


ORIGINAL ARTICLE

Influence of anxiety and resilience on depression among hospital nurses: A comparison of nurses working with confirmed and suspected patients in the COVID-19 and non-COVID-19 units

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Abstract

Aims and objectives: This study aimed to compare anxiety, resilience, and depression between COVID-19 unit (confirmed patients and suspected patients) and non-COVID-19 unit nurses and assess their effects on depression.

Background: Nurses working during the global pandemic are known to be physically and psychologically exhausted, and experience severe anxiety and depression. However, there is a lack of studies comparing anxiety and depression between COVID-19 and non-COVID-19 unit nurses.

Design: Descriptive research study.

Methods: This study was conducted on 64 nurses who directly worked for more than a month in a COVID-19 unit of a general hospital with nationally designated negative-pressure isolation beds and 64 nurses working in a non-COVID-19 unit. Data were collected through questionnaires and were analysed using SPSS 25.0. Reporting of this research adheres to the STROBE guidelines.

Results: Anxiety and depression were significantly higher in nurses working with patients suspected to have COVID-19 rather than nurses working with confirmed COVID-19 patients and non-COVID-19 patients. Resilience was significantly lower in suspected patient unit nurses than in COVID-19 unit nurses. Anxiety was the major factor predicting depression in both COVID-19 unit (confirmed patients and suspected patients) and non-COVID-19 unit nurses with 76.6%, 80.7%, and 63.6% explanatory power, respectively.

Conclusions: Among nurses working in COVID-19 units, suspected patients unit nurses had higher depression than confirmed patients unit nurses due to an unsafe facility environment, insufficient personal protective equipment, and unknown conditions of the patients. Thus, interventions which have a high impact on depression need to be provided to relieve anxiety.

Relevance to clinical practice: The nursing organisation must provide comprehensive support including coordinated shifts, internal motivation, incentives, up-to-date

information, and clear infection prevention guidelines to relieve anxiety caused by exhaustive workload, uncertainty of infectious diseases, and lack of human and material resources.

KEYWORDS

anxiety, COVID-19 infection, depression, nurses, resilience

What does this paper contribute to the wider global clinical community?

- Among those who worked in COVID-19 units, those in the suspected patients unit showed significantly higher anxiety and depression than those working in the confirmed patients unit, suggesting that insufficient support and uncertainty about infectious status of patients further promoted anxiety and affected depression.
- Anxiety had a high explanatory power as a factor that predicted depression in COVID-19 (CU, SU) and non-COVID-19 unit nurses. This indicates that measures to alleviate anxiety such as coordinated work, compensation, information provision and infection prevention measure are required at an organisational level.

1 | INTRODUCTION

The coronavirus disease-2019 (COVID-19) has resulted in a pandemic with a high morbidity and mortality rate worldwide that occurred in Wuhan, China in December 2019 (Lovrić et al., 2020). By the end of April, the number of healthcare workers infected with COVID-19 was 11% in the USA, 10% in Italy, 4.3% in Japan and 2.4% in Korea (Jang & Kim, 2020). Approximately 90,000 healthcare workers worldwide were infected, and more than 600 nurses died (Dawn News, 2020). As such, nurses caring for COVID-19 patients are at a high risk of infection. There was a lack of preparation for COVID-19 due to the sudden outbreaks, and nurses are facing difficulties such as fatigue and discomfort from long intensive and heavy workloads and long-term usage of personal protective equipment (PPE; Liu, Luo, et al., 2020; Smith et al., 2017).

2 | BACKGROUND

Nurses comprise the largest portion of hospital healthcare professionals (United States Bureau of Labor Statistics, 2020), spend more time with patients than other healthcare professionals and play an important role in the treatment, care and control of diseases. However, 76.5% of 960 nurses caring for COVID-19 patients showed a fear of infection (Korean Nurses Association, 2020), and frontline healthcare providers were also shown to have a high risk of mental health problems such as anxiety, depression, insomnia and stress (Liu, Yang, et al., 2020). About 35.6% of Korean healthcare professionals working in COVID-19 base hospitals reported anxiety (Kwon et al., 2020), while 44.6% of those working in Wuhan, China experienced anxiety (Lai et al., 2020). In addition, they were also shown to experience a psychological conflict between their responsibility as healthcare professionals treating diseases and their right to protect themselves from the virus (Kim, 2018), and they were particularly concerned about the effects of the virus on their families

(Kim, 2018; Sun et al., 2020). Based on previous reports that nurses experience the highest degree of pain due to occupational stress and anxiety than any other groups in similar situations of infectious diseases so far (Maunder et al., 2006; Nickell et al., 2004), it would be necessary to closely observe mental health issues such as anxiety in nurses.

