



COVID-19–Related Functional Impairment in a Community Sample of Korean Adults: Associations With Depression, COVID-19 Infection Fear, and Resilience

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Objective We aimed to determine the effects of depression, COVID-19 infection fear, and resilience on COVID-19–related functional impairment.

Methods We obtained data from 476 community-dwelling adults aged 20–69 years living in Jeju, South Korea, and evaluated the relationships between COVID-19–related functional impairment (work/school, social, and home life) and sociodemographic and health-related characteristics, COVID-19–related life changes (financial difficulties since the pandemic, employment change, interpersonal conflict), and clinical characteristics, including depression, COVID-19 infection fear, and resilience.

Results Functional impairment in the home life domain was associated with marital status and monthly income. Greater work/school, social, and home life functional impairment was significantly associated with all COVID-19–related life changes. Regression analysis indicated that resilience modulated the positive associations of COVID-19–related functional impairment with symptoms of depression and COVID-19 infection fear when relevant factors were controlled for.

Conclusion Our results suggest the importance of clinical characteristics, including depression, COVID-19 infection fear, and resilience for understanding functional impairment related to COVID-19. These results have important implications for interventions aimed at reducing depression and COVID-19 infection fear, and enhancing resilience.

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Keywords COVID-19; Functional impairment; Depression; COVID-19 infection fear; Resilience.

INTRODUCTION

COVID-19 was declared a pandemic in March 2020 by the WHO. The prolonged pandemic spread worldwide; to date, about 510 million confirmed cases of COVID-19 have been reported, including 6 million deaths.¹ In Korea, there have been more than 17 million cases and 23,000 deaths.² The lockdown

policy implemented in response to this novel coronavirus disease, and the associated social distancing and isolation, severely limited interpersonal and community interactions.^{3,4} Many countries imposed strict border rules and quarantine measures because of the alarming spread and severity of the coronavirus.^{5,6} About 60 governments announced or implemented containment measures, and more than 39 countries closed schools and universities.⁷

The purpose of social distancing and quarantine is to prevent infection and viral spread.^{8–10} People had to adapt to a completely new way of life; daily lives changed instantaneously. Social distancing measures are important for reducing the spread of infectious disease, but reduce the social support needed to manage psychological problems and loneliness.^{11–13}

Quarantine forced people to work and learn from home, reduced contact with friends and colleagues, and reduced quality of life.^{14,15} Many people lost their jobs or experienced a decrease in income.¹⁶ Financial difficulties caused by COVID-19, and the

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isolation associated with quarantine, had psychological problems such as anxiety, fear, and depression.^{17,18} In fact, this psychological pain has become a public health crisis.^{19,20} Many studies reported that the mental health of the general population deteriorated over the past 2 years, i.e., during the COVID-19 pandemic.^{21–26} The pandemic has led to depression and anxiety disorders, irrational fear and anger, impulsiveness, sleep disturbances, post-traumatic stress disorder (PTSD), and suicide.^{27–29}

The association between COVID-19 and functional impairment has not been widely studied. COVID-19 affects quality of life, and the association between the severity of symptoms and dysfunction (disability and functional impairment) depends greatly on an individual's psychiatric condition.^{30–33} We hypothesize that psychiatric problems due to COVID-19, such as depression and anxiety disorders, are highly related to disability and functional impairment.

Previous studies focused on the relationship between coping ability and mental health.^{34,35} Negative coping styles are associated with severe psychiatric problems, while positive coping styles are negatively related to anxiety and depression. In this respect, psychological resilience has emerged as an important concept. Resilience is a term mainly used in positive psychology studies of subjective well-being and mental health. Resilience refers to the ability to willingly accept serious life changes or challenges and overcome a crisis without becoming frustrated.^{36–39}

The current study was conducted to identify sociodemographic and psychiatric factors associated with COVID-19–related functional impairment, including depression, COVID-19 infection fear, and psychological resilience. We have also made some suggestions for improving mental health at the individual level.

METHODS

Study participants and procedure

A cross-sectional survey was performed of 500 community-dwelling adults aged 20–69 years living in Jeju, Korea. A quota sampling strategy was utilized to collect data from June to July 2021, and a random sample of adults was obtained from the target population, stratified based on geographic region, gender, and age. The purpose of the study, confidentiality, and voluntary nature of participation were fully explained to the participants in oral and written forms. Questionnaires with no responses to any of the sociodemographic questions, or with no responses for over half of all items, were not included in the analysis. As a result, there were 476 respondents in the final analysis. The study protocol was approved by the Institutional Review Board of Jeju National University Hospital, Korea (IRB No. JEJUNUH 2021-12-010).

