



ORIGINAL ARTICLE

Posttraumatic stress disorder and related factors among nurses working during the COVID-19 pandemic

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Abstract

Aim: To analyse the prevalence of posttraumatic stress disorder (PTSD) and examine its related factors among nurses who worked during the coronavirus disease 2019 (COVID-19) pandemic in Daegu, South Korea.

Background: Nurses are a high-risk population for PTSD, especially during the COVID-19 pandemic. This study was conducted to identify the nursing work environmental factors that should be addressed to reduce PTSD.

Methods: Using a cross-sectional design, 365 nurses were enrolled. Their characteristics (intrapersonal, interpersonal, organizational, and COVID-19-related) and PTSD Checklist-5 scores were analysed.

Results: The average PTSD score was 14.98 ± 15.94 , and 16.5% of the participants had a high risk of PTSD. Nurses were more likely to have PTSD if they were married (odds ratio = 3.02, $p = .013$) and when nurse managers' abilities, leadership, and support of nurses were low (odds ratio = 3.81, $p < .001$).

Conclusions: The nursing work environment was found to be associated with PTSD. Therefore, interventions are necessary to increase nurse managers' abilities, leadership, and support for nurses to reduce the risk of PTSD among nurses.

Implications for Nursing Management: Effective professional and social support and interventions to improve nurse managers' abilities, leadership, and support of nurses are needed to reduce PTSD.

KEYWORDS

COVID-19, nurses, pandemics, posttraumatic, professional practice, stress disorders

1 | BACKGROUND

Coronavirus disease 2019 (COVID-19) spread rapidly around the world after it was first reported in China in December 2019 (Lancet, 2020). On 11 March 2020, the World Health Organization (WHO) proclaimed it a pandemic (WHO, 2021). From 18 February 2020, when the first case was confirmed (i.e., before the WHO proclaimed COVID-19 to be a pandemic) in Daegu, to March 2020, 6684 cases were reported, and the daily number of cases reached

741 on 29 February (Central Disease Control Headquarters, 2021). In order to respond to the COVID-19 pandemic, Daegu and the Korean government adapted various methods, including reorganisation of the public health system, interventions targeting health care facilities, and the implementation of mass screening testing for COVID-19 (Kim et al., 2020). In order to provide inpatient treatment to the rapidly increasing number of COVID-19 patients, designated COVID-19 hospitals or hospitals with designated COVID-19 isolation wards were established. Later in 2020, as the COVID-19 pandemic stabilized in

Daegu, designated COVID-19 isolation wards were terminated at private tertiary hospitals but maintained at public tertiary hospitals.

Nurses who work at the front lines of the COVID-19 pandemic can become infected and develop a psychological distress and fear of spreading COVID-19 to patients, coworkers, and family members (Fernandez et al., 2020). Due to this fear, nurses can experience depression, anxiety, and acute stress disorder (Lai et al., 2020). They also have a high risk of developing posttraumatic stress disorder (PTSD) within a few months (Boyras & Legros, 2020). PTSD is defined as 'a psychiatric disorder that can occur in people who have experienced or witnessed a traumatic event' (American Psychiatric Association, 2013). This condition also occurs in people who experienced repeated or severe exposure to an event. A study on COVID-19-related PTSD among health care providers reported that nurses who had direct patient contact were most vulnerable to PTSD (Yunitri et al., 2022). Nurses were more likely to develop PTSD if they directly cared for COVID-19 patients, experienced self-isolation after exposure (Carmassi et al., 2020).

Based on the bioecological model of disasters, individuals are affected by factors at various levels, including the individual level, the family level, and the community level (Hoffman & Kruczek, 2011). Individuals may develop PTSD if they lack resources to protect themselves from stressors such as COVID-19 pandemic. The factors affecting nurses' PTSD are classified into the interpersonal, intrapersonal, and organisational levels (Schuster & Dwyer, 2020). PTSD symptoms are reduced when nurses receive support from spouses or family members living together. Meanwhile, nurses are more likely to report PTSD symptoms if they do not receive support from nursing managers. Moreover, the nursing work environment, which is a contextual issue surrounding the event, is a major factor related to PTSD caused by performing the role of a nurse (Rodney et al., 2022).