During the COVID-19 pandemic, nurses experience stress and psychological difficulties due to lack of resources or ethical and emotional problems (Maben & Bridges, 2020). However, nurses in Hubei, China, showed a spirit of 'resilience within the challenge' to overcome the COVID-19 crisis (Liu, Luo, et al., 2020). In a study to assess the psychology of nurses in Henan, China, negative emotions such as fatigue, discomfort and helplessness were dominant in the early stages. However, it was shown that growth of positive emotions such as increased affection and gratitude and development of professional responsibility coexisted over time (Sun et al., 2020). As such, resilience reacts differently according to the coping skills of individuals overcoming difficulties (Wakim, 2014), and it is an important factor affecting anxiety or depression in nurses (Kwak & Byeon, 2013). In a study on intensive care unit nurses, there was a significant difference in depression between high and low resilience groups (Mealer et al., 2012). Moreover, greater social support led to better psychological health in nurses, lowering anxiety and depression (Zou et al., 2016).

The proportion of nurses experiencing depression is reported to be high both domestically and internationally. Around 50.4% of healthcare professionals treating COVID-19 patients in China experienced depression (Lai et al., 2020). In Korea, 23.8% of healthcare professionals working at COVID-19 base hospitals in Korea showed symptoms of depression, and nurses had higher levels of depression than doctors (Kwon et al., 2020). Moreover, 38.5% of nurses who were involved in treatment of patients with severe acute respiratory syndrome (SARS), a previous infectious disease, showed symptoms of depression (Su et al., 2007). Factors affecting depression of nurses included excessive workload, job insecurity, inappropriate

compensation, overtime and long working hours (Brandford & Reed, 2016; Letvak et al., 2012; Yoon & Kim, 2013). In addition, healthcare professionals showed elevated symptoms of depression during the COVID-19 pandemic, and groups of women, single individuals, those with children and those living with others over the age of 60 showed significant differences in depression (Neil, 2020). However, if mental health of nurses is not properly managed, it leads to poor patient safety and the quality of nursing services (Puradollah & Ghasempour, 2020), which suggests that it should be considered as an important factor for organisations.

Currently, nurses working during the COVID-19 global pandemic situation are experiencing physical and psychological depletion (Maben & Bridges, 2020). During the previous SARS and Middle East Respiratory syndrome (MERS) pandemics, front-line healthcare professionals were afraid, anxious and frustrated and showed a higher risk of mental health problems after the pandemics (Lee et al., 2018; Marjanovic et al., 2007). Although professional psychological counselling and crisis intervention for mental health of healthcare professionals need to be continuously provided and monitored, domestic policies and support for mental and psychological health problems of healthcare professionals are lacking. Therefore, this study aimed to perform evidence-based research to understand the mental health of front-line nurses by comparing anxiety, resilience and depression between COVID-19 confirmed patients unit (CU) nurses, COVID-19 suspected patients unit (SU) nurses and non-COVID-19 unit nurses and assessing their effects on depression. The specific purposes of this study were as follows:

- Compare the degrees of anxiety, resilience and depression between COVID-19 (CU, SU) and non-COVID-19 unit nurses.
- Assess the correlation of anxiety, resilience and depression for COVID-19 (CU, SU) and non-COVID-19 unit nurses.
- Assess the risk factors for depression in COVID-19 (CU, SU) and non-COVID-19 unit nurses.

3 | METHODS

3.1 | Design

This is a descriptive research study to compare the relationship between anxiety, resilience and depression in COVID-19 (CU, SU) and non-COVID-19 unit nurses and understand the effects of anxiety and resilience on depression.

3.2 | Setting

This study was conducted on clinical nurses working at a general hospital with more than 500 beds in Goyang-si, Gyeonggi-do, South Korea. The hospital in this study was the only private hospital in Korea to have nationally designated negative-pressure isolation beds, and treatments related to COVID-19 patients were operated

as part of the Dual-Track Healthcare system in a different building, separated from general patients. In the building, a screening clinic and a relief outpatient facility were present. In addition, five intensive care units and one ward for COVID-19 patients, and 33 pneumonia surveillance unit (PSU) beds for COVID-19 patients were operating.

All inpatients visited the relief outpatient clinic a day prior to the planned hospitalisation date and underwent the Reverse Transcription Polymerase Chain Reaction (RT-PCR) test. If the test result was negative, the patient was admitted to the general ward. If a positive result was observed, the patient was admitted to the nationally designated negative-pressure isolation beds. Those with fever and respiratory symptoms were hospitalised to PSU and were treated even if the RT-PCR test was negative. The COVID-19 unit in this study referred to the confirmed patients unit (CU), where those diagnosed with COVID-19 received treatment in the intensive care unit and ward, and suspected patients unit (SU), where COVID-19 suspected patients received treatment in the PSU. A total of 47 COVID-19 patients were admitted to this study hospital from 26 January to 23 June 2020. The average number of patients hospitalised on a daily basis was 5.26. Around 31.9% of the patients were given ICU care and 23.4% of the patients were provided with ventilator therapy. Around 17.0% was the case fatality rate (Lee et al., 2020). As of the same day, the number of confirmed COVID-19 cases in South Korea was 12,484, and the death toll was 281, and the mortality rate was 2.25% (Central Accident Remediation Headquarters & Central Defense Response Headquarters, 2020).

