such as fatigue, depression, and anxiety, and to compare these symptoms according to participant characteristics in patients who had been previously hospitalized due to COVID-19. Between August 4, 2022, and August 6, 2022, online questionnaires were distributed to individuals who received hospital care for COVID-19 and were discharged from the hospital at least 4 weeks before. Those who had a history of mental or cognitive illness were excluded. 137 patients were recruited, and 114 responses were used for analysis.

Personal and hospital-related patient information, as well as PCS symptom data, were collected. Fatigue was measured using the Fatigue Severity Scale (FSS), anxiety and depression were measured using the Hospital Anxiety-Depression Scale (HADS), and the other 13 PCS symptoms were measured for frequency, severity, and distress using a PCS symptom questionnaire. The results of the study were analyzed via descriptive

characteristics, the t-test, the Wilcoxon rank-sum test, and the Kruskal-Wallis test.

The results of the study were as follows.

First, the symptoms with the highest prevalence were anxiety (66.7%), fatigue (64%), headache (57.9%), and concentration or memory difficulties (57.9%).

Second, concentration or memory difficulties and sleep disturbances had the highest mean frequency (1.07), concentration or memory difficulties had the highest mean severity (1.04), and cough, loss of taste, and muscle and joint pain had the highest mean distress (.82).

Third, female participants had higher distress in thirteen out of sixteen symptoms. Those hospitalized for more than two weeks had a more distressful cough, low-grade fever, chest discomfort, and muscle pain. Patients discharged more than nine months ago had more sleep, concentration, or memory problems. Ten of sixteen symptoms were more distressing in unvaccinated participants. More anxiety, fever, headache, sleep disturbances, concentration or memory difficulties, and joint pain were present in participants who tried at least one symptom relief method.

The findings of this investigation into the frequency, severity, and distress of symptoms shed light on the identification of post-COVID symptoms in detail. To objectively evaluate and comprehend the symptom trajectories of PCS, prospective studies on the development of symptom assessment tools and studies with a longitudinal design should be conducted.

In addition, a significant number of respondents reported numerous symptoms and expressed symptom distress; therefore, the development of nursing interventions and treatments to alleviate PCS symptoms is necessary.

Keywords: long COVID, anxiety, fatigue, headache, difficulties in concentration or memory

Student number: 2021-27135

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# **CHAPTER I. INTRODUCTION**

## **1. Background**

As of December 2022, nearly three years have passed since the initial detection of coronavirus disease 2019 (COVID-19), and more than 640 million people have been infected globally, with approximately 6.6 million deaths (World Health Organization, 2022). Even though around 98% of those infected with COVID-19 survive, many people continue to experience a variety of symptoms for months after viral recovery (Ritchie et al., 2022). As such, these sequelae were termed post-acute COVID-19 syndrome (PCS) or long COVID (Callard & Perego, 2021). Post-acute COVID-19 syndrome (PCS) is defined as a syndrome of persistent symptoms and/or delayed or long-term complications occurring more than four weeks after the onset of symptoms (Nalbandian et al., 2021). PCS is also called post-acute COVID-19, long-haul COVID, and post-acute sequelae of SARS-CoV-2 infection (PASC) (Centers for Disease Control and Prevention, 2021).

In September 2022, according to a representative survey conducted by the UK Government Office of National Statistics (ONS), approximately 2.3 million people, or 3.5% of the entire UK population, were experiencing PCS (Office for National Statistics, 2022). Some of the most common PCS symptoms are fatigue (31-58%), dyspnea (18-35%), headache (44%), attention and/or concentration problems (18-22%), memory loss (19%), depression and/or anxiety (10-32.6%) and sleeping disturbances (12-44%)

(Alkodaymi et al., 2022; Iqbal et al., 2021; Lopez-Leon et al., 2021; Yong, 2021). As a consequence, more than half of the individuals with PCS reported diminished health-related quality of life, particularly in the self-care and usual activities domains (Malik et al., 2022; Tenforde et al., 2020).

The prolongation of the COVID-19 pandemic and the increasing number of people experiencing PCS highlight the need for healthcare professionals to emphasize the understanding and management of post-COVID symptoms. Currently, research is being conducted to study the clinical status of recovered COVID-19 patients, with an emphasis on discovering the existence and types of PCS symptoms. Although it is critical to thoroughly describe PCS symptoms to develop appropriate interventions, there is a lack of literature examining symptoms in depth, such as the frequency, severity, and level of distress in symptoms experienced by COVID-19 survivors.

Furthermore, sparse research exists in the field of nursing addressing post-COVID symptoms. Professional nurses play an instrumental role in defining patient care needs and developing comprehensive care plans. Thus, a detailed description of post-COVID symptoms is essential to address patient care needs beyond the acute treatment phase and to design effective interventions for those who have recovered from COVID-19.

## **2. Purpose of the Study**

This study aimed to describe the prevalence and characteristics of post-acute COVID-19 symptoms, including fatigue, depression, and anxiety, and to compare them according to participant characteristics in patients who were hospitalized due to COVID-19.

Specific objectives were as follows:

1. Describe the prevalence of post-acute COVID-19 symptoms including fatigue, depression, and anxiety.
2. Identify the characteristics of post-acute COVID-19 symptoms according to frequency, severity, and distress.
3. Compare PCS symptoms in discharged COVID-19 patients based on participant characteristics.

### **3. Definition of Terms**

#### **1) Post-acute COVID-19 Syndrome (PCS)**

##### ***Conceptual Definition.***

Different institutions refer to PCS by various names (post-COVID syndrome, long COVID) and definitions. According to the Centers for Disease Control (CDC) and the National Institute of Health and Care Insurance (NICE), post-COVID condition or long COVID is described as newly occurring or persistent symptoms that last more than 4 weeks after the onset of COVID-19 infection (Centers for Disease Control and Prevention, 2021; National Institute for Health and Care Excellence, 2022). The World Health Organization (WHO) defines long COVID or post-COVID condition as the persistence or development of symptoms three months after COVID-19 infection, lasts for at least two months, and cannot be explained by another diagnosis (World Health Organization, 2021).

##### ***Operational Definition.***

In this study, post-acute COVID-19 syndrome is defined as new or persistent symptoms experienced beyond 4 weeks upon discharge from the hospital. Symptoms include fatigue, anxiety, depression, and thirteen additional symptoms measured on the post-acute COVID-19 symptom questionnaire. The scores measured by the post-acute COVID-19 syndrome

questionnaire correspond to the frequency, severity, and distress caused by PCS symptoms.

## 2) Fatigue

### ***Conceptual Definition.***

Fatigue is characterized as a state of exhaustion that is distinct from depressed mood or physical weakness (Krupp, 2003).

### ***Operational Definition.***

Fatigue indicates the scores measured on the 9-item Fatigue Severity Scale (FSS) (Chung & Song, 2001; Krupp, 1989).

## 3) Anxiety and Depression

### ***Conceptual Definition.***

Anxiety is marked by apprehension and bodily tension signs where a person expects imminent danger, catastrophe, or misfortune. Depression is a negative affective state that spans from unhappiness and discontent to an intense feeling of sadness, pessimism, and despondency that disrupts everyday life (*APA Dictionary of Psychology*®, 2015).

### ***Operational Definition.***

Anxiety and depression refer to the scores evaluated on the 14-item Hospital Anxiety and Depression Scale (HADS) (Min et al., 1999; Zigmond & Snaith, 1983).

## **CHAPTER 2. LITERATURE REVIEW**

### **1. COVID-19**

The novel coronavirus, severe acute respiratory syndrome 2 (SARS-CoV-2), caused a worldwide pandemic of coronavirus disease 2019 (COVID-19). Symptoms take 2-14 days to manifest upon exposure (Guan et al., 2020), and those with COVID-19 experience mild to critical illnesses. 81% of patients had mild diseases (no or mild pneumonia), 14% had severe diseases (within 24 to 48 hours of dyspnea, hypoxia, or greater than 50% lung involvement on imaging), and 5% had critical illnesses (respiratory failure, shock, or multi-organ dysfunction) (Wu & McGoogan, 2020). Patients with underlying co-morbidities and over the age of 70 were particularly vulnerable to hospitalizations and fatalities (Stokes et al., 2020).

Recovery from COVID-19 infection is expected to take between 2 to 6 weeks, with a median hospital stay ranging from 5 to 15.7 days (Faes et al., 2020). Cough, fever, myalgia, headache, and dyspnea are the typical symptoms of COVID-19. However, the virus affects multiple other organs and causes a wide range of symptoms, including diarrhea, nausea, vomiting, and loss of smell or taste (Stokes et al., 2020).

As a result of intensive research to combat COVID-19, vaccines have shown effectiveness and safety. Two vaccination doses were 85% effective at preventing SARS-CoV-2 infections and 96% effective at reducing ICU admissions, according to a review (Liu et al., 2021). Furthermore, studies

show that booster doses have a protective effect against COVID-19 infections and reduce their severity (Bar-On et al., 2021; Chenchula et al., 2022).

As of December 2022, there were roughly 28 million confirmed cases of COVID-19 in South Korea, representing approximately 54% of the whole population (World Health Organization, 2022). In 2020, among the 7,590 people admitted to the hospital with COVID-19 in South Korea, 3,528 (46.5%) were above the age of 50, and 1,463 (19.3%) had underlying hypertension (Cho et al., 2021).

A retrospective study using data from the Korean Health Insurance Review and Assessment Service (HIRA) found that among 21,615 people who were confirmed to have COVID-19 infection between January and September 2020, one or more complications were found in 4,139 (19.1%) people (Lee et al., 2022). Since more than half of South Korea's population was infected with COVID-19 as of December 2022, it is assumed that a significant number of patients are suffering from post-acute COVID-19 syndrome in South Korea. Therefore, considerable attention should also be given to the post-acute COVID-19 syndrome in South Korea.

## **2. Post-acute COVID-19 syndrome (PCS)**

Between 50% and 80% of those who recovered from COVID-19 go through residual or newly occurring physical or neuropsychiatric symptoms that last from several weeks to more than 3-6 months (C. Huang et al., 2021; Mikkelsen, 2022; Yong, 2021). A meta-analysis revealed that more than fifty



long-term sequelae were experienced in 80% of previously infected patients in diverse organs (Lopez-Leon et al., 2021). Most common symptoms involve fatigue (31-58%) and shortness of breath (dyspnea) (18-35%) (Lopez-Leon et al., 2021; Malik et al., 2022). Other common physical symptoms include cough (15%), chest pain (16%), headache (44%), hair loss (25%), joint pain (19%), muscle pain (22%), as well as loss of smell and/or taste (11-23%) (Alkodaymi et al., 2022; Chopra et al., 2021; C. Huang et al., 2021; Iqbal et al., 2021; Lopez-Leon et al., 2021; Yong, 2021). Neuropsychiatric symptoms manifest as depression and/or anxiety (10-32.6%), sleep disturbances (12-44%), post-traumatic stress disorders (14.5%), attention deficits (18-22%), and impairments in memory (19%). Among them, depression and/or anxiety were the symptoms reported most often (Rogers et al., 2020; Schou et al., 2021).

Patients experienced fatigue (32–48%) and shortness of breath (dyspnea) (21–39%) in both the acute (3-12 weeks after infection) and chronic (greater than 12 weeks) phases of COVID-19 recovery (Alkodaymi et al., 2022; Iqbal et al., 2021). Post-COVID symptoms were associated with a decreased quality of life and showed associations with psychological distress, as well (Han et al., 2022; Tabacof et al., 2022). According to a meta-analysis, fatigue was specifically found to be related to low health-related quality of life, indicating a substantial symptom burden (Malik et al., 2022). On the other hand, PCS symptoms and overall health status were observed to recover with time in one-year follow-up studies, although symptoms such as

anxiety and/or depression persisted for more than a year in some individuals (L. Huang et al., 2021; Kim et al., 2022).

The underlying mechanisms of post-acute COVID-19 syndrome are not yet fully understood. Nonetheless, the mechanisms of PCS can be divided into two categories: those caused directly by the viral infection and those caused indirectly by posttraumatic stress, social isolation, and economic factors such as job loss (Groff et al., 2021). The direct effect, or the pathophysiology of PCS, is known to be associated with long-term tissue damage to multiple organs and unresolved inflammation due to viral persistence and lymphopenia, which eventually lead to physical, psychological, and/or cognitive symptoms (Nalbandian et al., 2021; Yong, 2021).

Currently, some of the identified risk factors for persistent COVID-19 symptoms are female sex, older age, hospitalization, specific comorbidities, ICU care, and vaccination status (Antonelli et al., 2022; Crook et al., 2021; Kim et al., 2022; Munblit et al., 2021; Peghin et al., 2021; Sudre et al., 2021; Tenforde et al., 2020). Older people  $\geq 70$  years of age were more likely to experience symptoms lasting over 28 days than individuals aged 18-49 years (Sudre et al., 2021). Female sex was found to be associated with PCS symptoms in many studies (Kim et al., 2022; Pérez-González et al., 2022; Sigfrid et al., 2021). Women under the age of 50 were twice as likely to report having severe fatigue and five times less likely to report feeling recovered than men with PCS (Sigfrid et al., 2021). Persistent symptoms were prevalent

after COVID-19 infection among hospitalized patients compared to outpatients (52.3% vs. 38.2%) (Pérez-González et al., 2022). Comorbidities such as asthma and chronic pulmonary disease were shown to be correlated with neurological symptoms and chronic fatigue, respectively (Munblit et al., 2021). Moreover, reporting a psychiatric condition was related to not returning to baseline health status (Tenforde et al., 2020). ICU admission served as an independent risk factor for PCS symptoms 6 months after acute infection (Peghin et al., 2021). On the other hand, vaccination was associated with decreased risks of developing PCS symptoms (Notarte et al., 2022).