In order to decrease PTSD among nurses in the COVID-19 pandemic, health care facilities must provide interventions to improve the nursing work environment. Five strategies have been suggested for hospitals to address the psychological and mental issues of health care providers related to the COVID-19 pandemic, including communication between health care providers and hospital management, protection of health care providers and family members through sufficient personal protective equipment and screening testing, education for high-quality nursing care, personal and emotional support, and care during self-isolation (Shanafelt et al., 2020). Similarly, the characteristics of the nursing work environment of hospitals that nurses prefer and that positively affect patient outcomes include the following five factors: nurse participation in hospital affairs; nursing foundations for quality of care; nurse managers' ability, leadership, and support of nurses; staffing and resource adequacy; and collegial nurse-physician relations (Lake, 2002).

Although organisational interventions have been emphasized as strategies to decrease PTSD among nurses, insufficient research has comprehensively analysed the nursing work environment factors that affect PTSD. As the COVID-19 pandemic stabilized in Daegu, private tertiary hospitals were terminated as designated COVID-19 hospitals at the end of May 2020, but nurses still reported stress due to

COVID-19. As a relevant parallel, 32% of nurses still reported PTSD 4 months after the previous Middle Eastern respiratory system outbreak ended in 2015 in Korea (Jung et al., 2020). In particular, since the COVID-19 pandemic has not yet ended, it is possible that nurses might care for COVID-19 patients again if the number of confirmed cases increases. Therefore, this study investigated (1) the current status of PTSD among nurses working at tertiary hospitals, which were used as designated COVID-19 hospitals before that role was terminated, and (2) intrapersonal, interpersonal, organisational, and COVID-19-related characteristics associated with PTSD.

2 | METHODS

2.1 | Design and participants

This was a cross-sectional study performed from 9 October to 25 November 2020. The target population comprised nurses working at tertiary hospitals where the operation of designated COVID-19 isolation wards was terminated. All tertiary hospitals in Daegu operated designated COVID-19 isolation wards at the peak of the COVID-19 pandemic. Among the five tertiary hospitals in total, three private tertiary hospitals ceased to operate designated COVID-19 isolation wards in May 2020, but two public tertiary hospitals continued to operate isolation wards. Hence, three private tertiary hospitals were selected as the study setting.

This study was conducted at tertiary hospitals in which a general ward or an integrated nursing care ward was designated as a COVID-19 isolation ward, in which nurses cared for COVID-19 patients. Nursing staffing shortages were filled by nurses who volunteered from general wards or integrated nursing care wards, or were involuntarily assigned by nursing managers. Therefore, the participants of this study were nurses who faced the possibility of working in designated COVID-19 wards; as a consequence, all nurses working in general wards or integrated nursing care wards were included. The inclusion criteria for study participants were as follows: (1) Nurses who worked in a general ward or an integrated nursing care ward, (2) nurses who had worked for more than a year, and (3) nurses who agreed to participate. The exclusion criterion was not signing the consent form.

The sample size was determined by using a single-population proportion formula. The following assumptions were made, the proportion (p) of nurses with PTSD was 32%, based on a study conducted in South Korea (Jung et al., 2020), the margin of error (w) was 0.05, and a standard normal distribution value at a 95% confidence level yielded a $Z_{\alpha/2}$ value of 1.96. This gave a minimum sample size of 334. Assuming a dropout rate of 15%, the total sample size was set at 385.

2.2 | Data collection

The surveys were conducted online from 9 October to 25 November 2020. An official request from the head of the hospital where the first author is affiliated, a text that explained the purpose and methods of

the study, and the approval letter from the institutional review board were sent to the nursing department of each hospital. A URL that linked to the survey was sent to the nursing department contact at the hospitals that agreed to participate in the study. The nursing department contacts sent the online survey to nurse managers in general wards and integrated nursing care wards, where the head nurses delivered the online survey to the nurses. Participants who met the inclusion criteria consented to the study and completed the survey. Among approximately 1500 nurses working in general wards and integrated nursing care wards at 3 private tertiary hospitals, 382 surveys were collected (return rate, 25.5%). After exclusion of 17 surveys with no name on the consent form or with missing information, 365 responses were included in the final analysis.

