


Protective Behaviors for COVID-19 Were Associated With Fewer Psychological Impacts on Nurses: A Cross-Sectional Study in Taiwan

INQUIRY: The Journal of Health Care Organization, Provision, and Financing
Volume 59: 1–12
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DOI: 10.1177/00469580221096278
journals.sagepub.com/home/inq


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Abstract

Objective: The COVID-19 pandemic has increased psychological distress among common people and has caused health care providers, such as nurses, to experience tremendous stress. **Methods:** This prospective cross-sectional study assessed the psychological impacts on nurses in a community hospital in Taiwan, including major depressive disorder (MDD), posttraumatic stress (PTS), and pessimism. According to transactional theory, coping strategies and personal factors have psychological impacts. We hypothesized that behavioral responses to COVID-19 (problem-focused coping) are more effective in reducing psychological impacts than emotional responses to COVID-19 (emotion-focused coping). Independent variables were the use of behavioral and emotional coping strategies for COVID-19 and 3 personal factors, namely sleep disturbance, physical component summary (PCS-12), and mental component summary (MCS-12) of the 12-Item Short Form Health Survey (SF-12) obtained from the Medical Outcomes Study. Dependent variables comprised 3 psychological impacts, namely MDD, PTS, and pessimism. **Results:** We determined that behavioral coping strategies had significant negative effects on PTS and pessimism; however, emotional coping strategies had significantly positive effects on PTS and pessimism. Sleep disturbance was significantly associated with increased MDD and pessimism. PCS-12 had a significant negative effect on PTS, whereas MCS-12 was not significantly associated with any of the 3 psychological impacts. **Conclusions:** Nurses who adopted protective behavior against COVID-19, such as washing hands, wearing masks, avoiding touching eyes, and mouth, and avoiding personal contact, were associated with less posttraumatic stress and pessimism. Healthcare providers should consider strategies for improving preventive behaviors to help ease their worries and fears concerning COVID-19.

Keywords

COVID-19, depression, posttraumatic stress, coping strategies, cross-sectional study

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Received 6 December 2021; revised manuscript accepted 6 April 2022

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Highlights***What Do We Already Know About This Topic?***

Mental well-being of people has been heavily affected by the global pandemic – such as COVID-19. It poses a serious threat to healthcare workers which may cause substantial degree of psychological distress.

How Does Your Research Contribute to the Field?

The present study explored the associated factors with the psychological impacts of nurses in Taiwan. Nurses who adopted protective behavior against COVID-19 were associated with less psychological impacts.

What Are Your Research's Implications Toward Theory, Practice, or Policy?

Prevention and response strategies should be strengthened by training health care professionals on crisis management and providing mental support. Healthcare providers should consider strategies for improving preventive behaviors to help ease their worries and fears concerning COVID-19.

Introduction

Illness from the 2019 coronavirus disease (COVID-19) was first reported in China in December 2019 and was declared an international public health emergency by the World Health Organization (WHO) on January 30, 2020. The disease continues to surge through many countries in Europe, America, and Asia.^{1,2} The fear of COVID-19 is likely due to its novelty and the uncertainty about how bad the current outbreak might become. This fast-spreading infectious disease has engendered universal awareness, anxiety, and distress. Furthermore, the adverse psychosomatic outcomes of the pandemic on the common people are expected to increase significantly because of the constant flow of readily available information and reinforced messages spread through social networking sites. The rapidly increasing mass panic regarding COVID-19 may lead to members of the public from all socioeconomic domains experiencing psychological problems, which could potentially be even more detrimental than the virus itself in the long run.³ Prior studies have reported that the mental well-being of people has been heavily affected by the global pandemic.⁴ Numerous recent studies have shown global increases in the prevalence and severity of COVID-19-related depression, anxiety, and stress^{5,6} –all likely stemming from challenges and changes to daily life in attempts to thwart viral spread⁷ –as well as other mental health issues such as traumatic stress^{6,8} and posttraumatic stress disorder.^{9,10} Therefore, an examination of how the COVID-19 pandemic may affect public mental health is warranted.