Although no proven evidence exists for interventions to mitigate post-acute COVID-19 syndrome, the UK National Institute for Health and Care Excellence (NICE) guidelines encourage multidisciplinary rehabilitation, self-management, and specific assistance for older adults and children. The guidelines recommend educating patients on available medical/social resources, patient education and advance care planning, and social isolation support (National Institute for Health and Care Excellence, 2022). In the United States, some hospitals offer multimodal post-COVID rehabilitation clinics with face-to-face or telemedicine physician appointments, follow-up nursing visits, and rehabilitation therapy beyond the acute infection period (Brigham et al., 2021; Tabacof et al., 2022). Several multidisciplinary “post-COVID clinics” have been established in South Korea since March 2022, as well (Jung et al., 2022).

Existing interventions for specific symptoms such as fatigue,

dyspnea, and depression/anxiety are centered on alleviating individual symptoms. Cognitive-behavioral therapy (CBT), a frequently used approach in treating post-viral fatigue, is suggested to alleviate post-COVID fatigue by improving the quality of rest and establishing a baseline for energy-saving activities (Gaber, 2021). High-dose vitamin C has also been reported to be beneficial in treating fatigue (Vollbracht & Kraft, 2021). In the case of dyspnea, pulse oximeters were recommended as useful tools for assessing and monitoring respiratory symptoms, and ‘breathing control’ techniques for normalizing breathing patterns were recommended (Greenhalgh et al., 2020). Topiramate has been effective in the treatment of headaches, while GABA agonists, tricyclic antidepressants, or serotonin and noradrenaline reuptake inhibitors (SNRI) are recommended for the treatment of neuropathic pain (Gaber et al., 2018; Moulin et al., 2014). CBT is regarded as the first-line treatment for anxiety and depression, although pharmacological interventions may be required in some instances (Gaber, 2021).

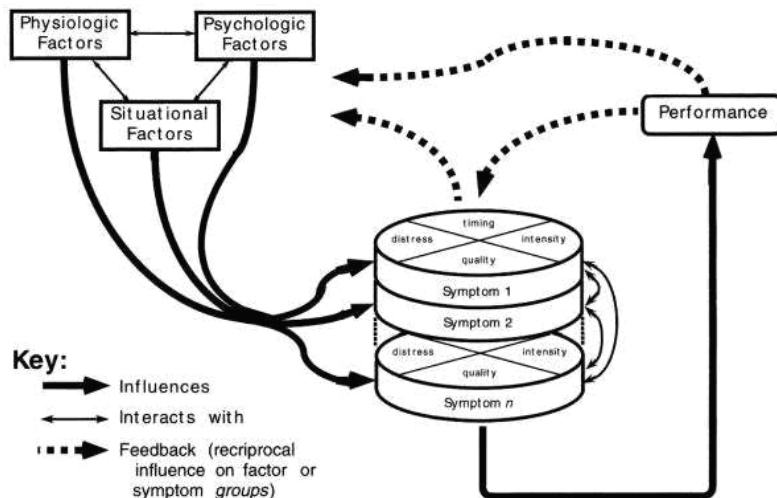
## **CHAPTER III. THEORETICAL FRAMEWORK**

### **1. The Theory of Unpleasant Symptoms**

The Theory of Unpleasant Symptoms (TOUS) developed by Lenz and Colleagues (1997) assumes that multiple symptoms occur simultaneously and are likely to influence one another. The theory is comprised of three major components: the symptoms experienced by the individual, the factors that produce or influence the symptom experience, and the consequences of the symptom experience as illustrated in Figure 1.

Symptoms consist of timing, intensity, distress, and quality. Timing represents the duration and frequency of symptom occurrence. Intensity shows the strength or severity of the experienced symptom. Distress refers to the degree of discomfort or bothersomeness. Quality is used to describe what the symptom feels like. Influencing factors in physical, mental, and situational areas contribute to or affect symptom experience, and as a result of symptom experience, consequences such as compromised performance occur (Lenz et al., 1997).

Based on the Theory of Unpleasant Symptoms, this study was able to identify the components of PCS symptoms in great detail, which served as the foundation for developing effective nursing care strategies for individuals with PCS symptoms.

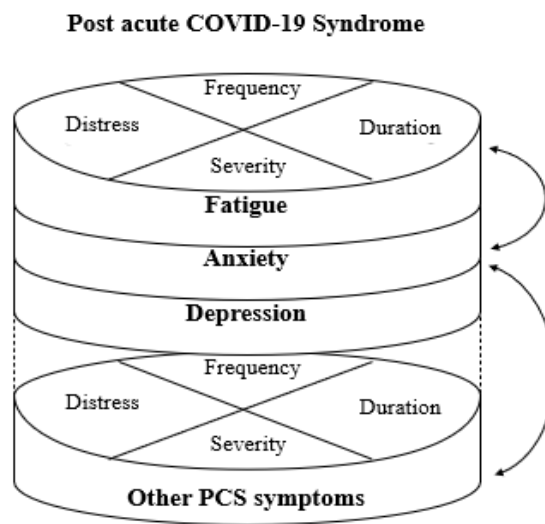


**Figure 1.** The Theory of Unpleasant Symptoms developed by Lenz and colleagues (1997). Adapted from Lenz, E. R., Pugh, L. C., Milligan, R. A., Gift, A., & Suppe, F. (1997). The middle-range theory of unpleasant symptoms: an update. *ANS Adv Nurs Sci*, 19(3), 14-27. <https://doi.org/10.1097/00012272-199703000-00003>. Used with permission of Wolters Kluwer Health, Inc.

## 2. Theoretical framework of this study

As the name Post-acute COVID-19 ‘syndrome’ implies, COVID-19 survivors are known to experience more than 50 symptoms, and the symptoms can be explained in domains presented by the Theory of Unpleasant Symptoms (TOUS) such as intensity and distress (Lopez-Leon et al., 2021). Thus, the theoretical framework of this study was partially adapted from TOUS to describe the characteristics of PCS in physical and psychological areas.

Using the Theory of Unpleasant Symptoms, this study examined the prevalence and characteristics of post-acute COVID-19 symptoms, such as fatigue, anxiety, depression, and other 13 PCS symptoms, in relation to timing (frequency, duration), severity, and level of distress. Figure 2 illustrates the conceptual framework of this study.



**Figure 2.** Conceptual framework of this study modified from the Theory of Unpleasant Symptoms developed by Lenz and colleagues (1997)

## CHAPTER IV. METHODS

### 1. Study Design

This was descriptive cross-sectional study conducted to identify the prevalence and characteristics of post-acute COVID-19 syndrome (PCS).

### 2. Setting and Sample

The inclusion criteria for this study were as follows:

- 1) Patients who had received hospital care upon being diagnosed with COVID-19
- 2) Patients at least 4 weeks after hospital discharge
- 3) Patients older than 18 years
- 4) Patients who had understood the purpose of the study and consented to participate

Participants who were diagnosed with mental illnesses or cognitive disabilities before COVID-19 were excluded.

The sample size was determined using the formula  $n = \frac{Z^2 P(1-P)}{d^2}$  for determining sample size in prevalence studies (n = sample size, Z = level of confidence, P = expected prevalence, d = precision of estimate) (Pourhoseingholi et al., 2013). Based on previous literature indicating a 47.1% prevalence of post-acute COVID-19 syndrome among previously



hospitalized patients, a minimum of 96 participants were calculated ( $P = 0.53$ ,  $Z = 1.96$ ,  $d = 0.1$ ) (Munblit et al., 2021). Considering the dropout rate of 30%, 137 participants were intended to be recruited. There were 137 participants recruited, and 23 (17%) dropped out due to ineligibility or incomplete responses. A total of 114 responses were used for data analysis.

### **3. Data collection procedure**

After receiving approval from the Institutional Review Board of Seoul National University (IRB No. 2208/002-006), participants were openly recruited through online communities and long COVID support groups such as Kakao Talk Open Chat Room ‘A Group Chat Room for Long COVID Patients’ (<https://open.kakao.com/o/gtfCh1Qd>) and Naver Cafe ‘Mom’s Holic Baby’ (<https://cafe.naver.com/imsanbu>). Those who met the inclusion criteria were invited to participate in the survey after filling out a brief form to determine their eligibility. Surveys were distributed between August 4, 2022, and August 6, 2022, and responses collected during this period were used for analysis.

#### **4. Ethical considerations**

The study's purpose, procedures, risks and benefits, methods for ensuring privacy and confidentiality, and the possibility of withdrawing from the survey were explained in the distributed online survey. Through a required question, informed consent was obtained online.

All identifiable private information including mobile phone numbers and email addresses was deleted after one month of data collection. The research data were stored in a password-protected database. The data will be retained for five years upon completion of the research and then permanently disposed of in accordance with Seoul National University IRB regulations.

## **5. Measurements**

### **1) Participant characteristics**

Participants' general and hospital-related data were collected via online surveys. Personal information included age, gender, marital status, household living arrangements, and employment status. Hospital-related data included the month of diagnosis, hospital type, hospital name, hospital length of stay, time since hospital discharge, types of co-morbidities, vaccination status, and ICU admission status.

### **2) Post-acute COVID-19 syndrome**

#### **2-1. The Fatigue Severity Scale (Fatigue)**

The Fatigue Severity Scale (FSS), originally developed for Multiple Sclerosis (MS) or systemic lupus erythematosus (SLE) patients, is a 9-item questionnaire that evaluates the severity of fatigue and its influence on daily functioning and daily life (Krupp, 1989). Scores range from 1 to 7 for each item, and the average score above 4 indicates severe fatigue, suggesting the need for further professional assessment. In the Korean version, Cronbach's alpha was .929 (Chung & Song, 2001). In this study, Cronbach's alpha for FSS was .93. Permission had been obtained from the authors.

## **2-2. Hospital Anxiety-Depression Scale (HADS) (Anxiety, Depression)**

HADS is a broadly implemented 14-item scale to assess anxiety and depression. 7 items measure anxiety, and 7 items measure depression. Scores range from 0 to 3 for each item, with a maximum score of 21 (Zigmond & Snaitch, 1983). For each subscale, scores between 0 and 7 are considered to be within the normal range, while scores above 8 are regarded clinically significant, indicative of mild, moderate, or severe anxiety or depression. The Korean version of HADS showed sound validity and reliability, with Cronbach's alpha of .89 for anxiety and .86 for depression (Min et al., 1999). In this study, Cronbach's alpha was .75 for anxiety and .74 for depression. The tool had been obtained from MAPI research following their permission.

## **2-3. Post-acute COVID-19 syndrome (PCS) symptom questionnaire**

A 16-item PCS symptom questionnaire was administered to assess commonly experienced symptoms, as there is currently no well-established tool for measuring PCS symptoms. Symptoms were selected based on existing literature and the UK's NICE COVID-19 rapid guideline: managing the long-term effects of COVID-19 (National Institute for Health and Care Excellence, 2022). The questionnaire was developed based on the Memorial Symptom Assessment Scale (MSAS), which is a widely implemented tool to measure cancer symptoms in terms of frequency, severity, and distress (Portenoy et al., 1994). In this questionnaire, the participants were asked to rate the frequency, severity, and level of distress of the symptoms over the

past week. The scores ranged from 0 to 4 (0: Not at all - 4: Very much) for each item. Participants were also asked about the duration of each symptom ranging from less than one week to more than six months after discharge. Symptoms in the questionnaire included cough, shortness of breath (dyspnea), sore throat, low-grade fever (37.3~38.0°C), chest discomfort, palpitations, headache, headache, sleep disturbances, difficulties in concentration or memory, loss of smell, loss of taste, joint pain, and muscle pain. Participants were also asked to write down any additional symptoms they have experienced, as well as the most distressing symptom, the ways they have tried to alleviate symptoms, and whether they were effective or not. The number for each symptom (prevalence) was counted if a score of 1 or higher was selected in at least one of the subscales; frequency, severity, and distress.

## **6. Data analysis**

The collected data were analyzed using R software version 4.2.1 program.

- 1) Participant characteristics (general, hospital-related information) were analyzed according to frequency, percentage, mean, and standard deviation.
- 2) Participants' PCS symptoms were analyzed using frequency, percentage, mean, and standard deviation.
- 3) The differences between variables according to participant characteristics were analyzed using the t-test for normally distributed data. Wilcoxon rank-sum test and Kruskal-Wallis test were used for non-normally distributed data. The post-hoc evaluation was performed using the Dunn test.

## **CHAPTER V. RESULTS**

### **1. Participant characteristics**

#### **1) General characteristics**

114 responses were used for data analysis. General characteristics included gender, age, marital status, household living arrangements, and employment status (Table 1). 84 (73.7%) participants were female. The mean (SD) age was 35.05 (8.43) years, and 54 (47.4%) were aged 30~39. 67 (59.8%) were not married, and 88 (77.2%) lived with their family. At the time of the survey, 83 (72.8%) respondents were employed.

Table 1. General participant characteristics

(N=114)

<b>Variable</b>	<b>Category</b>	<b>n (%)</b>	<b>Mean <math>\pm</math> SD (range)</b>
Gender	Male	30 (26.3)	
	Female	84 (73.7)	
Age (years)	18 ~ <30	30 (26.3)	35.05 $\pm$ 8.43 (21~63)
	30 ~ <40	54 (47.4)	
	40 ~ <50	22 (19.3)	
	50 ~ <60	6 (5.3)	
	60 ~ <70	2 (1.7)	
Marital status	Not married	67 (59.8)	
	Married	47 (41.2)	
Living status	No	26 (22.8)	
	Yes	88 (77.2)	
Employment status	Unemployed	31 (27.2)	
	Employed	83 (72.8)	



## 2) Hospital-related characteristics

Hospital-related characteristics included hospital type, hospital length of stay, ICU admission, time since hospital discharge, types of comorbidities, and COVID-19 vaccination status. 92 (80.7%) were admitted in a secondary hospital (hospitals with 30 to 500 beds). 52 (45.6%) were hospitalized for less than one week. 2 (1.8%) were admitted to the intensive care unit during hospitalization. At the time of the survey, 26 (22.8%) of the participants had been discharged for 1~2 months. 102 (89.5%) did not have any comorbidities. Of those with more than one comorbidity (n=12), hypertension (4; 3.4%) and diabetes mellitus (3; 2.5%) were the most common illnesses. 2 (1.7%) participants had more than one comorbidity. 102 (89.5%) people received at least one dose of COVID-19 vaccination and 12 (10.5%) were not vaccinated. 55 (48.3%) of all participants completed the second dose of vaccination, while 31 (27.2%) received the third (Table 2).