A total of 38 nurses were employed at CU and a total of 34 nurses at SU. CU was in operation from 26 January 2020 and SU from 22 February 2020. Among the nurses working in the existing general ward and ICU, the selection of nurses was first added to the applicants, and as COVID-19 progressed in the long term, additional recruitment was conducted through the cooperation of unit managers. The nurses were not rotated unless they requested it, and they worked separately from nurses who cared for general patients. In addition, the institution provided them with incentives for special allowances.

3.3 | Study sample

The sample size was calculated using the G*Power 3.1.2 program with a significance level (α) of 0.05, a medium effect size of 0.15, statistical power ($1 - \beta$) of 0.8, and 11 independent variables in multiple linear regression, and 123 participants were required. Each of the 62 persons in the COVID-19 units (CU, SU) and non-COVID-19 units formed an appropriate sample size for this study. Therefore, each of the 32 persons for COVID-19 units (CU, SU) and 64 persons for non-COVID-19 units with a relatively large number of samples were allocated applying convenience sampling because of the unequal population ratio.

The inclusion criteria for the participants were as follows: (a) nurses who have been working in a ward or intensive care unit for

at least 1 year in a general hospital with 500 beds or more and (b) nurses who directly cared for confirmed or suspected patients with COVID-19 for at least 1 month. The exclusion criteria involved nurses who worked in departments other than wards and intensive care units and who did not directly care for patients.

3.4 | Instruments

In this study, a structured questionnaire consisting of 36 questions, nine on general characteristics (gender, age, marital status, educational level, working units, total clinical experience, experience in the COVID-19 unit, willingness to work in the COVID-19 unit in the future and open-ended questions on problems related to organisational support), seven on anxiety, 10 on resilience and nine on depression were used. Anxiety and depression tools, which are distributed free of charge on websites, were used, and a resilience tool was used with the permission of the original author. In this study, as a result of factor analysis on variables to secure the validity of scale, factor loading of resilience was 0.622–0.846 and factor loading of anxiety was 0.782–0.894 for the independent variables, and the factor loading of dependent variables ranged from 0.655 to 0.833. Therefore, the validity of the scale was secured with all factor loadings over 0.50 (Hair et al., 2009).

3.4.1 | Anxiety

Anxiety referred to the score measured using a tool developed by Spitzer et al. (2006) (generalised anxiety disorder-7 [GAD-7]) and adapted and validated by Seo and Park (2015). The tool consisted of 7 items in total and was constructed to obtain answers based on the frequency of suffering from symptoms over the past 2 weeks. Each item was marked on a 4-point Likert scale from 0 points indicating 'not at all' to 3 points indicating 'almost every day'. Higher scores indicated higher exposure to anxiety. Anxiety scores ranged from a minimum point of 0 to of 21, with a total score of 5 or more indicating 'anxiety'. A total score of 0–4 indicates 'normal', 5–9 'mild anxiety', 10–14 'moderate anxiety', and ≥ 15 'severe anxiety'. The Cronbach's alpha was 0.92 in the study by Spitzer et al. (2006), 0.92 in Seo and Park's (2015) study, and 0.94 in the present study.

3.4.2 | Resilience

In this study, resilience referred to a score measured using a tool adapted and validated by Jung et al. (2016) from the original tool developed by Connor and Davidson (2003) and shortened to 10 by Campbell-Sills and Stein (2007). The tool consisted of 10 items in total. Each item was evaluated on a 5-point Likert scale, where 0 and 4 points indicated 'not at all' and 'almost always', respectively. The minimum and maximum possible scores were 0 and 40, respectively, and higher scores indicated higher exposure to resilience. The

Cronbach's alpha was 0.89 in Connor and Davidson's (2003) study, 0.85 in Campbell-Sills and Stein's (2007) study, 0.96 in the study by Jung et al. (2016), and 0.94 in the present study.

3.4.3 | Depression

Depression referred to a score measured using the Korean version of the depression screening tool, which was adapted and validated by Park et al. (2010) from the original tool developed by Spitzer et al. (1999). The tool consisted of 9 items in total and was constructed to be answered based on the frequency of suffering from symptoms in the past 2 weeks. Each item was scored based on a 4-point Likert scale, where 0 and 3 points indicated 'never' and 'almost every day', respectively. Higher scores indicated higher exposure to depression. Depression scores ranged from a minimum score of 0 to a maximum score of 27 with the total score of 5 or more indicating 'depression'. A total score of 0–4 indicates 'normal'; 5–9 'mild depression'; 10–14 'moderate depression', 15–19 'moderately severe depression' and ≥ 20 'severe depression'. The Cronbach's alpha was 0.89 in the study by Spitzer et al. (1999), 0.84 in the study by Park et al. (2010) and 0.90 in the present study.