Health care providers may face more stress than the general population not only because of the more intense and heavy workload but also because they must take care of patients who may be infected with COVID-19 in their working environment.¹¹⁻¹⁵ Stress among health care

providers, including nurses, heavily influences the quality of patient care and safety.¹⁶ The stress faced by nurses has been attracting the attention of numerous studies on health care professionals for a long time.¹⁷⁻¹⁹ Many studies have focused on the effect of the COVID-19 pandemic on the mental health of nurses from different hospitals and different countries, with the focal outcomes including burnout, posttraumatic stress disorder, and insomnia.^{9,20}

Taylor et al (2020) reported that distress-related responses to COVID-19 comprise a multifaceted network of interconnected symptoms called COVID stress syndrome.^{21,22} Greater severity of COVID stress syndrome, as assessed based on total COVID stress scale score, was associated with younger age, female gender, unemployment, low educational attainment, and pre-existing diagnosis of a mental health disorder.²³ The core symptom of COVID stress syndrome is worries about the dangerousness of COVID-19; COVID stress syndrome is also connected to fear of adverse socioeconomic consequences, xenophobia, checking and reassurance seeking, excessive avoidance of public places, and maladaptive attempts at coping. Pandemics are dynamic, and COVID-19-related distress might fluctuate over time,²⁴ with fears rising as infection rates increase and falling as infection rates decline. Screen-and-treat approaches for COVID stress syndrome could be implemented in conjunction with community-based interventions (eg, the provision of educational materials). The understanding and treatment of pandemic-related distress is an urgent research topic.

Pessimism, defined as an expectation that bad things will happen, has been shown to worsen health and well-being outcomes, but very little research has explored the factors affecting pessimism after a disaster. Optimism–pessimism is considered to be a generalized version of the confidence–doubt dichotomy pertaining to life in general, rather than to a specific issue.²⁵ Pessimism is one type of emotional

response to the pandemic.²⁶ A previous study revealed that COVID-19–related stress had a significant predictive effect on pessimism and psychological problems.²⁷

According to transactional theory,²⁸ appraisal is an individual's interpretation of a stressor and their ability to cope with it. When an imbalance exists between a person's appraisal of the demands of a situation and their ability to meet the demands, a stress response occurs. Lazarus and Folkman (1984) used the term coping to describe the "cognitive and behavioral efforts" a person employs to manage stress, generally categorized as problem-focused or emotion-focused coping. Problem-focused coping involves strategies that solve problems, seek social support, or minimize the effects of a stressful situation. Conversely, emotion-focused coping, which attempts to alter stressful feelings, involves strategies of self-preoccupation, fantasy, or other conscious activities related to affect regulation. Many common coping behaviors were demonstrated to have high correlation with negative psychological impacts. For example, researchers found that the type of heightened self-focus associated with rumination increased the duration and intensity of depressive episodes.²⁹ Coping styles also had impacts on posttraumatic stress disorder and depressive symptoms among pregnant women exposed to Hurricane Katrina.³⁰ Adequate coping appeared to be an effective strategy for reducing psychological distress.³¹

Transaction (interaction) occurs between a person and the environment. Many personal characteristics influence the probability of psychological problems. Sleep and fatigue were demonstrated to be risk factors of poor psychological

functioning.³² Brown (2011) noted cross-sectional relationships of sleep disturbance and fear of sleeping alone with PTSD symptom severity in minority youth exposed to Hurricane Katrina.³³ Other personal factors, such as poor health-related quality of life, were associated with PTSD.³⁴ PTSD was significantly associated with more cardiovascular, neurological, and total chronic physical symptoms.³⁵ In the present study, we included sleep and health status as personal factors that have psychological impacts.

The conceptual framework for the present research is presented in Figure 1.

Methods

Study Design

This prospective cross-sectional, hospital-based survey was performed in a community hospital. This hospital had been designated as the specialty hospital for infectious diseases prevention by the Department of Health of the Kaohsiung City Government since the 2003 outbreak of severe acute respiratory syndrome. To respond to COVID-19, the Ministry of Health and Welfare listed this hospital as one of 167 nationally appointed community testing hospitals. Therefore, this hospital was in charge of screening and admitting patients diagnosed with COVID-19. This hospital adopted the following 5 major strategies to fight COVID-19: (1) Entry and exit access control, (2) Management of wards, (3) Management of hospital staff, (4) Educational training for all hospital staff, volunteers, and contractors, and (5)