Table 2. Hospital-related Characteristics

(N=114)

Variable	Category	n (%)
Hospital type*	Secondary	92 (80.7)
	Tertiary	22 (19.3)
Hospital length of stay	< 1 week	52 (45.6)
	1 ~ < 2 weeks	48 (42.1)
	2 ~ < 3 weeks	6 (5.3)
	3 ~ < 4 weeks	4 (3.5)
	1 ~ < 3 months	1 (.9)
	≥3 months	1 (.9)
	Don't know	2 (1.8)
ICU admission	No	107 (93.9)
	Yes	2 (1.8)
	Don't know	5 (4.3)
Time since hospital discharge	1 ~ < 2 months	26 (22.8)
	2 ~ < 3 months	25 (21.9)
	3 ~ < 6 months	36 (31.6)
	6 ~ < 9 months	14 (12.3)
	9 ~ < 12 months	8 (7.0)
	≥ 12 months	5 (4.4)
Number of comorbidities	None	102 (89.5)
	1	10(8.8)
	≥ 2	2(1.7)
Types of comorbidities	Hypertension	4 (3.4)
	Diabetes mellitus	3 (2.5)
	Cardiovascular disease	2 (1.7)
	Cerebrovascular disease	1 (.8)
	Malignant neoplasm	1 (.8)
	Chronic obstructive pulmonary disease	2 (1.7)
	Others	4 (3.4)
COVID-19 vaccination status	Not vaccinated	12 (10.5)
	1 <sup>st</sup> dose	12 (10.5)
	2 <sup>nd</sup> dose	55 (48.3)
	3 <sup>rd</sup> dose	31 (27.2)
	4 <sup>th</sup> dose	4 (3.5)

*Note.* \*Secondary hospital: Medical facilities for inpatients with 30 to fewer than 500 beds. Tertiary hospital: Hospital-level medical institutions with 500 or more beds and offer specialized medical care.

## **2. Post-acute COVID-19 syndrome symptoms**

### **1) Post-acute COVID-19 syndrome symptoms**

Post-acute COVID-19 syndrome symptoms included fatigue, anxiety and depression, cough, shortness of breath, sore throat, low grade fever, chest discomfort, palpitations, headache, sleep disturbances, difficulties in concentration or memory, loss of smell, loss of taste, joint pain, and muscle pain. (Table 3, 4).

Anxiety (66.7%), fatigue (64%), headache (57.9%), and difficulties in concentration or memory (57.9%) were symptoms most experienced by participants. 73 (64%) participants had severe fatigue, with the mean score of fatigue being  $4.24 \pm 1.11$  (range 1.44~7). 76 (66.7%) were above the clinical cut-off score of 8 for anxiety. The average score of anxiety was  $8.18 \pm 3.4$  (range 0~21). 56 (49.1%) were above the clinical cut-off score for depression. The average depression score was  $7.63 \pm 3.59$  (range 0~21) (Table 3).

The frequency, severity, and distress associated with PCS symptoms are detailed in Table 4 (range 0~4). Headache (66; 57.9%) and difficulties in concentration or memory (66; 57.9%) had the greatest prevalence (the number of respondents who scored more than one point on at least one of the subscales - frequency, severity, or distress). Difficulties in concentration or memory had the highest symptom frequency ( $1.07 \pm 1.09$ ) and severity scores ( $1.04 \pm 1.14$ ) (n=66). Sleep disturbances also had the highest frequency ( $1.07 \pm 1.17$ ). The highest mean distress scores were for cough ( $.82 \pm 1.10$ ) (n=59),

loss of taste ( $.82 \pm 1.10$ ) (n=38), joint pain ( $0.82 \pm 1.10$ ) (n=48), and muscle pain ( $.82 \pm 1.10$ ) (n=38).

The duration of PCS symptoms is described according to the duration since hospital discharge. Cough (n=45, 51.7%), headache (n=44, 50.6%), and sore throat (n=40, 46.0%) were the most prevalent symptoms among 87 patients discharged less than six months ago. However, among 27 patients discharged more than six months ago, headache (n=17, 63%), cough (n=15, 55.6%), and sleep disturbances (n=15, 55.6%) were the most prevalent (Table 5-1, 5-2).

Table 3. PCS symptoms (Fatigue, Anxiety, Depression)

(N=114)

Domain	Category	n (%)	Mean $\pm$ SD (range)
Fatigue (1~7)	Mild or no fatigue (< 4)	41 (36.0)	4.24 $\pm$ 1.11
	Severe fatigue ( $\geq$ 4)	73 (64.0)	(1.44 ~ 7)
Anxiety (0~21)	Normal (< 8)	38 (33.3)	8.18 $\pm$ 3.4
	Mild, moderate, or severe ( $\geq$ 8)	76 (66.7)	(0 ~ 18)
Depression (0~21)	Normal (< 8)	58 (50.9)	7.63 $\pm$ 3.59
	Mild, moderate, or severe ( $\geq$ 8)	56 (49.1)	(0 ~ 18)

Table 4. PCS Symptoms measured by PCS symptom questionnaire

(N=114)

Variable	Mean $\pm$ SD					
	n (%)	Frequency		Severity		Distress
Cough	59(51.8)	.76	$\pm$ .87	.80	$\pm$ .98	.82 $\pm$ 1.10
Shortness of breath	54(47.4)	.68	$\pm$ .90	.68	$\pm$ .97	.81 $\pm$ 1.08
Sore throat	61(53.5)	.89	$\pm$ 1.03	.76	$\pm$ 1.02	.79 $\pm$ 1.07
Low grade fever	40(35.1)	.53	$\pm$ .89	.53	$\pm$ .94	.79 $\pm$ 1.07
Chest discomfort	54(47.4)	.75	$\pm$ .96	.72	$\pm$ .96	.79 $\pm$ 1.08
Palpitations	50(43.9)	.70	$\pm$ .96	.65	$\pm$ .94	.80 $\pm$ 1.08
Headache	66(57.9)	1.06	$\pm$ 1.08	.99	$\pm$ 1.05	.81 $\pm$ 1.08
Sleep disturbances	64(56.1)	1.07	$\pm$ 1.17	1.00	$\pm$ 1.22	.80 $\pm$ 1.09
Difficulties in concentration or memory	66(57.9)	1.07	$\pm$ 1.09	1.04	$\pm$ 1.14	.80 $\pm$ 1.09
Loss of smell	49(43.0)	.73	$\pm$ 1.04	.68	$\pm$ 1.06	.81 $\pm$ 1.09
Loss of taste	38(33.3)	.54	$\pm$ .88	.49	$\pm$ .89	.82 $\pm$ 1.10
Muscle pain	48(42.1)	.68	$\pm$ .98	.62	$\pm$ .94	.82 $\pm$ 1.10
Joint pain	38(33.3)	.50	$\pm$ .82	.44	$\pm$ .79	.82 $\pm$ 1.10

Table 5-1. Duration of PCS symptoms (Time since hospital discharge &lt; 6 months)

(N=87)

Variable	n (%)												N (%)		
	< 1 week		1 ~ <2 weeks		2 ~ <4 weeks		1 ~ <2 months		2 ~ < 3 months		3 ~ < 6 months			≥6 months	
Cough	11	(12.6)	8	(9.2)	9	(10.3)	6	(6.9)	5	(5.7)	5	(5.7)	1	(1.1)	45(51.7)
Shortness of breath	6	(6.9)	7	(8.0)	7	(8.0)	4	(4.6)	4	(4.6)	3	(3.4)	2	(2.3)	33(37.9)
Sore throat	7	(8.0)	15	(17.2)	9	(10.3)	4	(4.6)	3	(3.4)	1	(1.1)	1	(1.1)	40(46.0)
Low grade fever	13	(14.9)	2	(2.3)	6	(6.9)	4	(4.6)	1	(1.1)	1	(1.1)	1	(1.1)	28(32.2)
Chest discomfort	13	(14.9)	6	(6.9)	3	(3.4)	3	(3.4)	5	(5.7)	2	(2.3)	4	(4.6)	36(41.4)
Palpitations	10	(11.5)	6	(6.9)	2	(2.3)	5	(5.7)	4	(4.6)	3	(3.4)	3	(3.4)	33(37.9)
Headache	13	(14.9)	10	(11.5)	6	(6.9)	4	(4.6)	4	(4.6)	3	(3.4)	4	(4.6)	44(50.6)
Sleep disturbances	14	(16.1)	9	(10.3)	3	(3.4)	2	(2.3)	2	(2.3)	6	(6.9)	3	(3.4)	39(44.8)
Difficulties in concentration or memory	5	(5.7)	10	(11.5)	5	(5.7)	8	(9.2)	5	(5.7)	3	(3.4)	3	(3.4)	39(44.8)
Loss of smell	12	(13.8)	5	(5.7)	6	(6.9)	5	(5.7)	0	(0.0)	0	(0.0)	3	(3.4)	31(35.6)
Loss of taste	9	(10.3)	5	(5.7)	5	(5.7)	2	(2.3)	2	(2)	0	(0.0)	2	(2.3)	25(28.7)
Muscle pain	6	(6.9)	10	(11.5)	4	(4.6)	0	(0.0)	4	(4.6)	3	(3.4)	4	(4.6)	31(35.6)
Joint pain	7	(8.0)	2	(2.3)	6	(6.9)	2	(2.3)	2	(2.3)	1	(1.1)	2	(2.3)	22(25.3)

Table 5-2. Duration of PCS symptoms (Time since hospital discharge  $\geq$  6 months)

(N=27)

Variable	n (%)														N (%)
	< 1 week		1 ~ <2 weeks		2 ~ <4 weeks		1 ~ <2 months		2 ~ < 3 months		3 ~ < 6 months		≥6 months		
Cough	5	(18.5)	2	(7.4)	2	(7.4)	4	(14.8)	1	(3.7)	0	(0.0)	1	(3.7)	15(55.6)
Shortness of breath	4	(14.8)	0	(0.0)	2	(7.4)	2	(7.4)	1	(3.7)	1	(3.7)	0	(0.0)	10(37.0)
Sore throat	5	(18.5)	1	(3.7)	4	(14.8)	2	(7.4)	2	(7.4)	0	(0.0)	0	(0.0)	14(51.9)
Low grade fever	2	(7.4)	3	(11.1)	1	(3.7)	1	(3.7)	1	(3.7)	1	(3.7)	0	(0.0)	9(33.3)
Chest discomfort	3	(11.1)	0	(0.0)	2	(7.4)	2	(7.4)	2	(7.4)	1	(3.7)	0	(0.0)	10(37.0)
Palpitations	3	(11.1)	2	(7.4)	2	(7.4)	4	(14.8)	0	(0.0)	1	(3.7)	0	(0.0)	12(44.4)
Headache	7	(25.9)	1	(3.7)	3	(11.1)	2	(7.4)	2	(7.4)	1	(3.7)	1	(3.7)	17(63.0)
Sleep disturbances	3	(11.1)	4	(14.8)	2	(7.4)	1	(3.7)	2	(7.4)	3	(11.1)	0	(0.0)	15(55.6)
Difficulties in concentration or memory	3	(11.1)	3	(11.1)	2	(7.4)	1	(3.7)	2	(7.4)	1	(3.7)	1	(3.7)	13(48.1)
Loss of smell	2	(7.4)	4	(14.8)	3	(11.1)	1	(3.7)	1	(3.7)	0	(0.0)	0	(0.0)	11(40.7)
Loss of taste	3	(11.1)	1	(3.7)	1	(3.7)	3	(11.1)	0	(0.0)	0	(0.0)	0	(0.0)	8(29.6)
Muscle pain	2	(7.4)	2	(7.4)	1	(3.7)	0	(0.0)	2	(7.4)	1	(3.7)	0	(0.0)	8(29.6)
Joint pain	0	(0.0)	3	(11.1)	0	(0.0)	2	(7.4)	1	(3.7)	0	(0.0)	0	(0.0)	6(22.2)

## 2) Other PCS symptom characteristics and symptom relief methods

When asked about the most distressing PCS symptom as a separate question, fatigue (n=22; 19.3%), headache (n=15; 13.2%), and cough (n=14; 12.3%) were rated as most distressing (Table 6). Furthermore, the subjective responses of the participants revealed a variety of such symptoms as general malaise, increased sputum, and numbness and tingling in limbs (Table 6).

The methods used to alleviate PCS symptoms are listed in Table 7. 55 participants (48.3%) attempted at least one way to ameliorate symptoms. The most common method was to take medications (36; 65.5%), followed by visiting the hospital (28; 50.9%). Taking medications (23; 38.3%) and going to the hospital (15; 25.0%) were counted as the most useful means of relieving symptoms.



Table 6. Most distressing PCS symptom

(N = 114)

Symptom	n	(%)
Fatigue	22	(19.3)
Headache	15	(13.2)
Cough	14	(12.3)
Sleep disturbances	12	(10.5)
Difficulties in concentration or memory	10	(8.8)
Sore throat	7	(6.1)
Chest discomfort	7	(6.1)
Loss of taste	6	(5.3)
Shortness of breath	4	(3.5)
Loss of smell	4	(3.5)
Muscle pain	4	(3.5)
Fever	3	(2.6)
Other	3	(2.6)
Anxiety or depression	1	(.9)
Palpitations	1	(.9)
Joint pain	1	(.9)

Table 7. Other PCS symptoms reported by participants

Category	Symptom
General	- General malaise
	- Chills
	- Pain of the back, armpit
Ear, nose, and throat	- Increased sputum
	- Nosebleed
	- Runny nose
	- Dizziness, tinnitus
Neurological	- Numbness and tingling in limbs
	- Sore hands, feet
Digestive	- Gastric reflux
	- Lack of appetite
	- Constipation
Endocrine	- Irregular menstruation
Cardiovascular	- New Hypertension

Table 8. Methods tried to alleviate PCS symptoms\*

Method	Method tried (n = 55)		Most useful method (n = 60)	
	n	(%)	n	(%)
Visiting the hospital	28	50.9	15	25.0
Visiting the Korean traditional medicine clinic	12	21.8	4	6.7
Taking medications (e.g., painkillers, fever reducers)	36	65.5	23	38.3
Changing lifestyles (e.g., exercise, diet)	23	41.8	11	18.3
Alternative medicine	1	1.8	0	0.0
Other	0	0	7	11.7

\* *Note.* More than one response was allowed.