3.5 | Data collection and ethical considerations

Data were collected from 5 October–20 October 2020 after receiving ethical approval from the authors' institution (IRB No.: MJH 2020-08-014-001). Permission was granted after personally visiting the nursing department of the hospital and explaining the purpose of this study. Afterwards, managers of the nursing unit were informed about the objectives, methods, and inclusion and exclusion criteria of participants. In addition, the nurses were told that the study could be stopped at any time, anonymity would be guaranteed, and that an online questionnaire would be conducted. A message about the study was sent to the nurses who satisfied the subject inclusion criteria, and consents were obtained before starting the online questionnaire. Approximately 15 min were required to complete the questionnaire. The final 133 questionnaires were distributed, and 128 copies (return rate: 91.4%) were finally analysed excluding 5 unfinished questionnaires. Reporting of this research adheres to the STROBE (Strengthening The Reporting of Observational Studies in Epidemiology) guidelines (see File S1).

3.6 | Data analysis

SPSS WIN 25.0 program was used to analyse the collected data, and the detailed analysis method was as follows:

- Descriptive statistics were performed to analyse general characteristics of the participants. Chi-squared test or Fisher's exact test was conducted to assess the differences in general characteristics

between the COVID-19 (CU, SU) and non-COVID-19 unit nurses.

- ANOVA was performed to assess significant differences in anxiety, resilience and depression according to the working unit of the participants, and significant differences between groups were analysed using Scheffé test.
- Chi-square test or Fisher's exact test was conducted to verify the differences in severity of anxiety and depression according to the working unit of the participants.
- The relationship between age, anxiety, resilience and depression according to the working unit of the participants was assessed using Pearson's correlation coefficients.
- Multiple regression analysis was conducted to assess the effects of anxiety and resilience on depression when adjusting for the working unit of the participants.

4 | RESULTS

4.1 | General characteristics

Participants included 32 CU nurses, 32 SU nurses and 64 non-COVID-19 unit nurses, a total of 128 nurses. Analysis of differences in the general characteristics according to the working unit of the participants showed that gender ($\chi^2 = 2.391$, $p = .308$), age ($\chi^2 = 0.946$, $p = .623$), marital status ($\chi^2 = 0.224$, $p = 1.000$),

educational level ($\chi^2 = 0.522$, $p = .770$) and total clinical experience ($\chi^2 = 6.048$, $p = .418$) were not significantly different between the three groups (Table 1). However, there were statistically significant differences in work units ($\chi^2 = 25.521$, $p < .001$) and nurses in the COVID-19 unit were significantly more willing to apply to the COVID-19 unit in the future than those in the non-COVID-19 unit ($\chi^2 = 24.095$, $p < .001$).

Around 81 nurses responded to the open-ended questions on problems related to organisational support. Twenty-three (28.4%), 20 (24.7%), 14 (17.3%), 10 (12.3%) and 14 (17.3%) nurses answered questions about overwork and exhaustion, anxiety about infecting themselves and their families, lack of capacity, lack of compensation and others (work instability, frequently changed guidelines and restrictions on life), respectively.

4.2 | Comparison of anxiety, resilience and depression in participants

Anxiety, resilience and depression in CU nurses, SU nurses and non-COVID-19 unit nurses were compared, and in all groups of this study, the study variables had a skew less than 2 and kurtosis less than 7, confirming normality. It was observed that anxiety ($F = 9.728$, $p < .001$), resilience ($F = 4.637$, $p = .015$) and depression ($F = 11.904$, $p < .001$) were all significantly different. In particular, anxiety and

TABLE 1 Differences in the participants' general characteristics (N = 128)

Variables	Categories	COVID-19 unit				Non COVID-19 unit (n = 64)		χ^2 or Fisher's exact (p)
		C.U (n = 32)		S.U (n = 32)		n	%	
		n	%	n	%	n	%	
Gender	Female	32	100	30	93.8	63	98.4	2.391 (.308)
	Male	0	0	2	6.2	1	1.6	
Age (years)	<30	19	59.4	22	68.8	44	68.8	0.946 (.623)
	≥30	13	40.6	10	31.2	20	31.3	
	M ± SD	29.06 ± 5.04		28.50 ± 4.93		28.22 ± 4.36		
Marital status	Single	28	87.5	28	87.5	57	89.1	0.224 (1.000)
	Married	4	12.5	4	12.5	7	10.9	
Educational level	Diploma	8	25.0	6	18.8	16	25.0	0.522 (.770)
	Bachelor or higher	24	75.0	26	81.2	48	75.0	
Working units	Ward	14	43.8	32	100	47	73.4	5.521 (<.001)
	Intensive care units	18	56.2	0	0	17	26.6	
Total clinical experience (years)	<3	9	28.1	9	28.1	22	34.4	6.048 (.418)
	≥3 to <6	12	37.5	17	53.1	19	29.7	
	≥6 to <9	2	6.3	1	3.1	7	10.9	
	≥9	9	28.1	5	15.6	16	25.0	
	M ± SD	5.84 ± 4.29		5.09 ± 4.42		5.38 ± 4.22		
Willing to apply to the COVID-19 unit in the future	Yes	18	56.2	2	6.2	10	15.6	24.095 (<.001)
	No	14	43.8	30	93.8	54	84.4	