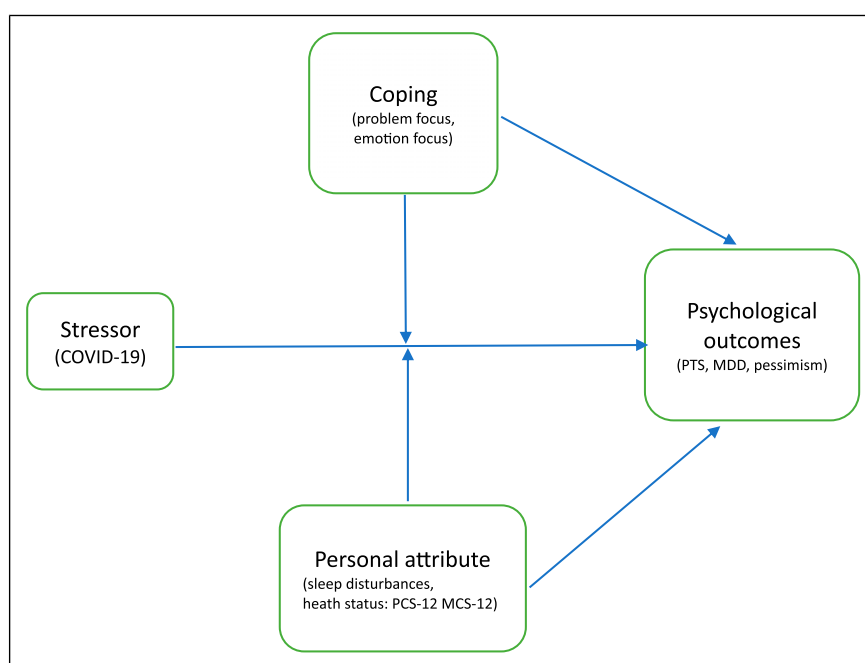


Figure 1. The conceptual framework of relationship between COVID-19. Stress, coping behaviors, personal resources, and psychological impacts among nurses.

Construction of a resilient epidemic prevention network within the community.³⁶

We used questionnaires to survey the nurses working in this district hospital in from August 13 to August 25, 2020. All registered and enrolled nurses working in this community hospital for at least 3 months were eligible to participate. Exclusion criteria were nurses' refusal to be on duty or absence from the hospital during this period. 189 questionnaires out of 196 nurses have been returned, however, there were 5 questionnaires incomplete. A total of 184 questionnaires were obtained for this study. The response rate was 93.88%.

We collected their demographic data, including gender, age, marital status, religion, education level, chronic diseases, and history of frontline work. The aim of our research was to find the association of psychologic impacts on nurses with behavior responses and emotional responses of COVID-19, sleep disturbance, and health related quality of life. Therefore, the questionnaire contained 5 parts: (1) The Disaster-Related Psychological Screening Test (DRPST, Appendix 1), including the major depression disorder (MDD) and post-traumatic stress (PTS)³⁷; (2) Pessimism (score: 1-5, from none to extreme, Appendix 1); (3) Sleep disturbance (Appendix 2); (4) Societal Influences Survey Questionnaire (SISQ) on COVID-19 (Appendix 2), including behavioral responses and emotional responses; and (5) generic Health Related Quality of Life (HRQoL) - the Medical Outcomes Study Short Form-12 (MOS SF-12), which was divided into the physical component summary (PCS-12) and mental component summary (MCS-12).

Measurement

Major depressive disorder and posttraumatic stress. We adopted the Disaster-Related Psychological Screening Test (DRPST) to measure major depression disorder (MDD) and posttraumatic stress (PTS). DPRST was designed by 5 psychiatrists and 2 public health professionals for quickly and simply interviewing respondents during the 6 months after the September 1999 Chi-Chi earthquake (37). The DRPST was a short screening scale for detecting MDD and PTS among earthquake survivors in Taiwan. A three-symptom analogue and a seven-symptom scale were selected for MDD and PTS screening, respectively. In validity of the DPRST using Mini-International Neuropsychiatric Interview (MINI, based on 5.0 English version) as the standard, a score of 5 or higher on the MDD scale was used to define positive cases of MDD, giving a sensitivity of 92.1% and specificity of 98.3%. A score of 10 or higher on the PTS scale was used to define positive cases of PTS, giving a sensitivity of 97.8% and specificity of 96.6%. Both scores of 5 or higher on the MDD scale and scores of 10 or higher on the PTS scale were used to define a group of positive cases that could provide useful information on the patient cohort and be of value in long-term follow-up studies on the prevalence of psychiatric diseases following a natural disaster.³⁸ Screening for MDD and PTS is also suitable for the general population.³⁹ DRPST has been proved to a valid and reliable scale

as it was used in Taiwan's earthquake.³⁷⁻³⁹ If the result indicates a positive case, seeing a psychiatrist is suggested.