### **3. Post-acute COVID-19 syndrome symptoms according to participant characteristics**

#### **1) Post-acute COVID-19 syndrome symptoms according to gender and age**

T-test and Wilcoxon rank-sum test were used to analyze differences in fatigue, anxiety, depression, and other PCS symptom distress based on participant characteristics. Among the sixteen PCS symptoms, female individuals showed higher symptom distress in thirteen symptoms, especially in psychological symptoms: anxiety, depression, cough, sore throat, fever, chest, palpitations, headache, sleep disturbances, concentration or memory difficulties, muscle pain, and joint pain. Male patients had greater shortness of breath, loss of smell, and loss of taste (Table 9).

Age was statistically significant for headache, sleep disturbances, and difficulties in concentration or memory. Respondents with a higher age (aged  $\geq 35$ ) had more distressful headache and concentration difficulties. Those with a lower age (aged  $< 35$ ) reported higher sleep disturbances than those over 35 ( $W=7750$ ,  $p=.006$ ).

Table 9. PCS symptom distress according to gender and age

(N=114)

Category Variable	Gender		Age					
	Female	Male	<35			≥35		
	Mean ± SD		W or t	p	Mean ± SD		W or t	p
Fatigue	4.31 ± 1.05	4.02 ± 1.24	1.167	.249	4.23 ± 1.08	4.24 ± 1.15	-.040	.968
Anxiety	8.41 ± 3.20	7.50 ± 3.86	12579	< .001***	7.73 ± 2.98	8.71 ± 3.79	-1.522	.131
Depression	7.86 ± 3.44	6.57 ± 3.87	12279	< .001***	7.40 ± 3.76	7.65 ± 3.40	-.373	.71
Cough	.99 ± 1.19	.37 ± .56	3819	< .001***	.69 ± 1.08	.98 ± 1.11	7179	.126
Shortness of breath	.65 ± 0.99	.77 ± 1.14	3279	< .001***	.63 ± 1.07	.75 ± .99	6640	.746
Sore throat	1.02 ± 1.18	.43 ± 1.01	4119	< .001***	.65 ± 1.03	1.13 ± 1.27	7216	.108
Low grade fever	.49 ± .86	.40 ± 1.00	2202	< .001***	.37 ± .81	.57 ± .98	5722	.066
Chest discomfort	.75 ± 1.028	.73 ± 1.05	3648	< .001***	.76 ± 1.09	.73 ± .95	6946	.312
Palpitations	.67 ± .99	.60 ± .89	3234	< .001***	.66 ± 1.05	.63 ± .84	6640	.747
Headache	1.08 ± 1.13	1.00 ± 1.34	5124	.003**	.85 ± 1.13	1.33 ± 1.20	8077	< .001***
Sleep disturbances	1.09 ± 1.25	.90 ± 1.29	4746	< .001***	1.09 ± 1.31	.98 ± 1.196	7750	.006**
Difficulties in concentration or memory	1.08 ± 1.15	.83 ± 1.12	4995	.0012**	.82 ± 1.03	1.25 ± 1.23	7994	.001**
Loss of smell	.76 ± 1.08	.77 ± 1.30	3453	< .001***	.65 ± 1.10	.90 ± 1.18	6754	.56
Loss of taste	.50 ± .94	.53 ± .94	2418	< .001***	.48 ± .94	.54 ± .94	5831	.116
Muscle pain	.75 ± 1.11	.60 ± 1.19	3300	< .001***	.56 ± 1.03	.88 ± 1.21	6464	.939
Joint pain	.44 ± .78	.43 ± .81	2187	< .001***	.35 ± .63	.59 ± 1.05	5810	.105

Note.  $p < .05^*$ ,  $p < .01^{**}$ ,  $p < .001^{***}$

## 2) Post-acute COVID-19 syndrome symptoms according to hospital-related characteristics

Differences in fatigue, anxiety, depression, and other PCS symptom distress according to hospital-related participant characteristics were analyzed using the t-test, Wilcoxon rank-sum test, and Kruskal-Wallis test. Dunn test was used for post-hoc analysis (Table 10, 11).

Symptom distress including cough, low grade fever, chest discomfort, and muscle pain varied with the hospital length of stay. Post-hoc analyses revealed that patients hospitalized for more than two weeks had greater cough distress than those hospitalized for less than one week ( $\chi^2 = 12.1$  ,  $p=.002$ ). Those hospitalized for more than two weeks experienced more distressful low-grade fever than those hospitalized for 1~2 weeks ( $\chi^2 = 12.1$  ,  $p=.002$ ). Participants hospitalized for greater than two weeks and 1~2 weeks expressed more distressing chest discomfort than those hospitalized for less than one week. Time since hospital discharge was statistically significant in sleep disturbances and concentration or memory difficulties. People who had been discharged more than 9 months ago experienced greater sleep disturbances than those discharged 1~2 months and 2~3 months ago ( $\chi^2 = 15.028$  ,  $p=.005$ ). Patients who were discharged more than 9 months ago also had more concentration or memory difficulties than those discharged 1~2 months and 3~6 months before ( $\chi^2 = 14.301$  ,  $p=.006$ ).

COVID-19 vaccination was statistically significant in anxiety, cough, shortness of breath, sore throat, chest discomfort, palpitations, loss of smell, loss of taste, muscle pain, and joint pain. Participants who did not receive any COVID-19 vaccinations reported more distressful symptoms in the statistically relevant variables than those who received one or more doses of vaccination. There were statistically significant differences in anxiety, sore throat, sleep disturbances, muscle pain, and joint pain according to the number of COVID-19 vaccinations. Post-hoc analyses indicated those who did not receive any vaccination dose experienced greater anxiety than those who received a third vaccination dose ( $\chi^2 = 10.443$ ,  $p=.015$ ). Non-vaccinated patients reported more sleep disturbances than those who received a second or third vaccination dose ( $\chi^2 = 9.933$ ,  $p=.005$ ). Participants who had no vaccination had more muscle pain than those who had a first or second dose of vaccination ( $\chi^2 = 13.073$ ,  $p=.004$ ). The presence of comorbidities was statistically significant in cough, shortness of breath, sore throat, low grade fever, chest discomfort, palpitations, headache, sleep disturbances, loss of smell, loss of taste, and muscle pain. Respondents with no comorbidities had higher symptom scores than those with comorbidities, except for sore throat distress, for which people with comorbidities had higher symptom scores ( $W= 8979$ ,  $p<.001$ ). Participants who had tried at least one symptom relief method had higher distress in anxiety, fever, headache, sleep disturbances, concentration or memory difficulties, and joint pain compared to those who had not.

Table 10. Fatigue, Anxiety, and Depression according to hospital-related participant characteristics

(N = 114)

Variables	Category	Fatigue			Anxiety			Depression			
		Mean ± SD	t, W or $\chi^2$	p	Mean ±SD	t, W or $\chi^2$	p	Dunn	Mean ± SD	t, W or $\chi^2$	p
Hospital length of stay	< 1 week	4.32±1.24	1.452	.484	7.56±3.63	2.104	.349		7.08±3.94	2.858	.234
	1 ~ <2 weeks	4.23±.93			8.56±2.61				7.75±3.21		
	≥2 weeks	3.94±1.15			9.14±4.58				8.36±3.48		
Time since hospital discharge	1 ~ <2 months	4.26±.70	8.716	.069	7.46±2.19	8.178	.085		7.00±2.65	4.279	.369
	2 ~ <3 months	4.13±1.07			7.64±4.21				7.12±4.08		
	3 ~ <6 months	3.98±1.25			7.81±3.00				7.28±3.87		
	6 ~ <9 months	5.00±1.17			10.21±3.77				9.00±3.51		
	≥ 9 months	4.28±1.10			9.46±3.55				8.38±3.48		
Comorbidities	None	4.23±1.08	-.0489	.962	8.19±3.29	.119	.907		7.60±3.52	.686	.51
	≥1	4.26±1.46			8.00±4.66				6.56±4.45		
COVID-19 vaccination	Not vaccinated	4.87±1.36	1.739	.106	11.44±.23	12684	<.001***		9.75±4.76	1.761	.103
	≥1 Dose	4.16±1.06			7.79±3.09				7.25±3.36		
COVID-19 vaccination number	Not vaccinated(a)	4.87±1.36	7.45	.059	11.42±4.23	10.443	.015*	a>d	9.75±4.77	4.89	.18
	1 <sup>st</sup> dose(b)	4.68±.83			8.33±1.87				7.75±2.53		
	2 <sup>nd</sup> dose(c)	3.99±1.11			8.25±2.78				7.45±3.31		
	3 <sup>rd</sup> dose(d)	4.24±1.15			6.88±3.70				6.77±3.70		
Symptom relief method	None	4.23±.87	-.754	.453	7.29±2.88	12802	<.001***		7.24±3.32	-.856	.393
	≥1	4.26±1.31			9.13±3.66				7.82±3.87		

Note.  $p < .05^*$ ,  $p < .01^{**}$ ,  $p < .001^{***}$

Table 11. PCS symptom distress according to hospital-related participant characteristics

(N = 114)

Variables	Category	Cough				Shortness of breath			Sore throat		
		Mean ± SD	t, W or $\chi^2$	<i>p</i>	<i>Dunn</i>	Mean ± SD	t, W or $\chi^2$	<i>p</i>	Mean ± SD	t, W or $\chi^2$	<i>p</i>
Hospital length of stay	< 1 week(a)	.59±.93	12.122	.002**	c>a	.50±.83	3.482	.175	.71±1.13	4.399	.111
	1 ~ <2 weeks(b)	.85±1.2				.71±1.05			.92±1.22		
	≥2 weeks(c)	1.57±1.02				1.29±1.44			1.29±1.07		
Time since hospital discharge	1 ~ <2 months	.85±1.19	3.496	.479		.54±.94	4.767	.312	.85±1.04	1.786	.775
	2 ~ <3 months	.96±1.27				.72±.94			.84±1.10		
	3 ~ <6 months	.72±.94				.69±.95			.89±1.28		
	6 ~ <9 months	1.07±.99				1.29±1.64			1.21±1.42		
	≥ 9 months	.54±1.13				.24±.44			.54±.88		
Comorbidities	None	.83±1.09	9114	<.001***		.70±1.04	8596.5	<.001***	.87±1.17	8979	<.001***
	≥1	.78±1.30				.44±.88			.89±1.16		
COVID-19 vaccination	Not vaccinated	1.00±1.13	4929	<.001***		1.08±1.56	4365	<.001***	1.25±1.36	5166	.003**
	≥1 Dose	.80±1.09				.63 ±.95			.82±1.14		
COVID-19 vaccination number	Not vaccinated	1.00±1.13	4.072	.254		1.08±1.56	8.584	.035	1.25±1.36	8.754	.033*
	1 <sup>st</sup> dose	.25±.45				.16±.39			.58±1.24		
	2 <sup>nd</sup> dose	.89±1.18				.49±1.15			.60±.95		
	≥ 3 <sup>rd</sup> dose	.86±1.09				1.03±1.12			1.26±1.27		
Symptom relief method	None	.64±.98	7044	.221		.32±.65	6503.5	.991	.52±.92	7093	.185
	≥1	1.02±1.19				1.07±1.21			1.24±1.29		

Note.  $p < .05^*$ ,  $p < .01^{**}$ ,  $p < .001^{***}$



Table 11. (Continued)

(N = 114)

Variables	Category	Low grade fever				Chest discomfort				Palpitations		
		Mean ± SD	t, W or $\chi^2$	<i>p</i>	<i>Dunn</i>	Mean ± SD	t, W or $\chi^2$	<i>p</i>	<i>Dunn</i>	Mean ± SD	t, W or $\chi^2$	<i>p</i>
Hospital length of stay	< 1 week(a)	.52±.96	9.345	.009**	c>b	.40±.82	11.58	.003*	b,c>a	.56±.92	1.043	.594
	1 ~ <2 weeks(b)	.25±.64				.98±1.08				.75±1.02		
	≥2 weeks(c)	1.00±1.18				1.21±1.18				.64±.93		
Time since hospital discharge	1 ~ <2 months	.46±.71	.858	.931		.62±.89	1.591	.810		.42±.70	3.448	.486
	2 ~ <3 months	.44±.77				.84±.99				.80±.82		
	3 ~ <6 months	.47±1.06				.69±1.03				.61±.96		
	6 ~ <9 months	.42±.85				1.07±1.38				.64±1.15		
	≥ 9 months	.54±1.13				.62±.96				.92±1.38		
Comorbidities	None	.48±.92	7872	<.001***		.78±1.06	8838	<.001***		.69±.97	8596.5	<.001***
	≥1	.22±.44				.33±.50				.22±.66		
COVID-19 vaccination	Not vaccinated	1.25±1.54	3222	.74		1.00±1.41	4746	<.001***		1.17±1.27	4365	<.001***
	≥1 Dose	.37±.74				.72±.98				.59±.90		
COVID-19 vaccination number	Not vaccinated	1.25±1.54	7.194	.065		1.00±1.41	1.374	.712		1.17±1.27	3.875	.275
	1 <sup>st</sup> dose	.08±.29				.42±.67				.75±1.06		
	2 <sup>nd</sup> dose	.34±.62				.69±.96				.49±.81		
	≥3 <sup>rd</sup> dose	.51±.98				.85±1.09				.69±.99		
Symptom relief method	None	.25±.60	5572	.03*		.64±1.03	6814	.478		.41±.79	6503.5	.991
	≥1	.69±1.09				.85±1.03				.90±1.06		