Assessments

The survey included various self-report questionnaires administered by interviewers during in-person interviews. Data on sociodemographic and health-related characteristics were collected, including age, gender, marital status, education level, monthly income, employment status, living arrangements, and pre-existing mental health conditions. COVID-19–related life changes were assessed by asking questions (yes or no) about financial difficulties since the pandemic, any change in employment (leaving or losing a job), and more interpersonal conflict more than before.

The Sheehan Disability Scale (SDS) was administered to assess COVID-19–related functional impairment.⁴⁰ The SDS assesses functional impairment in the domains of work/school life, social life, and home life on a visual analog scale (0, not at all; 1–3, mild; 4–6, moderate; 7–9, marked; 10, extreme).

To screen for depression, we employed the Patient Health Questionnaire-9 (PHQ-9),^{41,42} which is a reliable and valid tool for measuring depression severity over the previous 2 weeks. The PHQ-9 is composed of nine items, each rated from 0 (not at all) to 3 (symptoms nearly every day); the scores for all items are summed to produce a total depression severity score (range: 0–27). The COVID-19 Infection Fear Scale (CIFS) was developed by the Korean Society for Traumatic Stress Studies and assesses the level of fear of COVID-19 infection.⁴³ This questionnaire consists of nine items scored on a 4-point Likert type scale ranging from 0 (strongly disagree) to 3 (strongly agree). The Cronbach's alpha value of the CIFS is 0.91, reflecting very high reliability. Psychological resilience was assessed using the 25-item Connor-Davidson Resilience Scale (CD-RISC).^{44,45} Items are rated on a 5-point Likert scale ranging from 0 (not true at all) to 4 (true nearly all the time). Higher total scores indicate higher resilience.

Statistical analysis

We used the independent t-test to compare the mean SDS scores. Pearson's correlation analysis was performed to identify the relationships between SDS scores and participant characteristics. Hierarchical regression analyses were conducted to test the hypothesis that resilience modulates the associations of COVID-19–related functional impairment with depressive symptoms and COVID-19 infection fear levels, after adjusting for factors significantly associated with the SDS score. Depressive symptoms (PHQ-9) and COVID-19 infection fear levels (CIFS) were included as predictors in step 1 of the hierarchical linear regression analysis. Resilience (CD-RISC) was entered in step 2. All statistical analyses were performed using SPSS software (version 25.0; IBM Corp., Armonk, NY, USA), and a p-value < 0.05 was considered significant.

RESULTS

Table 1 shows the sociodemographic and clinical characteristics. Of the 476 participants included in the analysis; 236 (49.6%) were men, 240 (50.4%) were women, and 251 (52.7%) were 20–49 years old, and 225 (47.3%) were 50 years old or more. The overall score of SDS was 13.4 (standard deviation [SD]: 7.4), while the work/school life domain score was 4.8 (SD: 3.0), the social life domain score was 5.3 (SD: 3.0), and the home life domain score was 3.3 (SD: 2.7). Numerically, the social life functional impairment was greatest.

Table 2 presents the associations between sociodemographic characteristics and SDS scores. The results revealed no signifi-

cant group differences in COVID-19–related functional impairment according to age, gender, education, living arrangements, employment status, or pre-existing mental health conditions in any SDS domain. The home life functional impairment domain score was associated with marital status ($p=0.002$) and monthly income ($p=0.016$). Higher scores in all SDS domains were significantly associated with COVID-19–related life changes, including financial difficulties since the pandemic, employment changes such as leaving or losing a job, and interpersonal conflict.

Table 3 also shows that higher scores on all SDS domains were associated with more severe symptoms (higher scores on the PHQ-9 and CIFS) (all $p<0.001$). In contrast, greater resilience was significantly associated with lower scores for all SDS domains (overall score, $p=0.001$; work/school life, $p=0.001$; work-life, $p=0.041$; home life, $p<0.001$).