Pessimism. We used 1 item to detect the severity of pessimism, with scores from 1 to 5 signifying none, mild, moderate, severe, and extreme pessimism, respectively.

Sleep disturbance. We employed a 4-point Likert scale and utilized 4 items to evaluate sleep disturbance, including sleep latency, sleep interruption, subjective sleep quality, and daytime dysfunction (Appendix 2). After performing item analysis, exploratory factor analysis, and a reliability test, the Kaiser-Meyer-Olkin (KMO) coefficient of sampling adequacy was .711. Furthermore, Bartlett's test of sphericity yielded significant results ($P < .001$). Our results verified the proposed one-factor solution for all 4 items. The Cronbach's α of sleep disturbance was .851.

Societal Influences Survey Questionnaire (Behavioral Responses and Emotional Responses). Societal Influences Survey Questionnaire (SISQ) was employed to evaluate the social influences of the COVID-19 pandemic on people. The scale had 20 items, including social distance, social anxiety, social desirability, social information, and social adaptation, and the responses were captured on a 4-point Likert scale. Construct validity and reliability were performed to verify SISQ, and item analysis and exploratory factor analysis were conducted. The KMO coefficient of sampling adequacy was .824, and Bartlett's test of sphericity yielded significant results ($P < .001$). Our result verified the proposed two-factor solution for all 20 items. The reason for excluding an item was that loading of an item was less than .5 or cross-loading of an item was over .5. Finally, there were 5 items in Factor 1 and 3 items in Factor 2 (Appendix 2). We named Factor 1 behavioral responses to COVID-19 (COVID-behavior) and Factor 2 emotional responses to COVID-19 (COVID-emotion). The Cronbach's α of SISQ in this study was .842.

Confirmatory factor analysis (CFA) was conducted using Mplus 7 software to examine the factor structure of MDD, PTS, sleep disturbance, COVID-emotion, and COVID-behavior. The findings from the hypothesized structural model were interpreted using common data-model indices and their cut-off points.⁴⁰ The results of CFA revealed an adequate data-model fit. The confirmatory factor analysis (CFA) was conducted by Mplus 7 software to examine the factor structure of MDD, PTS, sleep disturbance, COVID-emotion, COVID-behavior. Findings from the hypothesized structural model were interpreted using common data-model indices and their cut-points.⁴⁰ The result of CFA revealed adequate data-model fit.

Medical Outcomes Study Short Form-12: Physical Component Summary and Mental Component Summary. The 12-Item Short Form Survey (SF-12) was developed as a short alternative to the SF-36. The SF-36 is a generic Health Related Quality of Life (HRQoL) questionnaire, which has evolved from the Medical Outcomes Study (MOS), consisting of 36 questions,