Note.  $p < .05^*$ ,  $p < .01^{**}$ ,  $p < .001^{***}$

Table 11. (Continued)

(N = 114)

Variables	Category	Headache			Sleep disturbances			Difficulties in concentration or memory				
		Mean ± SD	t, W or $\chi^2$	<i>p</i>	Mean ± SD	t, W or $\chi^2$	<i>p</i>	<i>Dunn</i>	Mean ± SD	t, W or $\chi^2$	<i>p</i>	<i>Dunn</i>
Hospital length of stay	< 1 week	1.00±1.22	1.866	.393	1.17±1.35	.772	.679		1.19±1.22	2.094	.351	
	1 ~ <2 weeks	1.04±1.18			.94±1.14				.92±1.13			
	≥2 weeks	1.36±1.08			.92±1.33				.71±.83			
Time since hospital discharge	1 ~ <2 months(a)	.96±1.04	2.195	.699	.54±.71	15.028	.005**	e>a,b	.69±.84	14.301	.006**	e>a,c
	2 ~ <3 months(b)	1.08±1.29			.68±.99				.88±1.05			
	3 ~ <6 months(c)	.94±1.26			1.00±1.29				.81±1.12			
	6 ~ <9 months(d)	1.36±1.39			1.71±1.38				1.50±1.40			
	≥ 9 months(e)	1.23±.83			2.15±1.51				2.00±1.08			
Comorbidities	None	1.11±1.18	9646.5	<.001***	1.07±1.27	9448.5	<.001***		1.03±1.15	9585	<.001***	
	≥1	.44±1.01			.78±1.09				.88±1.01			
COVID-19 vaccination	Not vaccinated	2.17±1.59	6252	.587	2.08±1.38	5775	.107		9.75±4.76	1.761	.103	
	≥1 Dose	.93±1.06			.92±1.19				7.25±3.36			
COVID-19 vaccination number	Not vaccinated(a)	1.75±1.29	8.372	.039	2.08±1.38	9.933	.019*	a>c,d	9.75±4.77	4.445	.217	
	1 <sup>st</sup> dose(b)	.67±.78			1.50±1.57				7.75±2.53			
	2 <sup>nd</sup> dose(c)	.91±.97			.82±1.12				7.45±3.31			
	≥3 <sup>rd</sup> dose(d)	1.03±1.25			.89± 1.13				.91±1.04			
Symptom relief method	None	.64±.99	7967.5	.001**	.95±1.25	7631.5	.013*		.81± 1.04	7883	.002**	
	≥1	1.51±1.22			1.15±1.27				1.24±1.22			

Note.  $p < .05^*$ ,  $p < .01^{**}$ ,  $p < .001^{***}$

Table 11. (Continued)

(N = 114)

Variables	Category	Loss of smell			Loss of taste			Muscle pain			Dunn
		Mean ± SD	t, W or $\chi^2$	p	Mean ± SD	t, W or $\chi^2$	p	Mean ± SD	t, W or $\chi^2$	p	
Hospital length of stay	< 1 week	.74±1.22	.825	.662	.58±1.05	1.801	.406	.50±1.02	10.882	.004**	
	1 ~ <2 weeks	.77±1.08			.38±.76			.69±1.09			
	≥2 weeks	.86± 1.09			.71±.99			1.57±1.28			
Time since hospital discharge	1 ~ <2 months	.58±.90	2.974	.562	.46±.58	2.336	.674	.58±1.03	4.983	.289	
	2 ~ <3 months	.96±1.21			.60±1.00			.68±.99			
	3 ~ <6 months	.67±1.15			.47±1.03			.61±1.13			
	6 ~ <9 months	1.21±1.53			.64±1.15			1.36±1.45			
	≥ 9 months	.54±.88			.38±.96			.62±1.12			
Comorbidities	None	.75±1.14	8710.5	<.001***	.52±.93	7938	<.001***	.72±1.13	8377.5	<.001***	
	≥1	.88±1.17			.33±1.00			.56±1.13			
COVID-19 vaccination	Not vaccinated	1.33±1.72	4479	<.001***	1.17±1.47	3381	<.001***	1.75±1.48	4239	<.001***	
	≥1 Dose	.69±1.04			.43±.83			.59±1.02			
COVID-19 vaccination number	Not vaccinated(a)	1.31±.72	1.259	.739	1.17±1.47	4.840	.184	1.75±1.49	13.073	.004**	a>b,c
	1 <sup>st</sup> dose(b)	.92±1.31			.33±.89			.50±1.17			
	2 <sup>nd</sup> dose(c)	.06±.87			.40±.78			.45±.80			
	≥3 <sup>rd</sup> dose(d)	.77±1.19			.51±.88			.83±1.15			
Symptom relief method	None	.55±.93	6617.5	.788	.39±.69	5684	.057	.44± 0.99	6330.5	.703	
	≥1	.98±1.29			.64±1.13			1.00±1.20			

Note.  $p < .05^*$ ,  $p < .01^{**}$ ,  $p < .001^{***}$

Table 11. (Continued)

(N = 114)

Variables	Category	Joint pain		
		Mean $\pm$ SD	t, W or $\chi^2$	p
Hospital length of stay	< 1 week	.35 $\pm$ .74	2.142	.343
	1 ~ <2 weeks	.58 $\pm$ .99		
	$\geq$ 2 weeks	1.57 $\pm$ 1.28		
Time since hospital discharge	1 ~ <2 months	.46 $\pm$ .71	2.878	.579
	2 ~ <3 months	.52 $\pm$ .71		
	3 ~ <6 months	.53 $\pm$ 1.02		
	6 ~ <9 months	.50 $\pm$ 1.16		
	$\geq$ 9 months	.62 $\pm$ 1.12		
Comorbidities	None	.48 $\pm$ .87	7981.5	<.001***
	$\geq$ 1	.33 $\pm$ .71		
COVID-19 vaccination	Not vaccinated	1.08 $\pm$ 1.38	3285	<.001***
	$\geq$ 1 Dose	.39 $\pm$ .75		
COVID-19 vaccination number	Not vaccinated	1.08 $\pm$ 1.38	8.044	.045*
	1 <sup>st</sup> dose	.17 $\pm$ .39		
	2 <sup>nd</sup> dose	.25 $\pm$ .48		
	$\geq$ 3 <sup>rd</sup> dose	.83 $\pm$ 1.15		
Symptom relief method	None	.37 $\pm$ .74	5658.5	.049*
	$\geq$ 1	.56 $\pm$ .96		

Note.  $p < .05^*$ ,  $p < .01^{**}$ ,  $p < .001^{***}$

## CHAPTER VI. DISCUSSION

This study was conducted to describe the prevalence and characteristics of PCS symptoms, such as fatigue, anxiety, depression, and other symptoms measured by frequency, severity, and distress, to compare them based on participant characteristics, and to contribute to the development of management strategies to alleviate PCS symptoms.

### **1. Post-COVID fatigue, anxiety, and depression in participants**

The findings that the majority of participants exhibited multiple symptoms are consistent with previous studies that reported a myriad of PCS symptoms after hospital discharge (Halpin et al., 2021; Taquet et al., 2021). The high prevalence and severity of post-COVID fatigue observed in this study are congruent with previous reports of 66~78% of patients with severe fatigue and mean FSS scores of 4.1~5.6 (Jung et al., 2022; Tabacof et al., 2022). In addition, research demonstrating the association between fatigue and low quality of life corroborates the participants' high distress levels in fatigue (Malik et al., 2022). In contrast, the prevalence and severity of anxiety and depression were significantly higher compared to previous studies, which reported 15.7~22.5% of anxiety and 19~21.9% of depression, with mean scores of 4.1 for both symptoms (Fernández-De-Las-Peñas, Rodríguez-Jiménez, et al., 2022; Jung et al., 2022).

The high levels of anxiety and depression in this study may be

attributable to the high proportion of female participants. A plethora of literature suggests that women are more likely to experience anxiety and/or depression (Bai et al., 2022; Fernández-De-Las-Peñas, Martín-Guerrero, et al., 2022; C. Huang et al., 2021; Kim et al., 2022). It is possible that psychological or socioeconomic status not investigated in this study, such as stress coping levels, income, or educational status, influenced anxiety and depression levels, indicating the need for additional research incorporating these variables (Uzunova et al., 2021).

## **2. PCS symptoms measured by frequency, severity, distress, and duration**

PCS symptoms measured by frequency, severity, and distress were reported in at least one-third of the participants in each symptom, with headaches and concentration or memory difficulties being the most prevalent. One possible explanation for the high prevalence of headaches is that the onset of severe headaches during acute COVID-19 infection may lead to long-term headaches even after recovery from acute infection (Tana et al., 2022). The study indicating that moderate-to-severe COVID headaches being prevalent in middle-aged women may provide another plausible explanation (García-Azorín et al., 2022).

Memory and concentration difficulties not only had the highest prevalence, but also the highest frequency and severity. Previous studies

imply that cognitive and memory impairment are experienced by more than half of the participants, and diminished executive function, memory, and attention were observed 3 months after COVID-19 infection (Chaumont et al., 2022; Crivelli et al., 2022; Davis et al., 2021; Ortelli et al., 2021). Post-COVID cognitive impairments may be described by the association between cognitive and depressive symptoms, which interact with cognitive function and deteriorate quality of life (Poletti et al., 2022). To determine the factors that influence the symptoms, it would be useful to conduct further research that explores the relationships between the symptoms.

Sleep disturbances were also reported to have the highest mean frequency. In a systematic review of PCS symptoms at follow-up periods ranging from 3 to 12 months, sleep disturbances were one of the most prevalent symptoms at all time points (24~30%) (Alkodaymi et al., 2022). Long COVID patients had decreased light sleep and decreased deep sleep, according to a study that measured sleep quality with wearable devices (Mekhael et al., 2022). Mekhael et al. (2022) found that light sleep time and deep sleep duration were correlated with respiratory rate and saturation of percutaneous oxygen (SpO<sub>2</sub>). In light of the relationships between sleep and vital signs and the high prevalence of sleep disturbances reported in previous studies, future research should involve a detailed measurement using objective methods.

Cough, loss of taste, joint pain, and muscle pain had the highest mean distress scores. Several studies demonstrate that these symptoms impair the

physical and psychological quality of life. Persistence of cough after COVID-19 was related to reduced perceived physical health (Jacobs et al., 2020). Loss of smell and taste in COVID-19 infection was found to be associated with depression and suicidal ideation (Yom-Tov et al., 2021). Joint and muscle pain was related to an increased risk of having an incomplete function at six months after hospital discharge (Du et al., 2021). However, due to the paucity of previous studies investigating the symptoms in terms of frequency, severity, and distress, and the relatively low PCS scores, the results cannot be compared directly and must be interpreted with caution.

The analysis of PCS symptom duration revealed that cough was the most prevalent symptom in both groups discharged less than and more than six months ago. Cough is a common PCS symptom reported by patients 2 months and 6-9 months after acute illness (Alkodaymi et al., 2022; Moreno-Pérez et al., 2021). Sleep disturbances were predominant in patients discharged more than six months ago, which is consistent with a longitudinal study reporting a high prevalence of sleep disturbances at 6-month follow-up (Shanley et al., 2022). The results must be interpreted with concern, however, due to the small number of patients discharged more than 6 months ago, and the fact that very few patients reported symptoms persisting beyond 3 months.



### **3. Comparison of PCS symptoms by participant characteristics**

The findings that female participants experienced greater distress in the majority of PCS symptoms are in line with previous studies. Several studies demonstrate that women have a greater number of symptoms, and a higher prevalence of physical and psychological PCS symptoms such as anxiety, depression, concentration difficulties, cough, and headache (C. Huang et al., 2021; Kim et al., 2022; Knight et al., 2022; Xie et al., 2021). One hypothesis for this is that PCS may be an estrogen-associated autoimmune disease. As women are prone to having autoimmune diseases, they are more likely to have long-term consequences of COVID-19 (Ortona et al., 2021). In contrast to prior research, men in this study reported higher distress in shortness of breath, loss of smell, and loss of taste. One possible explanation is that men experience greater severity during acute COVID-19 infection, a risk factor for experiencing more distressful PCS symptoms (Jin et al., 2020; Kim et al., 2022). Men are believed to have acute infections that are more severe due to factors such as testosterone effects and a greater propensity for unhealthy behaviors such as smoking and drinking (Fabião et al., 2022).

Participants with a higher age had more headache and concentration difficulties. Some studies reported that middle-aged individuals exhibit a significantly higher prevalence of persistent symptoms than younger ones,

although immediate comparisons were difficult due to varying definitions of middle age (Carvalho et al., 2021; Lombardo et al., 2021). On the other hand, sleep disturbances were more common among young adults. A study of COVID-19 inpatients indicating that younger patients with greater fatigue and anxiety were more likely to have insomnia may explain a possible association between these symptoms following viral recovery (Wang et al., 2020). The results further imply the need for future investigation into the relationships between fatigue, anxiety, and sleep disturbances to explain the high prevalence of insomnia among young adults. In comparison to the numerous studies indicating that older adults over the age of 65 experience more PCS symptoms, there has been relatively little research on younger or middle-aged adults. Cho et al. (2021) revealed that among those hospitalized due to COVID-19 in 2020, 36.6% were aged between 20 and 40. In addition to the substantial proportion of young adults hospitalized due to COVID-19, this study showed a high symptom burden among relatively young patients, suggesting that this population should receive more attention.

In most symptoms, participants with COVID-19 vaccination had less distress than those without vaccination. Also, in some symptoms, those with a second or third vaccination experienced less distress than non-vaccinated individuals. Recent research discovered that vaccination is associated with reduced risks or probabilities of long COVID, with two doses more effective than one (Ayoubkhani et al., 2022; Notarte et al., 2022). However, since there

is a paucity of literature examining the relationship between a booster dose and PCS symptoms, future research should investigate these relationships.