2.3 | Instrument

2.3.1 | PTSD

PTSD was measured using the PTSD Checklist-5 (PCL-5) (Weathers et al., 2013), which was developed to identify symptoms according to the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5), which was translated into Korean by Park (Park, 2016). The PCL-5 is composed of a total of 20 items across four subscales on intrusion (five items), avoidance (two items), negative changes in perception and emotion (seven items), and hypersensitivity (six items). Each item is scored using a 5-point Likert scale, with 0 points indicating *not at all* and 4 points indicating *extremely*. If the total score exceeds 33 points, the patient meets the DSM-5 diagnostic criteria for PTSD (Wortmann et al., 2016). The Cronbach's alpha value of the original tool was .94 (Blevins et al., 2015), and the Cronbach's alpha value of the Korean PCL-5 was .91–.93 (Lee et al., 2020). In this study, PTSD was defined as a total PCL-5 score of 34 points or more.

2.3.2 | Intrapersonal and interpersonal characteristics

The intrapersonal and interpersonal characteristics in the questionnaire included age, work experience, gender, education level, marital status, and cohabitation status.

2.3.3 | Organisational characteristics

Organisational characteristics included ward type and the nursing work environment. Ward type was categorized as a general ward or an integrated nursing care ward. The general ward nursing staffing level of the tertiary hospitals included in this study was grade 1, which translates to 9.5 patients per nurse (Cho, Lee, et al., 2016). The number of patients in general wards is higher than that of integrated nursing care wards, where each nurse is in charge of five to six patients.

The nursing work environment was measured using the nursing work environment measurement tool (Cho et al., 2011) developed by Lake (2002) and translated into Korean. The nursing work environment measurement tool has a total of 29 items across five subscales: nurse participation in hospital affairs (nine items); nursing foundations for quality of care (nine items); nurse managers' ability, leadership, and support of nurses (four items); staffing and resource adequacy (four items); and collegial nurse-physician relations (three items). Each item is scored using a 4-point Likert scale, with 1 point indicating *not at all* and 4 points indicating *absolutely*. The average scores of the items in each subscale are calculated, and a higher score suggests a better nursing work environment. According to the number of factors that showed a higher or lower score than the median score for all hospitals, hospitals were classified as having 'better', 'mixed', and 'poor' care environments (Aiken et al., 2008). Since this study was conducted only on three hospitals, it was limited to use the method above. Therefore, the nursing work environment was dichotomized at the median value by subscale. Upon development of the tool, the Cronbach's alpha values of the subscales ranged from 0.71 to 0.84 (Lake, 2002), and the Cronbach's alpha values of the Korean tool ranged from 0.80 to 0.84 (Cho et al., 2011). In the univariate and multivariate analyses on PTSD, the nursing work environment was dichotomized at the median value for each subscale.

2.3.4 | COVID-19-related characteristics

As COVID-19-related characteristics, we gathered information on assignment to a designated COVID-19 isolation ward and self-isolation experience.

2.4 | Data analysis

Nurses' intrapersonal, interpersonal, and organisational characteristics, COVID-19-related characteristics, and PTSD were presented using descriptive statistics (frequency, percentage, average, standard deviation, and median). Differences in participants' characteristics according to the presence or absence of PTSD were analysed using the chi-square test. The five subscales of age, work experience, and the nursing work environment, which are continuous variables, were classified based on median values and converted into binary variables, to which the chi-square test was applied. Logistic regression analysis was conducted to analyse factors affecting PTSD, with PTSD ('yes' = 1, 'no' = 0) as the dependent variable. The analysis was conducted with SAS (SAS Institute, Cary, NC, USA).