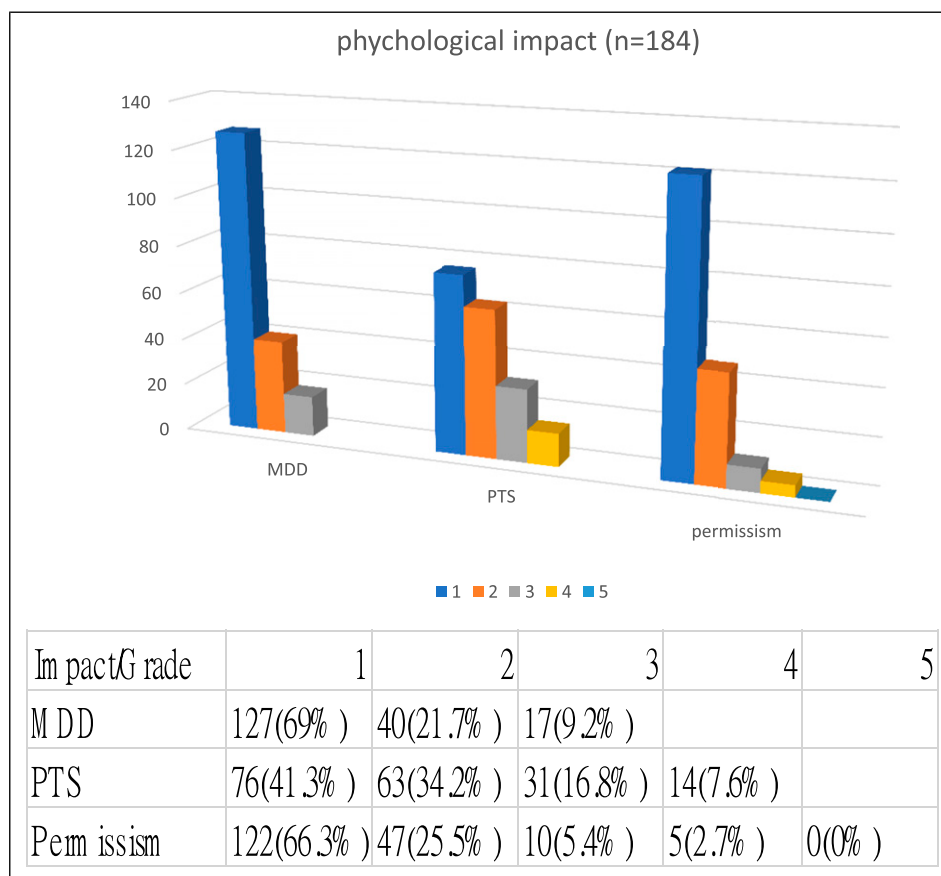


Figure 2. Severity of psychological impacts.

and is the most widely used generic health outcome instrument worldwide because of its psychometric performance and usefulness in measuring and monitoring the health outcomes of both general and disease-specific populations. The SF-12 comprises a subset of 12 items selected from the SF-36 Health Survey that covers the same domains of health outcomes. When the SF-12 was compared with the SF-36 using patient groups with varying ages and physical and mental health status, the scores of the SF-12 were similar with the scores of the SF-36. However, larger standard errors were almost always observed.⁴¹ The SF-12 can be classified into Physical (PCS) and Mental Component Summary (MCS). SF-12 had satisfactory reliability and validity in measuring health status of Chinese community population⁴² and people with mental illness.⁴³ The Cronbach’s alpha of PCS and MCS in this study were .853 and .749, respectively.

Data Analysis

We used SPSS 24.0 (IBM SPSS Statistics for Windows, Version 24.0, Armonk, NY, USA: IBM Corp) and Mplus 7 software for statistical analysis. Dependent variables (psychological impacts) comprised MDD, PTS, and pessimism. The 5 independent variables were COVID-emotion, COVID-behavior, sleep disturbance, PCS-12, and MCS-12.

Confirmatory factor analysis (CFA) was conducted to examine the factor structure of MDD, PTS, sleep disturbance, COVID-emotion, and COVID-behavior. We used Student’s *t* test and one-way ANOVA to determine the association between the demographic data and psychological impacts. We ran a bivariate Pearson’s correlation coefficient to measure a linear association between all variables. Multiple linear regressions were employed to predict the value of each dependent variable (MDD, PTS, or pessimism) on the basis of the value of the 5 independent variables. Sample size was calculated a priori using G × Power 3.1.9.7 software in statistical test of linear multiple regression, fixed mode. We set $\alpha=.05$, power=.8, number of predictor (independent variables) = 5. The effect sizes were based on the minimal clinically important differences (MCID). In the cases of MDD, PTS, and pessimism, the calculated sample sizes were 51, 62, and 41, respectively.

We made the following hypotheses:

H1: COVID-behavior (problem-focused coping) is associated with low psychological impacts.

H2: COVID-emotion (emotion-focused coping) has less effect on reducing psychological impacts than does COVID-behavior.

H3: Sleep disturbance is associated with high psychological impacts.

Table 1. Association between demographics and adverse psychological outcomes.