The results of hierarchical regression analyses are presented in Table 4. After controlling for relevant factors (gender, age group, marital status, monthly income, and COVID-19–related life changes), depressive symptoms (PHQ-9) and COVID-19 infection fear (CIFS) were entered simultaneously into the SDS regression model (step 1). Depressive symptoms and COVID-19 infection fear were positively associated with all SDS domain scores. Depression and COVID-19 infection fear together accounted for 22.4% of the variance in overall functional impairment, 13.1% of the variance in work/school life functional impairment, 14.9% of the variance in social life functional impairment, and 21.4% of the variance in home life functional impairment. When entered in the final regression analysis after the covariates of demographic characteristics, symptoms of depression, and CD-RISC (step 2), resilience was negatively associated with the scores for all SDS domains, except social life functional impairment. This model (step 2) explained an additional 2.0% of the variance in overall functional impairment, 2.1% of the variance in work/school life functional impairment, 0.5% of the variance in social life functional impairment, and 1.4% of the variance in home life functional impairment, indicating that resilience modulated the associations of COVID-19–related functional impairment with symptoms of depression, and COVID-19 infection fear.

Table 1. Characteristics of the study population

Variables	Value
Age (yr)	
20–49	251 (52.7)
≥50	225 (47.3)
Women	240 (50.4)
Marital status	
Married	331 (69.5)
Single or other	145 (30.5)
Education	
High school and below	213 (44.7)
College and above	263 (55.3)
Monthly income (US\$) (N=432)	
<1,000	150 (34.7)
≥1,000	282 (65.3)
Live alone	48 (10.1)
Unemployed	130 (27.3)
Pre-existing psychiatric condition, yes	17 (3.6)
COVID-19–related life change, yes	
Financial difficulties since the pandemic	230 (48.3)
Employment change (leaving or losing a job)	79 (16.6)
More interpersonal conflict more than before	69 (14.5)
Depression (PHQ-9)	3.8±4.9
COVID-19 fear of infection (CIFS)	17.7±5.5
Resilience (CD-RISC)	57.5±16.2
COVID-19–related functional impairment (SDS)	
Overall	13.4±7.4
Work/school life	4.8±3.0
Social life	5.3±3.0
Home life	3.3±2.7

Values are presented as number (%) or mean±standard deviation. PHQ-9, Patient Health Questionnaire-9; CIFS, COVID-19 Infection Fear Scale; CD-RISC, Connor-Davidson Resilience Scale; SDS, Sheehan Disability Scale

DISCUSSION

The present study sought to assess the impact of depression, COVID-19 infection fear, resilience, and various sociodemographic characteristics on COVID-19–related functional impairment.

The sociodemographic characteristics were not associated with COVID-19–related functional impairment, except marital status ($p=0.002$) and monthly income ($p=0.016$). We found

that married individuals, and those with a high income, had high SDS domain scores. This result was not in line with the expectation that people with a higher standard of living and more family support have less functional impairment.^{46,47} Stress and disability due to COVID-19 may increase concern regarding the physical and psychological condition of families (children and spouses) of married people. And people who earn

are more likely to have concerns about decreased wages due to changes in external circumstances.⁴⁸ Further research to test this hypothesis is needed.

Severe financial difficulties (all p-values<0.001), an employment change (all p-values<0.01), and interpersonal conflict (all p-values<0.01) were all associated with higher scores for home, social, and work-life functional impairment. In other

Table 2. Sociodemographic characteristics associated with COVID-19–related functional impairment