2.5 | Ethical considerations

This study collected data after receiving approval from the institutional review board of the hospital where the first author is affiliated. The aim of the study, an explanation about participants' anonymity

and confidentiality, and the option to discontinue participation were included on the informed consent form. The survey was conducted after participants provided written consent. To promote the voluntary participation of nurses, an external researcher not affiliated with the hospital reviewed the collected data and processed the data statistically. No identifying personal information was collected from the nurses.

3 | RESULTS

3.1 | Intrapersonal, interpersonal, and organisational characteristics

The average age of nurses was 31.76 ± 9.06 years old, and their median age was 28. The average work experience of nurses was 9.24 ± 9.36 years, with a median work experience of 5 years. They were older and had more work experience than Korean nurses overall, who have an average age of 28.7 years and 6.2 years of work experience (Cho, Chin, et al., 2016). Most participants were women (97.5%), unmarried (66.3%), lived with family (83.6%), and had a bachelor's degree in nursing or higher (86.6%). A total of 67.1% of the nurses worked in a general ward, while 32.9% worked in an integrated nursing and care service ward. The average score for the nursing work environment was 2.50 ± 0.41 points, with a median score of 2.52 (2.24–2.79) (Table 1).

3.2 | COVID-19-related characteristics

In total, 16.7% of respondents had experienced self-isolation due to COVID-19, and 46.8% had worked in designated COVID-19 isolation wards (Table 1).

3.3 | Factors influencing PTSD

In total, 16.4% of nurses had a PCL-5 score exceeding 33 points, which was the cut-off for the diagnostic criterion of PTSD. When comparing participants according to PTSD, marital status ($\chi^2 = 4.10$, $p = .043$) from intrapersonal characteristics and 'nurse participation in hospital affairs' and 'nurse managers' ability, leadership, and support of nurses' ($\chi^2 = 9.13$, $p = .003$) from the organisational characteristics were statistically significantly associated with PTSD (Table 2). In order to understand the characteristics that influenced PTSD, multivariate logistic regression analysis was conducted. Nurses were more likely to have PTSD if they were married (odds ratio [OR] = 3.02, 95% confidence interval [CI] = 0.12–0.58, $p = .013$) and when nurse managers' abilities, leadership, and support of nurses were low (OR = 3.81, 95% CI = 1.73–8.40, $p < .001$) (Table 3).

TABLE 1 Characteristics and PTSD ($N = 365$)

	<i>n (%) or M \pm SD</i>
Intrapersonal and interpersonal characteristic	
Age (years)	31.76 \pm 9.06
Work experience (years)	9.24 \pm 9.36
Gender	
Male	9 (2.5)
Female	356 (97.5)
Education level	
Associate's degree or lower	49 (13.4)
Bachelor's degree or higher	316 (86.6)
Marital status	
Unmarried	242 (66.3)
Married	123 (33.7)
Cohabitation status	
Living alone	60 (16.4)
Living with family	305 (83.6)
Organizational characteristic	
Ward type	
General ward	245 (67.1)
Integrated nursing and care service ward	120 (32.9)
Nursing work environments	2.50 \pm 0.41
Nurse participation in hospital affairs	2.34 \pm 0.47
Nursing foundations for quality of care	2.70 \pm 0.42
Nurse managers' ability, leadership, and support of nurses	2.73 \pm 0.54
Staffing and resource adequacy	2.30 \pm 0.59
Collegial nurse-physician relations	2.33 \pm 0.62
COVID-19-related characteristic	
Experience of self-isolation related to COVID-19	
No	304 (83.3)
Yes	61 (16.7)
Worked in designated COVID-19 isolation wards	
No	194 (53.2)
Yes	171 (46.8)
PTSD	14.98 \pm 15.94

4 | DISCUSSION

This study explored the status of PTSD among nurses working during the study period at tertiary hospitals that operated designated COVID-19 isolation wards in Daegu from February 2020 to May 2020 and analysed the factors that influenced PTSD among this population. In total, 16.4% of nurses met the diagnostic criteria for PTSD. Exact comparisons are difficult since no other South Korean studies have used the PCL-5 among nurses; however, the prevalence of PTSD among nurses in Daegu was found to be lower than the 36.7% rate