Variables	Number	MDD		PTS		Pessimism	
		Mean	p (t) Value	Mean	p (t) value	Mean	p (t) Value
Gender			.576		.000**		.000**
Male	7	3.29		7.14		1.00	
Female	177	3.46		8.68		1.46	
Age (years)			.960		.911		.980
≤29	68	3.44		8.74		1.46	
30~39	64	3.48		8.55		1.45	
40~49	42	3.40		8.50		1.40	
≥50	10	3.50		8.80		1.40	
Marital status			.609		.518		.696
Single	107	3.48		8.70		1.46	
Married	77	3.42		8.51		1.42	
Education			.133		.121		.544
High school	2	4.50		11		2	
College	171	3.45		8.64		1.43	
Graduate	11	3.27		7.91		1.45	
Religion			.701		.841		.781
Yes	122	3.47		8.60		1.45	
No	62	3.42		8.66		1.42	
Exercise			.066		.628		.226
Regularly	91	3.56		8.69		1.51	
Irregularly	93	3.34		8.55		1.38	
Dietary			.045*		.467		.788
Regularly	129	3.52		8.69		1.45	
Irregularly	55	3.29		8.45		1.42	
Chronic disease			.385		.019*		.441
Yes	30	3.57		9.40		1.53	
No	154	3.43		8.47		1.42	
Quarantine			.287		.026*		.111
Yes	17	3.65		9.65		1.71	
No	167	3.43		8.51		1.41	
Frontline			.810		.150		.197
Yes	55	3.47		8.95		1.55	
No	129	3.44		8.48		1.40	

Note: *P<.05; **P<.001.

H4: Worse physical and mental health is associated with high psychological impacts.

Ethics and Consent to Participate

This study was approved by Institutional Review Boards of the study hospital (KSPH-2020-04). All respondents provided written informed consent prior to the survey.

Results

A total of 184 nurses participated in our survey. A total score of ≥ 5 in MDD and ≥ 10 in PTS implied risk of psychological impacts requiring attention. A total of 17 nurses (9.2%) had high risk for MDD and 45 nurses (24.4%) had high risk for PTS. For

pessimism, 15 nurses (8.1%) were more than moderately pessimistic (Figure 2).

The demographic data revealed no significant differences in age, marital status, religion, education level, regular exercise, and frontline nurses across the 3 psychological impacts (MDD, PTS, pessimism). Although only 7 among the 184 nurses were male adults, female nurses were at a statistically significant high risk for MDD and pessimism ($P < .001$). Notably, nurses who ate regularly were prone to develop MDD ($P = .045$). Nurses with chronic diseases ($P = .019$) or experience with being quarantined were more likely of developing PTS ($P = .026$) (Table 1).

The mean score of sleep disturbance was 6.11 ± 2.36 , while the range of sleep disturbance was 4 to 16. The mean score of behavioral responses to COVID-19 (COVID-behavior)

was 17.15 ± 3.29 , and the range of COVID-behavior was between 5 and 20. This meant that most nurses exhibited protective behaviors in response to COVID-19. The mean score of emotional responses to COVID-19 was 6.81 ± 2.38 , and the range of COVID-emotion was between 3 and 12. For the MOS SF-12, the mean score of the PCS-12 was 49.67 ± 6.44 and that of the MCS-12 was 47.81 ± 9.92 . Both scores were somewhat lower than the normal level. The correlations between variables are showed in Table 2. Sleep disturbance ($r = .474 \sim .552$), COVID-emotion ($r = .214 \sim .438$), PCS-12 ($r = -.285 \sim -.245$) were significantly correlated with our 3 dependent variables (MDD, PTS pessimism). The coefficients are in weak to moderate correlation. However, COVID-behavior had no statistically significant correlation with our 3 dependent variables. MCS-12 had the significant correlation with MDD ($r = -.186$) and pessimism ($r = -.178$), while it was not correlated with PTS significantly.

In the multiple linear regression analysis on psychological impacts, we predicted modes for MDD, PTS, and pessimism (Table 3). Sleep disturbance was the only significant factor for MDD ($\beta = .494$, $P < .001$) (adjusted $R^2 = .309$, $P < .001$). In PTS, COVID-emotion ($\beta = .445$, $P < .001$) exerted a positive effect, while COVID-behavior ($\beta = -.146$, $P = .041$) and PCS-12 ($\beta = -.180$, $P = .009$) had negative effects (adjusted $R^2 = .261$, $P < .001$). Regarding pessimism, sleep disturbance ($\beta = .349$, $P < .001$), and COVID-emotion ($\beta = .417$, $P < .001$) exerted positive effects and COVID-behavior ($\beta = -.166$, $P = .013$) had a negative effect (adjusted $R^2 = .363$, $P < .001$).