Participants with a longer hospital stay had more distressful cough, low-grade fever, and chest discomfort. While Fernández-De-Las-Peñas et al. (2021) suggested an association between a longer hospital stay and a greater number of PCS symptoms, other studies revealed that the length of hospital stay is not associated with symptom persistence such as cough or fever (Karaarslan et al., 2021; Moreno-Pérez et al., 2021). Inconsistent research results may suggest that hospital length of stay is not an independent predictor; however, a two-week hospital length of stay was used as a comparison, so future studies including a longer time frame should be conducted.

Respondents who had been discharged more than 9 months ago experienced greater sleep disturbances and concentration difficulties compared to recently discharged patients. Kim et al. (2022) discovered that symptoms continued to resolve except for psychological symptoms, which recovered slowly and lasted more than a year. In the meantime, L. Huang et al. (2021) found that many symptoms, including sleep problems, decreased significantly one year after hospitalization. As this study compared the symptoms of different participants at distinct time points, studies that prospectively track patients' symptoms should be conducted to gain a better understanding of the symptom trajectory.

In most symptoms, individuals without comorbidities exhibited more distress. Although several studies suggest that patients with comorbidities

experience more PCS symptoms, a systematic review revealed that COVID-19 patients who were previously healthy reported significant fatigue, breathlessness, and decreased quality of life (Willi et al., 2021). In healthy individuals, the greater number of symptoms in the acute phase, higher BMI, and arthralgia were associated with the risk of long COVID in healthy individuals (Chudzik et al., 2022). In this study, it is noteworthy that a substantial burden of symptoms was reported in individuals with no underlying illness; therefore, additional research on post-COVID sequelae and the associated factors should also be conducted on previously healthy individuals.

Individuals who had tried at least one symptom relief method showed higher distress in 6 symptoms compared to those who had not. Those with greater symptom distress may have been more likely to take active measures to alleviate their symptoms. A qualitative study on the management of symptoms in PCS patients classified types of symptom management into three categories. The ‘self-management’ group emphasized health promotion strategies, while the ‘treatment focus’ group focused on medical treatment, and the ‘lethargy’ group did not actively try anything out of helplessness (Baek & Cha, 2022). In this sample, many participants can be interpreted as a ‘treatment-focused’ group as they took medications or visited the hospital to manage their PCS symptoms. Given the lack of literature on PCS symptom management, future nursing research and interventions should focus on reducing patients' distress and promoting self-management of PCS symptoms.

## **Limitations**

This study has some limitations. First, the survey was distributed through online communities, including long COVID support groups, resulting in a sampling bias in favor of active participants at the time the survey was uploaded. It is possible that individuals with limited digital literacy due to factors such as old age were unable to complete the survey. Additionally, those who no longer had their illnesses may have been discouraged from answering the survey, leading to an overestimation of symptom prevalence. Second, because the majority of participants had been discharged for less than 6 months, the long-term effects of PCS were not captured. Recruitment of participants based on the WHO definition of persistent symptoms for at least 2 months may facilitate the inclusion of participants who had been discharged for a longer period of time. Third, the overrepresentation of participants aged 20 to 40 and the exclusion of participants over the age of 70 decreases the generalizability of the sample. Fourth, it is challenging to determine whether the PCS symptoms occurred after COVID-19 infection, due to the lack of baseline information before COVID-19. Despite these limitations, the originality of this study lies in its comprehensive examination of symptom frequency, severity, and distress. The findings of this study provide insight into the characteristics of symptoms and which symptoms are problematic for patients. Detailed information on PCS symptoms may aid in addressing and caring for the persisting PCS symptoms in COVID-19 survivors.

## CHAPTER VII. CONCLUSION

The purpose of this study was to describe the prevalence and characteristics of post-acute COVID-19 symptoms (fatigue, anxiety, and other PCS symptoms) and to compare them according to participant characteristics in patients who had been hospitalized due to COVID-19. Surveys were distributed via online communities between August 4, 2022, and August 6, 2022. 137 participants were recruited, and 23 dropped out. 114 responses were used for data analysis. The main results were as follows:

First, anxiety (66.7%), fatigue (64%), headache (57.9%), and difficulties in concentration or memory (57.9%) were symptoms most experienced by participants.

Second, concentration or memory difficulties and sleep disturbances had the highest mean frequency (1.07). Concentration or memory difficulties also had the highest severity (1.04). Cough, loss of taste, and joint and muscle pain had the highest mean distress (.82)

Third, compared to males, female participants had higher distress in thirteen out of sixteen symptoms, markedly psychological symptoms, compared to males.

Fourth, participants without COVID-19 vaccination experienced more distress in ten of sixteen symptoms, compared to those who had received vaccination.

Fifth, participants hospitalized for longer than two weeks experienced more distress in cough, low grade fever, chest discomfort, and muscle pain. Those discharged more than nine months ago had more sleep disturbances and concentration or memory difficulties than more recently discharged patients.

Sixth, participants who had tried at least one symptom relief method had more distress in anxiety, fever, headache, sleep disturbances, concentration or memory difficulties, and joint pain compared to those who had not.

## **Directions for future research**

The following suggestions can be made for future research based on the findings of this study. First, the development and implementation of validated symptom assessment tools to specifically assess PCS symptoms will assist in the accurate measurement of PCS symptoms. Second, a longitudinal study design with long-term follow-up would be useful for comprehending the trajectory of symptoms. Third, investigating the relationships between the symptoms would be helpful in determining the key symptom to develop effective interventions. Fourth, nursing interventions to promote effective management of PCS symptoms by promoting health behaviors should be implemented to help individuals manage their symptoms in daily life. Finally, to increase the generalizability of the results, larger studies with a control group, diverse samples from various age groups, and studies with data before COVID-19 infection should be conducted.

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# APPENDICES

## Appendix 1. Approvals to use measurement tools



Krupp, Lauren

나에게 ▼

The planned use of the FSS is fine. Best of luck with your research

Sent from my iPhone

On May 16, 2022, at 11:23 PM, 어윤수

> wrote:



정규인

나에게 ▼

사용하시고 좋은 결과 얻으시기를 바랍니다.

--- Original Message ---

**From :** "어윤수"

**To**

**Date :** 2022/05/13 금요일 오후 2:19:52

**Subject :** 교수님 안녕하세요, 한국판 Fatigue Severity Scale 사용 승인 관련해서 메일 드립니다.

...

2206961 - Request to access the Korean version of Hospital Anxiety and Depression Scale (HADS)

ACCOUNT ADMINISTRATOR

### REQUEST

#### Subject

Request to access the Korean version of Hospital Anxiety and Depression Scale (HADS)

#### Description

Hello, my name is Yoonsoo Eo, and I am a master's student in Seoul National University College of Nursing in South Korea. I am currently working on a master's thesis titled 'Post-acute COVID-19 syndrome in patients discharged from a tertiary care hospital'. The primary aim of the study is to determine the prevalence of post-acute COVID-19 syndrome including fatigue, depression, and anxiety. I believed HADS would be an excellent tool to measure anxiety and depression in discharged COVID-19 patients. Therefore, I would like to request access to the Korean version of the Hospital Anxiety and Depression Scale. The scores obtained from HADS will be used to describe the prevalence and characteristics of post-COVID anxiety and depression, and anxiety and depressive symptoms will be compared according to participant characteristics such as COVID-19 severity and duration after discharge. I am planning on using the online version of the entire instrument without any modifications. The thesis paper is expected to be completed in December 2022. Attached file is the proposal for my master's thesis. Thank you.

### INFORMATION

**Number**  
2206961

**Type of request**  
Questionnaire Distribution

**Assigned to**  
Rohan Shirbhate

**Creation date**  
13 May 2022

**Modification date**  
5 Aug 2022

**Status**  
Closed Completed

Rohan Shirbhate 3 Aug 2022 10:30 PM

Hello Yoonsoo,

Thank you for your message. The screenshots looks good and you can proceed ahead with the use of questionnaire.

Please let em know if you have any questions before I close this request.

Thank you

Regards

Rohan

RS

## Appendix 2. Letter of information and consent

### 연구참여자유 설명문

연구 과제명 : COVID-19으로 입원치료를 받았던 사람들의 포스트 코로나 증후군 (Post-acute COVID-19 syndrome in previously hospitalized patients)

연구 책임자명 : 어윤수 (서울대학교 간호대학/석사과정)

이 연구는 코로나19 감염증으로 입원치료를 받은 후 퇴원한 성인을 대상으로 포스트 코로나 증후군의 현황과 특성을 파악하기 위한 연구입니다. 코로나19 감염증에서 회복한 사람 중 절반 이상이 피로, 숨 가쁨, 우울, 불안 등 다양한 후유증을 겪으며, 이로 인해 건강상태의 회복에 지장이 생기거나 삶의 질이 저하되는 등 여러 문제가 발생합니다. 이처럼 코로나19 증상이 시작된 지 4주 이후에도 지속되거나 새롭게 나타나는 증상을 포스트 코로나 증후군 또는 롱코비드라고 합니다 (미국 질병통제예방센터, CDC).

귀하는 코로나 19 감염증으로 인해 입원치료를 받은 적 있어 있다고 응답하셨기 때문에 이 연구에 참여하도록 권유 받았습니니다. 이 연구를 수행하는 서울대학교 소속의 어윤수 연구원(010-2845-9906)이 귀하에게 이 연구에 대해 설명해 줄 것입니다. 이 연구는 자발적으로 참여 의사를 밝히신 분에 한하여 수행 될 것이며, 귀하께서는 참여 의사를 결정하기 전에 본 연구가 왜 수행되는지 그리고 연구의 내용이 무엇과 관련 있는지 이해하는 것이 중요합니다. 다음 내용을 신중히 읽어보신 후 참여 의사를 밝혀 주시길 바라며, 필요하다면 가족이나 친구들과 의논해 보십시오. 만일 어떠한 질문이 있다면 담당 연구원이 자세하게 설명해 줄 것입니다.

#### 1. 이 연구는 왜 실시합니까?

이 연구의 목적은 입원치료 후 퇴원한 환자를 대상으로 피로, 불안, 우울 등 포스트 코로나 증후군 증상의 현황 및 증상의 지속 기간, 정도, 불편한 정도 등 여러 특성을 알아보는 것입니다.

#### 2. 얼마나 많은 사람이 참여합니까?

코로나19 감염증으로 입원치료를 받은 후 퇴원한지 4주 이상 경과한 만 18세 이상 성인 137명이 참여할 것입니다.

#### 3. 만일 연구에 참여하면 어떤 과정이 진행됩니까?

만일 귀하가 참여의사를 온라인상에 밝혀 주시면 다음과 같은 과정이 진행될 것입니다.

우선 선정기준 및 제외기준으로 구성된 5개의 질문에 응답해주시면, 대상자 선정기준을 만족하시는 분들께 이메일 또는 문자를 통하여 피로, 불안 및 우울, 기타 포스트 코로나 증후군 증상, 그리고 일반적 & 병원 관련 특성을 묻는 설문지 링크를 받게 되실 것입니다. 설문 소요 시간은 약 15~20분입니다.

#### 4. 연구 참여 기간은 얼마나 됩니까?

본 연구 참여에 동의할 경우 설문지를 1회 작성하게 되며, 설문지 작성은 15~20분 정도 소요될 것으로 예상됩니다.

**5. 참여 도중 그만두어도 됩니까?**

예, 귀하는 언제든지 어떠한 불이익 없이 참여 도중에 그만 둘 수 있습니다. 만일 귀하가 연구에 참여하는 것을 그만두고 싶다면 바로 설문응답을 중지하시거나 해당 사이트에서 나가시면 됩니다. 그만 두는 경우 모아진 자료는 인터넷 창을 닫으시거나 중단하시는 즉시 자동으로 전량 폐기됩니다.

**6. 부작용이나 위험요소는 있습니까?**

본 연구로 인해 귀하에게 예상된 부작용과 위험은 없으며, 설문에 소요되는 시간으로 인한 최소한의 불편함이 예상됩니다.

**7. 이 연구에 참여시 참여자에게 이득이 있습니까?**

본 연구에 참여하시게 되어 귀하에게 예견되는 직접적인 이익은 없지만, 응답해주신 답변은 향후 코로나에서 회복한 사람들에게 더 나은 치료와 간호를 제공하기 위한 기초자료로 활용될 것입니다.

**8. 만일 이 연구에 참여하지 않는다면 불이익이 있습니까?**

귀하는 본 연구에 참여하지 않을 자유가 있습니다. 또한, 귀하가 본 연구에 참여하지 않아도 귀하에게는 어떠한 불이익도 없습니다.

**9. 연구에서 얻은 모든 개인 정보의 비밀은 보장됩니까?**

개인정보관리책임자는 서울대학교의 이윤수 연구원(eysooo@snu.ac.kr)입니다. 본 연구에서 수집되는 개인정보는 (전화번호, 이메일 주소)입니다. 이러한 개인정보는 이윤수 연구원에게만 접근이 허락되며, 본 연구에서 수집된 설문조사 자료는 암호화된 파일로 잠금장치가 있는 컴퓨터에 보관이 될 것입니다. 동의서는 관련 법령에 따라 3년을 보관한 후 폐기할 예정이며, 연구자료의 경우는 서울대학교 연구윤리 지침에 따라 가능한 한 연구 보관할 예정입니다. 귀하의 설문 응답 (스크리닝 응답, 본 설문 응답) 및 개인정보 (휴대폰 번호, 이메일)는 자료수집 완료일 기준 1개월 이내에 일괄 폐기될 예정입니다. 저희는 이 연구를 통해 얻은 모든 개인 정보의 비밀 보장을 위해 최선을 다할 것입니다. 이 연구에서 얻어진 개인 정보가 학회지나 학회에 공개 될 때 귀하의 이름 및 기타 개인 정보는 사용되지 않을 것입니다. 그러나 만일 법이 요구하면 귀하의 개인정보는 제공될 수도 있습니다. 또한 모니터 요원, 집결 요원, 생명윤리위원회는 연구참여자의 개인 정보에 대한 비밀 보장을 침해하지 않고 관련규정이 정하는 범위 안에서 본 연구의 실시 절차와 자료의 신뢰성을 검증하기 위해 연구 결과를 직접 열람할 수 있습니다. 귀하가 본 동의서에 서명하는 것은, 이러한 사항에 대하여 사전에 알고 있었으며 이를 허용한다는 동의로 간주될 것입니다.