TABLE 2 Comparison of PTSD According to nurse characteristics (N = 365)

	n (%)	PTSD n (%)		χ^2	p
		No	Yes		
Intrapersonal and Interpersonal characteristic					
Age (years)					
<28	161 (44.1)	137 (85.1)	24 (14.9)	0.49	.483
≥28	204 (55.9)	168 (82.4)	36 (17.6)		
Work experience (years)					
<5	186 (51.0)	157 (84.4)	29 (15.6)	0.20	.656
≥5	179 (49.0)	148 (82.7)	31 (17.3)		
Gender					
Male	9 (2.5)	8 (88.9)	1 (11.1)	0.19	.662
Female	356 (97.5)	297 (83.4)	59 (16.6)		
Education level					
Associate's degree or lower	49 (13.4)	42 (85.7)	7 (14.3)	0.19	.662
Bachelor's degree or higher	316 (86.6)	263 (83.2)	53 (16.8)		
Marital status					
Unmarried	242 (66.3)	209 (86.4)	33 (13.6)	4.10	.043
Married	123 (33.7)	96 (78.0)	27 (22.0)		
Cohabitation status					
Living alone	60 (16.4)	51 (85.0)	9 (15.0)	0.11	.742
Living with family	305 (83.6)	254 (83.3)	51 (16.7)		
Organizational characteristic					
Ward type					
General ward	245 (67.1)	204 (83.3)	41 (16.7)	0.05	.827
Integrated nursing and care service ward	120 (32.9)	101 (84.2)	19 (15.8)		
Nurse participation in hospital affairs					
Below the median	198 (54.2)	161 (81.3)	37 (18.7)	1.59	.207
Above the median	167 (45.8)	144 (86.2)	23 (13.8)		
Nursing foundations for quality of care					
Below the median	217 (59.5)	179 (82.5)	38 (17.5)	0.45	.503
Above the median	148 (40.5)	126 (85.1)	22 (14.9)		
Nurse managers' ability, leadership, and support of nurses					
Below the median	203 (55.6)	159 (78.3)	44 (21.7)	9.13	.003
Above the median	162 (44.4)	146 (90.1)	16 (9.9)		
Staffing and resource adequacy					
Below the median	203 (55.6)	169 (83.3)	34 (16.7)	0.03	.858
Above the median	162 (44.4)	136 (84.0)	26 (16.0)		
Collegial nurse-physician relations					
Below the median	216 (59.2)	180 (83.3)	36 (16.7)	0.02	.887
Above the median	149 (40.8)	125 (83.9)	24 (16.1)		
COVID-19-related characteristic					
Experience of self-isolation related to COVID-19					
No	304 (83.3)	257 (84.5)	47 (15.5)	1.27	.261
Yes	61 (16.7)	48 (78.7)	13 (21.3)		
Worked in designated COVID-19 isolation wards					
No	194 (53.2)	165 (85.1)	29 (14.9)	0.67	.413
Yes	171 (46.8)	140 (81.9)	31 (18.1)		

TABLE 3 Factors related to PTSD (*N* = 365)

	Odds ratio (95% confidence intervals)	<i>p</i> value
Aged 28 years or older (ref. = less than 28)	1.30 (0.43–3.96)	.643
Work experience 5 years or more (ref. = less than 5)	0.44 (0.13–1.49)	.188
Female (ref. = Male)	1.68 (0.19–14.70)	.639
Bachelor's degree or higher (ref. = Associate's degree or lower)	1.39 (0.56–3.45)	.483
Married (ref. = Unmarried)	3.02 (1.27–7.20)	.013
Living with family (ref. = Living alone)	0.87 (0.37–2.05)	.741
Integrated nursing and care service ward (ref. = General ward)	0.88 (0.46–1.69)	.708
Nurse participation in hospital affairs above the median (ref. = Below the median)	0.85 (0.40–1.82)	.672
Nursing foundations for quality of care above the median (ref. = Below the median)	1.53 (0.71–3.28)	.274
Nurse managers' ability, leadership, and support of nurses above the median (ref. = Below the median)	0.26 (0.12–0.58)	<.001
Staffing and resource adequacy above the median (ref. = Below the median)	1.26 (0.64–2.48)	.509
Collegial nurse-physician relations above the median (ref. = Below the median)	1.25 (0.63–2.47)	.529
Experience of self-isolation related to COVID-19 (ref. = No)	1.74 (0.81–3.76)	.159
Worked in designated COVID-19 isolation wards (ref. = No)	1.20 (0.65–2.18)	.563