Abbreviations: C.U, confirmed patients unit; COVID-19, coronavirus disease 2019; S.U, suspected patients unit.

depression were significantly higher in SU nurses than in CU nurses and non-COVID-19 unit nurses, whereas resilience was significantly higher in non-COVID-19 nurses than in SU nurses (Table 2).

4.3 | Comparison of anxiety and depression severity in participants

About 34.4%, 56.2% and 26.6% of COVID-19 (CU, SU) and non-COVID-19 unit nurses, respectively, showed anxiety. Depression was observed in 56.2% and 75.0% of COVID-19 unit nurses (CU, SU) and in 42.2% of non-COVID-19 unit nurses. When anxiety and depression severity were compared between non-COVID-19 nurses and CU and SU nurses from the COVID-19 unit, anxiety ($\chi^2 = 14.058$, $p = .020$) and depression ($\chi^2 = 24.557$, $p < .001$) showed significant differences. In addition, comparison of moderate severity of anxiety and depression in the three groups showed that 7 (21.9%) and 6 (18.7%) of CU nurses showed anxiety and depression, respectively. Twelve (37.6%) and 17 (53.1%) of SU nurses showed anxiety and depression, respectively, while 7 (11.0%) showed anxiety and 12 (18.8%) showed depression among non-COVID-19 unit nurses (Table 3).

4.4 | Relationship between age, anxiety, resilience and depression in participants

In CU nurses, depression was positively correlated with anxiety ($r = .886$, $p < .001$) and negatively correlated with resilience ($r = -.525$, $p = .002$). In addition, resilience was negatively correlated with anxiety ($r = -.542$, $p = .001$), and age was not statistically significant. In SU nurses, depression was positively correlated with anxiety ($r = .906$, $p < .001$) and negatively correlated with age ($r = -.381$, $p = .032$). In addition, resilience was positively correlated with age ($r = .356$, $p = .046$) and anxiety was negatively correlated with age ($r = -.417$, $p = .018$). In non-COVID-19 unit nurses, depression was positively correlated with anxiety ($r = .794$, $p < .001$) and negatively

correlated with resilience ($r = -.452$, $p < .001$). Resilience was negatively correlated with anxiety ($r = -.398$, $p = .001$), and anxiety was not statistically significant (Table 4).

4.5 | Effects of anxiety and resilience on depression in participants

To identify factors affecting depression in participants, multiple regression analysis was performed by setting age, anxiety and resilience, which were significant in the Pearson's correlations, as independent variables. Among independent variables, age, which was a nominal variable (under the age of 30 = 0, over the age of 30 = 1) was treated as a dummy variable. In the regression model of CU nurses, the tolerance limit of all independent variables ranged from 0.675–0.919, which was higher than 0.1. The variance inflation factor (VIF) ranged between 1.008–1.535, which was lower than 10. Thus, there were no multi collinearity problems observed. Durbin-Watson was 2.12, which was close to 2, indicating that the independence of residuals was secured. Analysis showed that the regression model was significant, and the most important predictor was anxiety, which showed an explanatory power of 76.6%. In the regression model of SU nurses, the tolerance limit of all independent variables ranged from 0.767–0.846, which was higher than 0.1. The variance inflation factor (VIF) ranged between 1.182–1.303, which was lower than 10. Thus, there were no multi collinearity problems observed. Durbin-Watson was 2.05, which was close to 2, indicating that the independence of residuals was secured. Analysis showed that the regression model was significant, and the most important predictor was anxiety, which showed an explanatory power of 80.7%.

In the regression model of non-COVID-19 unit nurses, the tolerance limit of all independent variables ranged between 0.831–0.987, which was higher than 0.1. The variance inflation factor (VIF) ranged between 1.013–1.203, which was lower than 10. Thus, there were no multi collinearity problems observed. Durbin-Watson was 2.44, which was close to 2, indicating that the independence of residuals was secured. Analysis showed that the regression model was

TABLE 2 Differences in anxiety, resilience, and depression between COVID-19 unit (C.U, S.U) and non COVID-19 unit (N = 128)

Variables	COVID-19 unit		Non COVID-19 unit ^c (n = 64)	F	p (Scheffé)
	C.U ^a (n = 32)	S.U ^b (n = 32)			
Anxiety	0.64 ± 0.66	1.17 ± 1.00	0.47 ± 0.59	9.728	<.001 (b > a, c)
Resilience	2.20 ± 0.80	1.82 ± 0.78	2.28 ± 0.65	4.637	.015 (b < c)
Depression	0.71 ± 0.54	1.18 ± 0.82	0.57 ± 0.45	11.904	<.001 (b > a, c)

Abbreviations: C.U, confirmed patients unit; COVID-19, coronavirus disease 2019; S.U, suspected patients unit.