Demographics	Sheehan Disability Scale								
	Overall		Domains						
	Mean±SD	p	Work life		Social life		Home life		
		Mean±SD	p	Mean±SD	p	Mean±SD	p	Mean±SD	p
Age (yr)		0.921		0.506		0.583			0.115
20–49	13.4±7.5		4.9±3.0		5.4±3.0		3.1±2.7		
≥50	13.4±7.3		4.7±2.9		5.2±2.8		3.5±2.7		
Gender		0.519		0.941		0.400			0.428
Men	13.2±7.8		4.8±3.1		5.2±3.0		3.2±2.7		
Women	13.6±7.0		4.8±2.9		5.4±2.8		3.4±2.7		
Marital status		0.634		0.373		0.479			0.002
Married	13.5±7.3		4.7±3.0		5.3±2.8		3.5±2.7		
Single or other	13.1±7.6		5.0±2.9		5.5±3.2		2.7±2.7		
Education		0.394		0.598		0.256			0.615
High school and below	13.7±7.3		4.9±3.0		5.5±3.0		3.3±2.7		
College and above	13.1±7.5		4.7±2.9		5.2±2.9		3.2±2.8		
Monthly income (US\$)		0.342		0.985		0.848			0.016
<1,000	12.8±7.1		4.8±2.9		5.2±2.9		2.8±2.6		
≥1,000	13.5±7.5		4.7±3.0		5.3±3.0		3.5±2.7		
Living arrangement		0.769		0.778		0.546			0.871
Alone	13.1±8.3		4.7±3.3		5.1±3.3		3.3±3.0		
With partner	13.4±7.3		4.8±3.0		5.3±2.9		3.3±2.7		
Employment status		0.887		0.328		0.214			0.925
Employed	13.4±6.5		4.9±3.0		5.2±3.0		3.3±2.7		
Unemployed	13.5±7.2		4.6±3.1		5.6±3.0		3.3±2.8		
Pre-existing psychiatric condition		0.294		0.657		0.244			0.261
Yes	15.2±7.5		5.1±2.8		6.1±2.6		4.0±2.4		
No	13.4±7.3		4.8±3.0		5.3±3.0		3.3±2.7		
Financial difficulties since the pandemic		<0.001		<0.001		<0.001			<0.001
Yes	16.0±7.0		5.7±2.8		6.1±2.7		4.2±2.8		
No	11.0±7.1		4.0±2.9		5.0±3.0		2.4±2.4		
Employment change (leaving or losing a job)		<0.001		<0.001		0.007			<0.001
Yes	16.5±7.1		6.1±3.0		6.1±2.8		4.3±2.8		
No	12.8±7.3		4.6±2.9		5.1±2.9		3.1±2.6		
Interpersonal conflict		0.001		0.017		0.120			<0.001
Yes	16.2±7.0		6.0±2.7		5.8±2.7		4.8±2.4		
No	13.0±7.4		4.7±3.0		5.2±3.0		3.0±2.7		

SD, standard deviation

words, social and economic conditions exert an important influence on the sense of psychological safety. Psychiatric factors, such as depression, COVID-19 infection fear, and resilience,

were strongly associated with SDS scores. Depressed people are likely to experience a decrease in productivity, lack of interpersonal communication, and social disconnectedness. COVID-19

Table 3. Clinical characteristics associated with COVID-19–related functional impairment

Clinical variables	Sheehan Disability Scale							
	Overall		Domains					
	r	p	Work/school life		Social life		Home life	
r			p	r	p	r	p	
PHQ-9	0.361	<0.001	0.276	<0.001	0.293	<0.001	0.365	<0.001
CIFS	0.297	<0.001	0.210	<0.001	0.273	<0.001	0.286	<0.001
CD-RISC	-0.159	0.001	-0.156	0.001	-0.094	0.041	-0.163	<0.001

PHQ-9, Patient Health Questionnaire-9; CIFS, COVID-19 Infection Fear Scale; CD-RISC, Connor-Davidson Resilience Scale

Table 4. Hierarchical regression analysis of factors associated with COVID-19–related functional impairment

SDS	Step 1 [†]			Step 2 [†]		
	B	β	t	B	β	t
Overall						
PHQ-9	0.333	0.220	4.702***	0.294	0.194	4.136***
CIFS	0.258	0.193	4.211***	0.279	0.209	4.575***
CD-RISC				-0.067	-0.148	-3.300**
Adjusted R ²		0.224			0.244	
Adjusted R ² change					0.020	
F		12.173***			12.317***	
Work/school life						
PHQ-9	0.096	0.157	2.977**	0.079	0.129	2.637**
CIFS	0.077	0.143	2.977**	0.086	0.129	3.343**
CD-RISC				-0.029	-0.158	-3.375**
Adjusted R ²		0.131			0.152	
Adjusted R ² change					0.021	
F		7.512***			8.033***	
Social life functional impairment						
PHQ-9	0.109	0.180	3.724***	0.099	0.164	3.356**
CIFS	0.115	0.216	4.553***	0.120	0.226	4.744***
CD-RISC				-0.017	-0.091	-1.956
Adjusted R ²		0.149			0.154	
Adjusted R ² change					0.005	
F		8.523***			8.148***	
Home life functional impairment						
PHQ-9	0.128	0.231	4.979***	-0.039	-0.245	-6.560***
CIFS	0.066	0.135	2.950**	0.072	0.149	3.263**
CD-RISC				-0.022	-0.132	-2.952**
Adjusted R ²		0.214			0.228	
Adjusted R ² change					0.014	
F		12.714***			12.562***	

p<0.01; *p<0.001; †adjustment for gender, age group, marital status, monthly income, and COVID-19–related life changes (financial difficulty, employment change, and interpersonal conflict). SDS, Sheehan Disability Scale; PHQ-9, Patient Health Questionnaire-9; CIFS, COVID-19 Infection Fear Scale; CD-RISC, Connor-Davidson Resilience Scale