found within a group at high risk for PTSD identified using the Korean Impact of Event Revised Scale among nurses in designated COVID-19 hospitals in Gwangju and Jeollabuk Province (Moon et al., 2021). The reason for this discrepancy can likely be attributed to differences between the tools used to measure PTSD in the studies. The PCL-5 score cut-off for PTSD based on the DSM-5 diagnostic criteria is 34 points. However, the cut-off for the Impact of Event Revised Scale used in the other study was 46 points, which is 21 points higher than the standard score of 25 points (Murphy et al., 2017).

Married nurses had a higher risk of PTSD than single nurses, which contradicts the results of another study reporting a lower risk

of PTSD among married nurses than single nurses (Song et al., 2020). Due to the possibility of transmission of COVID-19, which has a high rate of transmission, to their family members and fear of social stigma related to the Shincheonji religious organisation (Shim et al., 2020), the prevalence of PTSD may have been higher among married nurses. Other interpersonal characteristics, such as age, gender, and education level, were not associated with PTSD. It is consistent with those of a recently performed meta-study (Yunitri et al., 2022).

The average total score for the nursing work environment was 2.50, which is similar to the average score of 2.58 found in a previous study of nurses in tertiary hospitals (Kim et al., 2018). The factor of the nursing work environment with the most significant influence on PTSD was nurse manager ability, leadership, and support of nurses. Daegu was the first region to experience a COVID-19 outbreak in South Korea, and guidelines related to COVID-19 were still evolving at the time since COVID-19 infection prevention management policy had not yet been finalized. In order to deliver rapidly evolving, important information and protocols to all nurses, nurse managers communicated in a top-down manner (White, 2021). Nurses, however, feel most supported when nurse managers actively listen to their concerns, receive feedback, and resolve those concerns accordingly, rather than through one-sided communication of information (Nelson et al., 2021). Moreover, support from nurse managers not only impacts PTSD among nurses, but also has a buffering effect that reduces turnover intention among nurses (Jung et al., 2020). Therefore, it is necessary to improve the systematic management of nurses and the competency of nursing managers so that nurses can demonstrate their ability to overcome crises in disaster situations and better cope with PTSD.

Although nurse participation in hospital affairs is an important strategy to decrease PTSD (Shanafelt et al., 2020), it is difficult for nurses, who are notified of decisions by the unit manager, to confirm whether the nursing department influenced the hospital administration's decisions. In the COVID-19 pandemic, the nursing department should have made suggestions relating to decisions affecting nurses, along with the hospital administration. Nurse managers only communicated with nurses in a directive manner to quickly carry out the decisions made by the hospital administration. Since nurses only received orders from nurse managers, the role of nurse managers was significant for PTSD, but nurse participation in hospital affairs was not. Other factors of the nursing work environment were not associated with PTSD. During the COVID-19 pandemic, insufficient health care providers and personal protective equipment have been reported, which are important factors associated with PTSD (Arnetz et al., 2020). However, during the COVID-19 outbreak in Daegu, the lack of personnel and resources was addressed quickly with the support of the Korean government and the participation of Korean citizens (Yoo et al., 2021). Nursing foundations for quality of care and collegial nurse-physician relations have not changed significantly due to the COVID-19 pandemic and are not considered to be significantly related to PTSD among nurses. In addition, it was confirmed that nurse staffing and ward characteristics were unrelated to whether nurses experienced PTSD.