^aC.U nurses' anxiety, resilience, and depression.

^bRepresents S.U nurses' anxiety, resilience, and depression.

^cRepresents Non C.U nurses' anxiety, resilience, and depression.

The 'a–c' was used for post-hoc analysis utilizing a scheffe test and its results was illustrated in the rightmost column next to p value.

Level of anxiety, depression severity, score	COVID-19 unit				Non COVID-19 unit (n = 64)		χ^2 or Fisher's exact	p
	C.U (n = 32)		S.U (n = 32)		n	%		
	n	%	n	%				
Anxiety								
Normal, 0–4	21	65.6	14	43.8	47	73.4	14.058	.020
Mild, 5–9	4	12.5	6	18.8	10	15.6		
Moderate, 10–14	6	18.8	6	18.8	6	9.4		
Severe, 15–21	1	3.1	6	18.8	1	1.6		
Depression								
Normal, 0–4	14	43.8	8	25.0	37	57.8	24.557	<.001
Mild, 5–9	12	37.5	7	21.9	15	23.4		
Moderate, 10–14	5	15.6	7	21.9	11	17.2		
Moderately severe, 15–19	0	0	5	15.6	1	1.6		
Severe, 20–27	1	3.1	5	15.6	0	0		

TABLE 3 Differences in anxiety and depression severity according to working unit (N = 128)

Abbreviations: C.U, confirmed patients unit; COVID-19, coronavirus disease 2019; S.U, suspected patients unit.

TABLE 4 Correlations of age, anxiety, resilience and depression for the COVID-19 unit (C.U, S.U) and the non COVID-19 unit (N = 128)

Unit	Variable	r (p)			
		Age	Anxiety	Resilience	
COVID-19 unit (n = 64)	C.U (n = 32)	Age	1		
		Anxiety	.063 (.732)	1	
		Resilience	.199 (.275)	-.542 (.001)	1
		Depression	.055 (.765)	.886 (<.001)	-.525 (.002)
	S.U (n = 32)	Age	1		
		Anxiety	-.417 (.018)	1	
		Resilience	.356 (.046)	-.298 (.097)	1
		Depression	-.381 (.032)	.906 (<.001)	-.212 (.245)
Non COVID-19 unit (n = 64)	Age	1			
	Anxiety	-.019 (.884)	1		
	Resilience	.111 (.383)	-.398 (.001)	1	
	Depression	.010 (.941)	.794 (<.001)	-.452 (<.001)	

Abbreviations: C.U, confirmed patients unit; COVID-19, coronavirus disease 2019; S.U, suspected patients unit.

significant, and the most important predictor was anxiety, which showed an explanatory power of 63.6% (Table 5).

5 | DISCUSSION

The purpose of this study was to help understand the mental health of front-line nurses working during the COVID-19 pandemic by comparing anxiety, resilience, and depression in COVID-19 (CU, SU) and non-COVID-19 unit nurses and assessing the effects on depression. About 34.4%, 56.2% and 26.6% of COVID-19 unit (CU, SU) and non-COVID-19 unit nurses, respectively, showed anxiety. Depression was observed in 56.2% and 75.0% of COVID-19 unit nurses (CU, SU) and in 42.2% of non-COVID-19 unit nurses. In this

study, depression was particularly high. Around 50.4% of Chinese healthcare professionals treating COVID-19 patients had depression (Lai et al., 2020), and 38.5% of nurses who participated in SARS patient care experienced depression (Su et al., 2007). Thus, compared with these findings, not only COVID-19 unit nurses (CU, SU), but also non-COVID-19 unit nurses in Korea showed severe depression. Anxiety and depression in three groups of non-COVID-19 unit nurses and CU and SU nurses among COVID-19 units were compared. Anxiety and depression were significantly higher in SU nurses than in CU nurses and non-COVID-19 unit nurses. In addition, comparison of anxiety and depression with moderate severity or higher showed that anxiety and depression in SU nurses were significantly higher than in CU nurses and non-COVID-19 unit nurses. It is thought that the perception of

TABLE 5 Factors affecting depression for the COVID-19 unit (C.U, S.U) and the non COVID-19 unit (N = 128)