infection fear is related to psychological, social, and financial threats.⁴⁹ Fear of infection and psychological contraction can reduce the quality of life as not only individual psychological pain but also problems with family and financial difficulties intensify.⁵⁰ In particular, social stigma caused by infection also negatively affects an individual's quality of life. Fear of infection and psychological contraction can be greater because there is a strong tendency to regard responsibility for the disease as an individual's problem.⁵¹ If someone becomes infected with COVID-19, permanent health impairment or death are concerns, as is the possibility that family, friends, relatives, and colleagues could become infected (which may lead to social ostracism or stigma for violating social rules).⁵² Long-term isolation can lead to unemployment or loss of income. In contrast, people with a higher level of resilience are more able to cope with stress, depression, and anxiety, which protects against functional impairment.³⁹ Therefore, detecting and treating depression and COVID-19 infection fear, as well as enhancing resilience, is very important to reduce COVID-19–related functional impairment.

Among the sociodemographic variables, high income and financial difficulties are associated with high SDS scores. It can seem like conflicting results at the same time in one study. The association between high SDS domain scores and a high income can be explained as the functional impairment of people with a lot of losses more severely declined, which means that income levels have been directly damaged by COVID-19. On the other side, the response to financial difficulties is based on the self-report evaluation. Since it is about the perceived economic difficulties of the participants, it seems more deeply related to the situation in which the individual interprets the current situation regardless of whether it is real or not. For this reason, it is presumed that conflicting results came out. Putting the two results together, we can expect that people with more to lose and those who perceive that they are currently experiencing more difficulties, can experience more functional impairment.

This study had some limitations. First, the data were from a community sample; other areas would need to be surveyed to allow generalization of the findings. Second, the PHQ-9, CIFS, and CD-RISC are self-report measures, so may lack precision. Despite these limitations, this study revealed that psychological resilience modulates COVID-19–related functional impairments in the work and home life domains. Psychological resilience was most strongly associated with the functional impairment related to COVID-19. When all significant variables, including sociodemographic factors, depression, and COVID-19 infection fear, were included in the final stepwise regression model, resilience modulated the negative relationships of functional impairment with the symptoms of depression and COVID-19 infection fear. This result was consistent

with previous studies on healthcare professionals.^{53,54} Buheji et al.⁵⁵ reported that resilience moderated the impact of a pandemic on patients in Bahrain. Additionally, resilience can lessen the harmful effects of COVID-19, such as stress and burnout.^{56,57}

Several serious infectious disease outbreaks occurred before COVID-19, including severe acute respiratory syndrome (SARS-CoV) and Middle East respiratory syndrome (MERS-CoV). A study of SARS survivors in Hong Kong reported that 25.6% and 15.6% of people were diagnosed with PTSD and depressive disorder 30 months after the SARS outbreak.⁵⁸ In total, 25% and 30%–40% of people were diagnosed with depressive disorder and PTSD 18 months after the MERS outbreak, respectively.⁵⁹ Similarly, COVID-19 could have long-term psychological consequences.⁶⁰ Although COVID-19 has become endemic, studies on reducing and recovering from the psychological damage caused by the disease have received less attention than studies on physical and economic difficulties.

The present study emphasizes the importance of developing a mental health service system to address the long-term psychiatric problems caused by COVID-19. COVID-19 has become a crisis in various areas of life for our society and individuals, but at the same time, we have the resilience to overcome it.⁶¹ In particular, a good understanding of the modulatory role of resilience in the relationships among depression, COVID-19 infection fear, and functional impairment will help identify ways to enhance well-being during the epidemic. Due to COVID-19, the vulnerability and resilience of infectious diseases have become an issue in our society. In the early days of COVID-19, understanding the infection rate, fatality rate, and the causes that affect it were emphasized. However, now facing the endemic, various studies and discussions are needed on how to recover and how to make efforts to increase the resilience of individuals and society. Therefore, more research is needed on how resilience specifically modulates mental health.

Availability of Data and Material

The datasets generated or analyzed during the study are available from the corresponding author on reasonable request.

Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

Author Contributions

Conceptualization: Moon-Doo Kim. Data curation: Young-Eun Jung, Moon-Doo Kim. Formal analysis: Yun-ju Park, Young-Eun Jung. Writing—original draft: Yun-ju Park, Young-Eun Jung. Writing—review & editing: all authors.

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