Nurses who worked in designated COVID-19 isolation wards had a higher prevalence of PTSD than other nurses, but it was not statistically significant. The designated COVID-19 isolation wards were designated quickly following the government's policy, and individual nurses' opinions were not reflected when assigning nurses to care for COVID-19 patients. In other words, if a nurse worked in a ward that was designated as a COVID-19 isolation ward, the nurse had to care for COVID-19 patients. Furthermore, the shortage of nurses was supplemented from other wards, but nurse managers could not reflect all the nurses' opinions in these staffing decisions. The participants of this study either faced the possibility of working in a designated COVID-19 isolation ward or had shared experiences of working in designated COVID-19 isolation wards with other colleagues in the same ward. Self-isolation experience was not a significant factor associated with PTSD. The self-isolated nurses had a 2-week break, while others kept working. Since travel nurses are not available in Korea, nurses who were not required to self-isolate often complained of fatigue due to the extra workload. In April 2020, at the height of the COVID-19 pandemic in Daegu, only 82 (fewer than 1%) were nurses who were occupationally infected (Kang, 2020).

There is a limitation to generalizing the results of the present study since it exclusively analysed data from nurses who worked in tertiary hospitals that operated designated COVID-19 isolation wards in Daegu from February 2020 to May 2020. Second, this is a cross-sectional study, and the COVID-19 pandemic has not yet ended as of the date of this study. Therefore, there is a limitation to understanding the causal relationships between PTSD among nurses and the explanatory variables. Even with such limitations, this study is meaningful since it provides evidence for adapting the nursing work environment to ameliorate COVID-19-related PTSD among nurses. This study also measured PTSD using the PCL-5, which is a measurement tool based on DSM-5 diagnostic criteria.

5 | CONCLUSIONS

This study identified the status of PTSD among nurses who worked in tertiary hospitals that operated designated COVID-19 isolation wards in Daegu and analysed the factors in the nursing work environment that affect the rate of PTSD among this population. Further research is suggested as follows. First, since this study only included nurses who worked during the study period in the COVID-19 pandemic, a further study should expand the participants to include nurses who resigned. Second, further research should repeatedly measure the relationship between PTSD among nurses and the nursing work environment according to COVID-19 pandemic conditions.

5.1 | Implications for nursing management

Since psychological issues among nurses negatively impact both nurses' health and the quality of nursing care, interventions are necessary to support nurses. In order to alleviate PTSD among nurses, we

suggest interventions to improve nurse managers' competence in terms of their abilities, leadership, and support for nurses. In particular, during the COVID-19 pandemic, nurse managers have been given expanding and changing roles and responsibilities, and in this process, support from head nurses is necessary (Jackson & Nowell, 2021). Therefore, in a pandemic situation, it is necessary to separate the role of supporting nurses from the role of the head nurse and to handle nurses' mental health through another organisational structure dedicated to this purpose. Furthermore, to prepare for the possibility that designated infectious disease isolation wards may again become necessary due to future pandemics, training in advance is necessary. For example, preliminary infectious disease isolation wards, such as respiratory wards or infection control wards, should be designated and nursing staff for those wards should be drawn from the entire hospital. Wards and nurses should have pre-assigned roles for pandemic situations and prepare accordingly.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

ETHICS STATEMENT

This study was approved by the Institutional Review Board of Yeungnam University Medical Center (YUMC 2020-09-050).

AUTHOR CONTRIBUTIONS

Soon Yeung Bae: Conceptualization; methodology; data curation; formal analysis; investigation; writing—original draft. **Hyo-Jeong Yoon:** Conceptualization; methodology; data curation; formal analysis; validation; supervision; writing—review and editing. **Yunjung Kim:** Conceptualization; methodology; data curation; writing—original draft preparation. **Jisun Kim:** Conceptualization; methodology; data curation; writing—original draft preparation. All authors have read and agreed to the published version of the manuscript.

DATA AVAILABILITY STATEMENT

Authors do not wish to share the data.

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