Unit	Variable	B	SE	β	T	P	R ² (adj R ²)	F (p)
COVID-19 unit (n = 64)	(Constant)	.357	.195		1.834	.077	.788 (.766)	34.756 (<.001)
	Age (≥ 30)	.016	.098	.015	0.166	.869		
	Resilience	-.045	.073	-.067	-0.626	.536		
	Anxiety	.692	.086	.849	8.021	.000		
S.U (n = 32)	(Constant)	.179	.210		0.856	.399	.825 (.807)	44.094 (<.001)
	Age (≥ 30)	-.040	.157	-.023	-0.254	.801		
	Resilience	.074	.090	.070	0.817	.421		
	Anxiety	.752	.072	.918	10.392	.000		
Non COVID-19 unit (n = 64)	(Constant)	.556	.149		3.730	.000	.654 (.636)	37.737 (<.001)
	Age (≥ 30)	.040	.073	.042	0.544	.589		
	Resilience	-.115	.058	-.167	-2.007	.049		
	Anxiety	.553	.063	.728	8.784	.000		

Abbreviations: C.U, confirmed patients unit; COVID-19, coronavirus disease 2019; S.U, suspected patients unit.

SU nurses not being adequately protected while CU nurses are provided with safer facility environment and sufficient personal equipment compared with SU nurses caused greater anxiety as assessed by open-ended questions. In addition, the study by Jang et al. (2020) was conducted by the target organisation of this study, which showed that 'the institution's response to infectious diseases' was the most influential on 'willingness to work', which provides the basis for the implication that protection and responses from infectious diseases provided by the organisation are important. In a study by Maben and Bridges (2020), it was also shown that anger and frustration were triggered when nurses felt they received poor support by the organisation in the COVID-19 situation and that such anger may remain after the crisis.

In the target institution of this study, CU nurses work in isolation wards equipped with negative-pressure facilities, wearing personal protective equipment such as Level D or Level D and Powered air-purifying respirator (PAPR). In contrast, SU nurses wear 5 types (disposable gowns, N95 masks, gloves, face shields, hats) or 3 types (disposable gowns, N95 masks, gloves) of protective equipment and work in 4-person or single-person wards rather than in wards with negative pressure. Thus, they are more vulnerable to infection and work in a less protected environment. Furthermore, considering the results that the anxiety of health-care professionals is caused by the unknown condition of the patients, SU nurses would experience higher anxiety as they are working with suspicious patients who are waiting for test results or have symptoms such as high fever or pneumonia although the test showed negative findings. Therefore, the medical institutions should provide a safe working environment with an interest in the reason behind higher anxiety and depression observed in SU nurses compared with CU nurses. Liu, Luo, et al. (2020) suggested that it is necessary to provide a safe working environment, sufficient protective equipment, and continuous education and monitoring to reduce anxiety and depression in an infectious disease situation.

Resilience in SU nurses was significantly lower than in non-COVID-19 nurses. Similarly, severe anxiety and depression in SU nurses were observed in 6 (18.8%) and 5 (15.6%) nurses, respectively, compared with 1 (1.6%) and 0 (0%) nurses of non-COVID-19 unit. Moreover, resilience showed a negative correlation with both anxiety and depression. In other words, resilience stimulates acceptance and achievement of responsibility in nurses (Wahab et al., 2017), which reduces burnout and physical and mental unhealthy conditions (Delgado et al., 2017). It is thought that resilience thereby helps to reduce and overcome negative emotions such as anxiety and depression. Therefore, measures to increase resilience to relieve anxiety and depression in SU nurses of this study need to be devised. In a qualitative study on nurses who were involved in caring for COVID-19 patients, findings that nurses overcame fear and anxiety about infectious diseases and grew psychologically emphasised the necessity of personal coping mechanisms (Sun et al., 2020). However, Traynor (2018) was concerned about organisations over-emphasising the resilient traits

and focussing on the psychological health of nurses on personal responsibility. Moreover, Maben and Bridges (2020) also argued that personal focus was not appropriate in this difficult time. Therefore, these findings suggest that resilience training programmes need to be provided for nurses and that previous studies on stress and increased adaptability need to be considered (Choi & Kim, 2016; McDonald et al., 2012).

In both COVID-19 (CU, SU) and non-COVID-19 unit nurses, the main factor affecting depression was anxiety. This suggested that higher levels of anxiety in nurses working during the COVID-19 pandemic situation led to higher levels of depression. As anxiety showed great effects, resilience did not show any significant results in regression analysis although it was significantly correlated with depression. Age also showed a weak negative correlation between anxiety and depression, and a weak positive correlation with resilience in the SU nurse group, but the regression analysis showed no significant results. No previous studies related to age could be found supporting the results of this study, but they need to be examined with interest later. In previous studies, anxiety in Chinese nurses during the COVID-19 situation was suggested as a major factor affecting stress (Mo et al., 2020), supporting the findings by An et al. (2020) who showed that excessive workload, long working hours, fear of infection in family and colleagues, uncertainty and anxiety were factors increasing depression. Among them, excessive workload and anxiety about the effects of the virus on family members have been reported (Kim, 2018; Liu, Luo, et al., 2020; Sun et al., 2020). In the study, excessive workload and exhaustion, anxiety about family infections, frequently changed shifts and uncertain persistence of the disease were given as answers to the open-ended question on problems with organisational support. This is consistent with previous findings that unsatisfactory salary, unfair treatment and lack of compensation compared to the current uncertain job situation affect depression (Yoon & Kim, 2013). Depression is associated with physical symptoms such as anxiety, fatigue, pain and sleep disturbances (Morrissy et al., 2013), and persistent depression leads to poor patient safety and quality of nursing services such as medication errors and falls (Letvak et al., 2012). Therefore, the organisations should provide psychological interventions to alleviate depression among nurses during and especially after infectious disease outbreaks (Maben & Bridges, 2020).