**10. 이 연구에 참가하면 사례가 지급됩니까?**

귀하의 연구 참여시 감사의 뜻으로 5,000원 정도 되는 작은 기념품 (커피 기프티콘)이 증정될 것입니다.

**11. 연구에 대한 문의는 어떻게 해야 됩니까?**

본 연구에 대해 질문이 있거나 연구 중간에 문제가 생길 시 다음 연구 담당자에게 연락하십시오.

\*

## 동 의 서

1. 나는 이 설명서를 읽었으며 이에 대해 충분히 생각하였습니다.
2. 나는 위험과 이득에 관하여 읽었으며 나의 질문에 만족할 만한 답변을 얻었습니다.
3. 나는 이 연구에 참여하는 것에 대하여 자발적으로 동의합니다.
4. 나는 이 연구에서 얻어진 나에 대한 정보를 현행 법률과 생명윤리위원회 규정이 허용하는 범위 내에서 연구자가 수집하고 처리하는 데 동의합니다.
5. 나는 담당 연구자나 위임 받은 대리인이 연구를 진행하거나 결과 관리를 하는 경우와 법률이 규정한 국가 기관 및 서울대학교 생명윤리위원회가 실태 조사를 하는 경우에는 비밀로 유지되는 나의 개인 신상 정보를 확인하는 것에 동의합니다.
6. 나는 언제라도 이 연구의 참여를 철회할 수 있고 이러한 결정이 나에게 어떠한 해도 되지 않을 것이라는 것을 압니다.

본 연구에 참여하시겠습니까?

- ☐ 예
- ☐ 아니오



## Appendix 3. Questionnaire

### 포스트 코로나 증후군 연구대상자 설문조사

#### 2. 피로 (FSS)

다음은 피로를 측정하기 위한 문항입니다. 다음 중 귀하의 지난 일주일 동안의 피로 상태를 가장 잘 반영하는 점수에 "O" 표시를 해주십시오. 각각 항목에 대해 "1점" (전혀 그렇지 않다) 부터 "7점" (매우 그렇다)까지 아래의 간에 표시해주십시오.

\* 1. 피로하면 의욕이 없어진다.

1점: 전혀 그렇지 않다	2점	3점	4점	5점	6점	7점: 매우 그렇다
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\* 2. 운동을 하면 쉽게 피로해진다.

1점: 전혀 그렇지 않다	2점	3점	4점	5점	6점	7점: 매우 그렇다
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\* 3. 쉽게 피곤해진다.

1점: 전혀 그렇지 않다	2점	3점	4점	5점	6점	7점: 매우 그렇다
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\* 4. 피로 때문에 신체활동이 감소된다.

1점: 전혀 그렇지 않다	2점	3점	4점	5점	6점	7점: 매우 그렇다
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\* 5. 피로로 인해 종종 문제가 생긴다.

1점: 전혀 그렇지 않다	2점	3점	4점	5점	6점	7점: 매우 그렇다
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\* 6. 피로 때문에 지속적인 신체활동이 어렵다.

1점: 전혀 그렇지 않다	2점	3점	4점	5점	6점	7점: 매우 그렇다
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\* 7. 피로 때문에 업무나 책임을 다 하지 못한다.

1점: 전혀 그렇지 않다	2점	3점	4점	5점	6점	7점: 매우 그렇다
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\* 8. 내가 겪고 있는 가장 힘든 문제를 세 가지 뽑는다면 그 중에 피로가 포함된다.

1점: 전혀 그렇지 않다	2점	3점	4점	5점	6점	7점: 매우 그렇다
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\* 9. 피로 때문에 직장, 가정, 사회 활동에 지장을 받는다.

1점: 전혀 그렇지

않다

2점

3점

4점

5점

6점

7점: 매우 그렇다

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

## 포스트 코로나 증후군 연구대상자 설문조사

### 3. 병원 불안-우울 척도 (HADS)

#### Hospital Anxiety and Depression Scale (HADS)

감정 상태는 당신의 질병이나 심태에 영향을 많이 줄 수 있습니다. 아래의 항목을 하나하나 읽어 보시고 지난 7일 동안 자신이 경험하고 있는 감정과 가장 가까운 답에 표시해주십시오. 응답하실 때 너무 오랫동안 생각하지 마십시오. 깊이 생각하시는 것보다 바로 떠오르는 답이 더 정확한 것일 수 있습니다.

\* 1. 신경이 곤두서거나 '긴장감'이 든다.

- ☐ 3. 거의 항상 그렇다.
- ☐ 2. 자주 그렇다.
- ☐ 1. 가끔, 때때로 그렇다.
- ☐ 0. 전혀 그렇지 않다.

\* 2. 좋아하던 것들을 여전히 즐긴다.

- ☐ 0. 확실히 즐긴다.
- ☐ 1. 예전만큼 많이 즐기지는 않는다.
- ☐ 2. 겨우 조금 즐긴다.
- ☐ 3. 전혀 즐기지 않는다.

\* 3. 뭘가 끔찍한 일이 일어날 것처럼 공포감이 든다.

- ☐ 3. 확실히 심하게 든다.
- ☐ 2. 공포감이 들지만 그렇게 심하지는 않다.
- ☐ 1. 조금 느껴지지만 걱정할 정도는 아니다.
- ☐ 0. 전혀 들지 않는다.

\* 4. 웃을 수도 있고 어떤 일의 재미있는 면을 볼 수 있다.

- ☐ 0. 예전만큼 그럴 수 있다.
- ☐ 1. 예전만큼 많이 그렇지 않다.
- ☐ 2. 확실히 예전 같지 않다.
- ☐ 3. 전혀 그렇지 못하다.

\* 5. 걱정스러운 생각이 든다.

- ☐ 3. 거의 항상 든다.
- ☐ 2. 자주 든다.
- ☐ 1. 가끔 든다.
- ☐ 0. 거의 들지 않는다.

\* 13. 갑작스럽게 극심한 공포감을 느낀다.

- ☐ 3. 매우 자주 느낀다.  
☐ 2. 자주 느낀다.  
☐ 1. 드물게 느낀다.  
☐ 0. 전혀 느끼지 않는다.

\* 14. 좋은 책이나 라디오, 텔레비전 프로그램을 즐길 수 있다.

- ☐ 0. 자주 즐긴다.  
☐ 1. 가끔 즐긴다.  
☐ 2. 드물게 즐긴다.  
☐ 3. 거의 즐기지 않는다.

HADS 저작권과 관련된 문의사항이 있으시다면, 이메일: [permissions@glasassessment.co.uk](mailto:permissions@glasassessment.co.uk) 로 연락 부탁드립니다.

HADS 번역본의 사용에 대한 정보를 원하신다면, Map Research Trust, Lyon, France URL: <https://eprovide.mapl-trust.org>로 연락 주십시오. 번역본을 포함한 모든 내용은 저작권의 보호를 받습니다.

\* 6. 명량한 기분이 든다.

- ☐ 3. 전혀 들지 않는다.  
☐ 2. 드물게 든다.  
☐ 1. 가끔 든다.  
☐ 0. 거의 항상 든다.

\* 7. 편히 앉아 긴장을 풀 수 있다.

- ☐ 0. 항상 그렇다.  
☐ 1. 자주 그렇다.  
☐ 2. 드물게 그렇다.  
☐ 3. 전혀 그렇지 않다.

\* 8. 마치 행동이 느려진 것처럼 느껴진다.

- ☐ 3. 거의 항상 그렇게 느낀다.  
☐ 2. 매우 자주 그렇게 느낀다.  
☐ 1. 가끔 그렇게 느낀다.  
☐ 0. 전혀 그렇게 느껴지지 않는다.

\* 9. 안정부질 못하게 두려운 느낌이 든다.

- ☐ 0. 전혀 들지 않는다.  
☐ 1. 가끔 든다.  
☐ 2. 자주 든다.  
☐ 3. 매우 자주 든다.

\* 10. 나는 외모에 대한 관심이 없어졌다.

- ☐ 3. 확실히 없어졌다.  
☐ 2. 신경 써야 하는 만큼 자주 신경을 쓰지 않는다.  
☐ 1. 가끔 신경을 쓰지 않는다.  
☐ 0. 언제나처럼 똑같이 신경을 쓴다.

\* 11. 무언가 꼭 하고 있어야 할 것처럼 불안하다.

- ☐ 3. 거의 항상 그렇게 느낀다.  
☐ 2. 매우 자주 그렇게 느낀다.  
☐ 1. 가끔씩만 그렇게 느낀다.  
☐ 0. 전혀 그렇게 느끼지 않는다.

\* 12. 예정된 일들을 기쁘게 기다린다.

- ☐ 0. 예정만을 기대한다.  
☐ 1. 이전보다는 다소 덜하다.  
☐ 2. 이전보다 확실히 덜하다.  
☐ 3. 전혀 그렇지 못하다.

포스트 코로나 증후군 연구대상자 설문조사

4. 증상 체크리스트

다음은 포스트 코로나 증후군의 증상에 관한 문항입니다. 지난 일주일 동안 다음에 제시된 증상을 얼마나 자주 겪었는지, 얼마나 심하게 겪었는지, 그리고 이로 인해 얼마나 불편했는지 체크해주시고. 각각 항목에 대해 "0점" (증상없음)부터 "4점" (아주 많이 그렇다) 중 한 가지에 표시해주시고.

\* 1. 지난 일주일 동안, 기침

	0점 (증상 없음)	1점 (거의 없음)	2점 (그런 편)	3점 (상당히)	4점 (아주 많이)
증상이 얼마나 자주 있었습니까?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
증상이 얼마나 심했습니까?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
증상이 얼마나 불편했습니까?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

1-1. (기침이 있었다고 응답한 경우) 기침은 퇴원 후 얼마동안 지속되었습니까?

→ 해당사항 없을 시 2번 문항으로 가십시오.

- ☐ 1주 미만
 ☐ 2-3개월  
☐ 1-2주
 ☐ 3-6개월  
☐ 2-4주
 ☐ 6개월 이상  
☐ 1-2개월

\* 2. 지난 일주일 동안, 숨가쁨 (호흡곤란)

	0점 (증상 없음)	1점 (거의 없음)	2점 (그런 편)	3점 (상당히)	4점 (아주 많이)
증상이 얼마나 자주 있었습니까?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
증상이 얼마나 심했습니까?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
증상이 얼마나 불편했습니까?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2-1. (숨가쁨이 있었다고 응답한 경우) 숨가쁨은 퇴원 후 얼마동안 지속되었습니까?

→ 해당사항 없을 시 3번 문항으로 가십시오.

- ☐ 1주 미만
 ☐ 2-3개월  
☐ 1-2주
 ☐ 3-6개월  
☐ 2-4주
 ☐ 6개월 이상  
☐ 1-2개월

	0점 (충심 없음)	1점 (거의 없음)	2점 (7인 반)	3점 (충분히)	4점 (아주 많이)
충심이 얼마나 자주 있었습니까?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
충심이 얼마나 심했습니까?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
충심이 얼마나 끈겼습니까?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

☐ 1주 미만
 ☐ 2~3개월  
☐ 1~2주
 ☐ 3~6개월  
☐ 2~4주
 ☐ 6개월 이상  
☐ 1~2개월

	0점 (충성 없음)	1점 (거의 없음)	2점 (그림 남)	3점 (상당히)	4점 (아주 많이)
충성이 얼마나 자주 있 었습니까?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
책 상이 얼마나 심했습 니까?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
책 상이 얼마나 많이했 습니까?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

☐ 1주 미만
 ☐ 2-3개월  
☐ 1-2주
 ☐ 3-6개월  
☐ 2-4주
 ☐ 6개월 이상  
☐ 1-2개월

	0점 (중심 없음)	1점 (거의 없음)	2점 (그린 편)	3점 (심황히)	4점 (아주 많이)
중심이 얼마나 자주 있었습니까?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
중심이 얼마나 심했습니까?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
중심이 얼마나 불편했습니까?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

5-1. (홍부 불편감이 있었다고 응답한 경우) 홍부 불편감은 퇴원 후 얼마동안 지속되었습니까?  
→ 해당사항 없을 시 6번 문항으로 가십시오.

- |                             |                              |
|-----------------------------|------------------------------|
| <input type="radio"/> 1주 미만 | <input type="radio"/> 2-3개월  |
| <input type="radio"/> 1-2주  | <input type="radio"/> 3-6개월  |
| <input type="radio"/> 2-4주  | <input type="radio"/> 6개월 이상 |
| <input type="radio"/> 1-2개월 |                              |

\* 6. 지난 일주일 동안, 가슴 두근거림

	0점 (증상 없음)	1점 (거의 없음)	2점 (그런 편)	3점 (상당히)	4점 (아주 많이)
증상이 얼마나 자주 있었습니까?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
증상이 얼마나 심했습니까?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
증상이 얼마나 불편했습니까?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6-1. (가슴 두근거림이 있었다고 응답한 경우) 가슴 두근거림은 퇴원 후 얼마동안 지속되었습니까?  
→ 해당사항 없을 시 7번 문항으로 가십시오.

- |                             |                              |
|-----------------------------|------------------------------|
| <input type="radio"/> 1주 미만 | <input type="radio"/> 2-3개월  |
| <input type="radio"/> 1-2주  | <input type="radio"/> 3-6개월  |
| <input type="radio"/> 2-4주  | <input type="radio"/> 6개월 이상 |
| <input type="radio"/> 1-2개월 |                              |

\* 7. 지난 일주일 동안, 두통

	0점 (증상 없음)	1점 (거의 없음)	2점 (그런 편)	3점 (상당히)	4점 (아주 많이)
증상이 얼마나 자주 있었습니까?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
증상이 얼마나 심했습니까?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
증상이 얼마나 불편했습니까?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7-1. (두통이 있었다고 응답한 경우) 두통은 퇴원 후 얼마동안 지속되었습니까?  
→ 해당사항 없을 시 8번 문항으로 가십시오.