5.1 | Limitations

Since this study conducted a survey by convenience sampling of nurses working in a general hospital, there are limitations in generalising the results. Additionally, the questionnaire involved a self-report format. Thus, response bias could have affected the results, and this has to be taken into account when the results of this study are interpreted. However, to the best of our knowledge, this study is significant in that it was the first domestic and international study to

compare mental health in non-COVID-19 unit nurses and CU and SU nurses of COVID-19 units.

6 | CONCLUSION

This study was performed to compare anxiety, resilience and depression between COVID-19 (CU, SU) and non-COVID-19 unit nurses and assess their effects on depression. There were significant differences in anxiety, resilience and depression between COVID-19 (CU, SU) and non-COVID-19 unit nurses. Among COVID-19 unit nurses, SU nurses showed significantly higher anxiety and depression than CU nurses. It is thought that an unsafe facility environment, insufficient personal protective equipment and unknown conditions of patients contributed to increased anxiety and depression. Therefore, it would be necessary to pay attention to the mental health of SU nurses. Moreover, 56.2%, 75.0% and 42.2% of COVID-19 unit nurses (CU, SU) and non-COVID-19 unit nurses showed depression, and anxiety was the main factor. Therefore, these findings suggest that the organisations should provide comprehensive support for coordination of work to alleviate anxiety, internal motivation, provision of incentives, provision of the latest information and clear infection prevention guidelines. It is suggested that studies on verification of effects of anxiety-relieving interventions on nurses working in suspected patients units are performed in the near future.

7 | IMPLICATIONS FOR CLINICAL PRACTICE

This is the first study to compare anxiety, resilience and depression between COVID-19 (CU, SU) and non-COVID-19 unit nurses, and there were significant differences in anxiety, resilience and depression between COVID-19 (CU, SU) and non-COVID-19 unit nurses. In particular, it is significant in that it is an evidence-based study showing SU nurses among the COVID-19 units had higher anxiety and depression than CU nurses. In addition, this study emphasised the necessity of presenting a systematic plan to relieve anxiety, which was shown as an important factor for depression. For excessive workload and irregular shifts, which were presented as factors of anxiety in this study, the maximum working hours need to be set by the nursing organisation, and shifts should be rationally adjusted to protect nurses from excessive workload. Moreover, it would be important to provide incentives for additional work and most importantly to create an atmosphere that provides recognition and encouragement for hard work. Another factor of anxiety was fear of infecting family members, and the organisation should provide clear guidelines to its members regarding this factor. Adams and Walls (2020) suggested that separation of living spaces after work, change of clothes, immediate shower after work and supportive conversations can help reduce anxiety.

Furthermore, providing up-to-date evidence-based information about COVID-19 is also important to improve knowledge and functional capacity of nurses. In fact, Lazzarotti and Lewis (2020) suggested that since knowledge about COVID-19 is evolving, sharing evidence-based guidelines is an effective way to reduce anxiety among healthcare professionals. Therefore, it is suggested that various psychological counselling programmes that can alleviate anxiety, and policies to improve working environments would help to enhance mental health of nurses.

ACKNOWLEDGEMENTS

The authors thank all the survey participants.

CONFLICT OF INTEREST

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article. This study was approved by the Institutional Review Board of Myongji Hospital (IRB No.: MJH 2020-08-014-001).

AUTHOR CONTRIBUTIONS

Conception and design, data acquisition, and data analysis and interpretation: EYD, MK, SL, SYL and KYL; Manuscript drafting and revision: EYD and MK; Final approval of the manuscript and public responsibility for appropriate portions of the content: EYD, MK, SL, SYL and KYL; Agreement to be accountable for all aspects of the work: EYD, MK, SL, SYL and KYL.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

How to cite this article: Doo E-Y, Kim M, Lee S, Lee SY, Lee KY. Influence of anxiety and resilience on depression among hospital nurses: A comparison of nurses working with confirmed and suspected patients in the COVID-19 and non-COVID-19 units. *J Clin Nurs*. 2021;30:1990–2000. <https://doi.org/10.1111/jocn.15752>