- |                             |                              |
|-----------------------------|------------------------------|
| <input type="radio"/> 1주 미만 | <input type="radio"/> 2-3개월  |
| <input type="radio"/> 1-2주  | <input type="radio"/> 3-6개월  |
| <input type="radio"/> 2-4주  | <input type="radio"/> 6개월 이상 |
| <input type="radio"/> 1-2개월 |                              |

	0점 (중상 없음)	1점 (거의 없음)	2점 (그린 권)	3점 (심당하)	4점 (아주 많이)
중상이 얼마나 자주 있었습니까?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
중상이 얼마나 심했습니까?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
중상이 얼마나 불편했습니까?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

→ 해당사항 없을 시 9번 문항으로 가십시오.

- |                   | 0점<br>(중상 없음)         | 1점<br>(거의 없음)         | 2점<br>(그런 편)          | 3점<br>(상당히)           | 4점<br>(아주 많이)         |
|-------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 중상이 얼마나 자주 있었습니까? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 중상이 얼마나 심했습니까?    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 중상이 얼마나 불편했습니까?   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

→ 해당사항 없을 시 10번 문항으로 가십시오.

- |                   | 0점<br>(중상 없음)         | 1점<br>(거의 없음)         | 2점<br>(그린 편)          | 3점<br>(상당히)           | 4점<br>(아주 많이)         |
|-------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 중상이 얼마나 자주 있었습니까? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 중상이 얼마나 심했습니까?    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 중상이 얼마나 불편했습니까?   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

→ 해당사항 없을 시 11번 문항으로 가십시오.

\* 11. 지난 일주일 동안, 미각장애

→ 해당사항 없을 시 12번 문항으로 가십시오.

\* 12. 지난 일주일 동안, 근육통

12-1. 근육통이 있었던 경우, 어느 부위에 근육통이 있었습니까?

해당사항 없을 시 13번 문항으로 가십시오.

→ 해당사항 없을 시 13번 문항으로 가십시오.



\* 13. 지난 일주일 동안, 관절통

	0점 (증상 없음)	1점 (거의 없음)	2점 (그런 편)	3점 (상당히)	4점 (아주 많이)
증상이 얼마나 자주 있었습니까?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
증상이 얼마나 심했습니까?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
증상이 얼마나 불편했습니까?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

13-1. 관절통이 있었던 경우, 어느 부위에 관절통이 있었습니까?

→ 해당사항 없을 시 14번 문항으로 가십시오.

13-2. (관절통이 있었다고 응답한 경우) 관절통은 퇴원 후 얼마동안 지속되었습니까?

→ 해당사항 없을 시 14번 문항으로 가십시오.

- ☐ 1주 미만                      ☐ 2-3개월  
☐ 1-2주                         ☐ 3-6개월  
☐ 2-4주                         ☐ 6개월 이상  
☐ 1-2개월

14. 이외에 지난 일주일간 겪었던 증상이 있다면 모두 적어주십시오.

\* 15. 다음 중 가장 불편했던 증상 한 개에 체크하거나 직접 적어주십시오.

- ☐ 기침  
☐ 피로  
☐ 숨가쁨  
☐ 인후통  
☐ 미열  
☐ 흉부 불편감  
☐ 가슴 두근거림  
☐ 두통  
☐ 수면장애  
☐ 집중력, 기억력 저하  
☐ 후각장애  
☐ 미각장애  
☐ 근육통  
☐ 관절통  
☐ 불안 또는 우울  
☐ 기타 증상이 있다면 적어주세요.

\* 16. 퇴원 후 증상을 완화하기 위해 시도한 방법이 있습니까?

- ☐ 예  
☐ 아니오

(16-1~2.) 16번에서 '예'라고 응답하신 분만 답해주세요.

→ 해당사항 없을 시 Part 5: 병원관련 특성 으로 가십시오.

16-1. 증상을 완화하기 위해 시도한 방법이 있다면 모두 표시하거나 직접 적어주십시오.

- |   |   |
|---|---|
| <input type="checkbox"/> 병원 방문              | <input type="checkbox"/> 생활습관 변화 (운동, 식이요법 등) |
| <input type="checkbox"/> 한의원 방문             | <input type="checkbox"/> 대체의학                 |
| <input type="checkbox"/> 약물 복용 (진통제, 해열제 등) |   |

기타 (구체적으로 명시)

(16번에서 '예'라고 응답하신 분만 답해주세요.)

16-2. 어떤 방법이 증상 완화에 가장 도움을 주었습니까?

- ☐ 해당사항 없음  
☐ 병원 방문  
☐ 한의원 방문  
☐ 약물 복용 (진통제, 해열제 등)  
☐ 생활습관 변화 (운동, 식이요법 등)  
☐ 대체의학  
☐ 기타 (구체적으로 명시)

포스트 코로나 중후군 연구대상자 설문조사

5. 병원 관련 특성

다음은 입원 정보와 관련된 문항입니다. 아래 문항을 읽고 해당되는 곳에 표시하거나 직접 기입해 주십시오.

\* 코로나 19 확진일 또는 확진 연월

PCR, 신속항원검사 등을 통해 코로나19에 확진되어 보건소에서 문자 받은 날을 입력해주시시오.

(예: 2022년 5월 1일, 기억나지 않을 경우 2022년 5월)

\* 입원 병원의 지역

- |                               |                               |
|-------------------------------|-------------------------------|
| <input type="radio"/> 서울특별시   | <input type="radio"/> 강원도     |
| <input type="radio"/> 경기도     | <input type="radio"/> 충청북도    |
| <input type="radio"/> 부산광역시   | <input type="radio"/> 충청남도    |
| <input type="radio"/> 대구광역시   | <input type="radio"/> 전라북도    |
| <input type="radio"/> 인천광역시   | <input type="radio"/> 전라남도    |
| <input type="radio"/> 광주광역시   | <input type="radio"/> 경상북도    |
| <input type="radio"/> 대전광역시   | <input type="radio"/> 경상남도    |
| <input type="radio"/> 울산광역시   | <input type="radio"/> 제주특별자치도 |
| <input type="radio"/> 세종특별자치시 |                               |
| <input type="radio"/> 기타      |                               |

\* 입원 병원 종류

- ☐ 3차 병원 (심급 종합병원: 예: 대학병원, 삼성서울병원, 아산병원, 길병원 등)
- ☐ 2차 병원 (병원, 종합병원, 요양병원, 한방병원 등; 예: 서울의료원)
- ☐ 잘 모르겠음
- ☐ 기타

입원 병원 이름:

본 문항 응답에 동의하시는 분은 입원했던 병원 그리고/또는 병동의 이름을 적어주시시오.

\* 입원 기간

- |                              |                               |
|------------------------------|-------------------------------|
| <input type="radio"/> 1주일 이내 | <input type="radio"/> 1개월~3개월 |
| <input type="radio"/> 1~2주   | <input type="radio"/> 3개월 이상  |
| <input type="radio"/> 2~3주   | <input type="radio"/> 잘 모르겠음  |
| <input type="radio"/> 3~4주   |                               |

\* 입원기간 중 중환자실 입실 여부

- ☐ 예  
☐ 아니오  
☐ 잘 모르겠음

\* 퇴원 후 경과기간

- ☐ 1주~4주  
☐ 1개월~2개월  
☐ 2개월~3개월  
☐ 3개월~6개월  
☐ 6개월~9개월  
☐ 9개월~12개월  
☐ 12개월 이상

\* 동반 질환 (복수응답 가능)

- |  |   |
|--|---|
| <input type="checkbox"/> 해당사항 없음                           | <input type="checkbox"/> 뇌혈관 질환 (예: 뇌졸중, 뇌출혈 등)           |
| <input type="checkbox"/> 고혈압                               | <input type="checkbox"/> 악성 종양 (암)                        |
| <input type="checkbox"/> 당뇨                                | <input type="checkbox"/> 만성 폐쇄성 폐질환 (폐기종, 만성 기관지염, 만성 천식) |
| <input type="checkbox"/> 심혈관계 질환 (예: 협심증, 관상동맥질환, 심근경색증 등) |   |
| <input type="checkbox"/> 기타 질환                             |   |

\* 코로나 19 백신 접종 여부

- ☐ 1차까지 접종  
☐ 2차까지 접종  
☐ 3차까지 접종  
☐ 4차까지 접종  
☐ 미접종

포스트 코로나 증후군 연구대상자 설문조사

6. 대상자 특성

다음은 일반적인 사항에 대한 문항입니다. 아래 문항을 읽고 해당되는 곳에 표시하거나 직접 기입해 주십시오.

\* 귀하의 성별은 어떻게 되십니까?

- ☐ 남  
☐ 여

\* 귀하의 나이가 만으로 어떻게 되십니까?

\* 현재 배우자가 있으십니까?

- ☐ 예  
☐ 아니오

\* 현재 동거 가족이 있으십니까?

- ☐ 예 (다른 가족, 친구, 또는 친척과 함께 거주)  
☐ 아니오 (혼자 거주)

\* 현재 직업이 있으십니까?

- ☐ 예 (보건의료계 아닌 직업군 종사자)  
☐ 예 (보건의료계 종사자: 의사, 간호사, 한의사, 치과의사, 물리치료사, 간호조무사 등)  
☐ 아니오  
☐ 기타(구체적으로 명시)

포스트 코로나 증후군 연구대상자 설문조사

7. 설문조사가 완료되었습니다. 참여해주셔서 감사합니다.

귀하의 답변은 향후 코로나에서 회복된 사람들에게 더 나은 치료와 간호를 제공하기 위한 기초자료로 활용될 것입니다.

답례품 (5000원 상당 커피 기프티콘)을 받으시는 분들은 아래 링크를 따라가셔서 핸드폰 번호 또는 이메일 주소를 남겨주십시오. 답례품은 자료수집 마감 후 1개월 이내에 문자메시지로 전송될 예정입니다. 제공해주신 연락처는 답례품 발송 목적 이외에는 사용되지 않습니다.

<https://ko.surveymonkey.com/r/9YCK699>

## 국문 초록

어 윤 수

서울대학교 대학원

간호학과

지도교수 장 선 주

코로나19 범유행의 장기화로 코로나19 감염 이후 후유증을 겪는 사람들이 전 세계적으로 증가하고 있다. 이러한 현상은 'Post-acute COVID-19 syndrome (PCS) (포스트 코로나19 증후군)'으로도 불린다. 그러나 현재 코로나19 생존자가 겪는 증상 중 빈도 (frequency), 정도 (severity), 불편감 (distress) 등 증상의 특성을 세부적으로 기술한 문헌은 찾기 어려운 실정이다. 따라서 본 연구는 코로나19로 입원 치료 후 퇴원한 환자를 대상으로 피로, 우울, 불안 등 PCS 증상의 현황과 특성을 심층적으로 파악하고, 증상을 대상자 특성에 따라 비교하기 위해 수행되었다.

연구 자료는 2022년 8월 4일부터 8월 6일까지 온라인 설문지를 배포하여 수집되었다. 코로나19로 입원한 이후 최소 4주 전 퇴원한 사람들이 대상자로 선정되었으며, 정신 질환이나 인지 질환을 진단받은 적이 있는 사람은 제외되었다. 수집된 137명의 설문지 중, 총 114명의 응답이 분석에 활용되었다.

수집된 연구 자료에는 환자의 일반적 특성 및 병원 관련 특성, PCS 증상 관련 특성이 포함되었다. 피로는 피로 증상 척도 (Fatigue Severity Scale), 불안과 우울은 불안-우울 척도 (Hospital Anxiety-Depression Scale)로 측정되었으며, 기타 13개 증상은 PCS 증상 설문지에서 빈도, 정도, 불편감의 세부 항목으로 측정되었다. 측정된 결과들은 기술통계, t-test, Wilcoxon rank-sum test, 또는 Kruskal-Wallis test를 이용하여 분석되었다.

본 연구의 결과는 다음과 같다.

1) 증상 중 불안(66.7%), 피로(64%), 두통(57.9%), 집중력 또는 기억력 장애(57.9%)가 가장 많이 보고되었다.

2) 증상의 평균 빈도는 집중력 또는 기억력 장애, 수면 장애에서 가장 높게 측정되었다(1.07). 증상의 평균 정도는 집중력 또는 기억력 장애(1.04)에서, 증상의 평균 불편감은 기침, 미각 상실, 관절통 및 근육통(.82)에서 가장 높게 나타났다.

3) 피로를 제외한 모든 증상에서 여성의 불편감이 더 높게 나타났다. 16개 중 10개 증상에서 코로나19 백신 미접종 대상자의 불편감이 더 높았다. 2주 이상 입원한 대상자에서 기침, 가슴불편감, 미열, 근육통 불편감 점수가 높았으며, 퇴원한 지 9개월 이상 지난

환자에서 수면 장애와 집중력 또는 기억력 저하로 인한 불편감이 더 높게 나타났다.

본 연구는 증상의 특성을 빈도, 정도, 불편감의 측면에서 기술했다는 점에서 PCS 증상을 다면적으로 파악하는 데 도움이 될 것으로 생각된다. 앞으로 PCS 증상 측정을 위한 도구 개발, 종단적 접근방식 등을 활용한 연구가 활발히 진행되어 증상을 객관적으로 사정하고 증상의 진행 과정을 총체적으로 파악하려는 노력이 필요하다. 또한 본 연구에서 많은 대상자가 코로나19 감염 이후 다양한 증상과 증상으로 인한 상당한 불편감을 호소했다는 점에서, 궁극적으로 PCS 증상을 경감하기 위한 간호 중재 및 치료의 개발이 요구된다.