Discussion

The disease characteristics of COVID-19 have provoked a generalized climate of wariness and uncertainty among common people. Biopsychological factors of COVID-19 include social factor, psychological factor, health related behavior and biological factors.⁴⁴ Furthermore, stress in medical staff has been caused by organizational factors, such as significant changes in social and family life, depletion of personal protective equipment, concerns about the rapidly changing information on the disease, lack of access to up-to-date information and communication, lack of specific drugs, and the shortage of ventilators and intensive care unit beds for the surging number of critically ill patients. Further negative effects have been identified, including feeling of being inadequately supported, concerns about the health of oneself, fear of taking the infection home to family members, being isolated, not having easy access to testing through occupational health channels if needed, and an overwhelming workload. Biological and behavioral factors interact with societal processes in the infectious disease context.⁴⁵ Additionally, positive social and organizational factors that contribute to improving resilience in the fight against the virus have been explored.⁴⁶ A

consensus has been reached in all the relevant literature that health care professionals are at an increased risk of high levels of stress, anxiety, depression, burnout, addiction, and posttraumatic stress disorder, which can have long-term psychological implications.^{13,47}

A systemic review of nurses during the COVID-19 pandemic between January 2020 and September 2020 revealed that the overall prevalence of stress was 43%, the overall prevalence of anxiety was 37%, the overall prevalence of depression was 35%, and the overall prevalence of sleep disturbance was 43%.⁴⁸ We surveyed nurses in a community hospital in southern Taiwan between August 13 and 25, 2020. In that period, people might be less stressed, because of no new-diagnosed patients since May 21 in Taiwan. Out of the 184 nurses surveyed in our study, 17 (9.2%) were at high risk for MDD, 45 nurses (24.4%) were at high risk for PTS, and 15 nurses (8.1%) were more than moderately pessimistic. Previous studies on health care workers in Singapore and India during the COVID-19 outbreak revealed that the incidence of depression, anxiety, and stress was around 5%–15%.⁴⁹ Compared with general population, 1 study in Taiwan revealed that affiliated health care professionals did not experience more anxiety than the general population did.⁵⁰ Another study revealed that the prevalence of sleep disturbances among nurses treating COVID-19 patients was roughly 34.8%, which was less than that faced by physicians (41.6%).⁵¹ In our study, the mean score of sleep disturbance was 6.11 ± 2.36 (range 4 to 16), it seemed sleep disturbance of nurses in this community hospital was not severe.

A previous study determined that females are at a greater risk for affective disorders before menopause (corresponding age for males), such as depression and anxiety disorders.^{52,53} Our result revealed that with regard to PTS and pessimism, female nurses were significantly affected worse than their male counterparts, although there were only 7 male nurses among the total 184 nurses. In accord with expectations, nurses with chronic diseases or those who had been quarantined were significantly at risk for PTS. Notably, nurses with regular dietary habits had significantly higher scores for MDD. This may be because the nurses with regular dietary habits were more concerned about their health and environment. Nurses were more worried about the impact of COVID-19, which led to a higher score in psychological impacts (MDD, PTS, pessimism). A previous study reported exercise might be an adjunctive treatment of mental illness,^{54,55} but it was not obvious in our study. However, we did not find regular exercise as an important factor.

In our study, frontline health care nurses were working in emergency rooms, intensive care units, infectious units, or wards for patients with suspected COVID-19 infection. In 1 study in Taiwan, frontline health care professionals exhibited no significant differences in general anxiety compared with affiliated health care professionals.⁵⁰ Our study had similar

Table 2. Correlations between variables (n = 184).

	Mean (SD)	1	2	3	4	5	6	7	8
1.MDD	3,45 (.795)	I							
2.PTS	8,62 (2.005)	.359**	I						
3.Perssivism	1.44 (.722)	.462**	.607**	I					
4.Sleep disturbance	6.11 (2.36)	.552**	.290**	.474**	I				
5.COVID-emotion	6.81 (2.38)	.214*	.438**	.438**	.221*	I			
6.COVID-behavior	17.2 (3.29)	.030	.063	.050	.098	.439**	I		
7.MCS-12	47.81 (9.92)	-.186*	-.098	-.178*	-.196*	-.043	.024	I	
8.PCS-12	49.67 (6.44)	-.245**	-.285**	-.265**	-.338**	-.137	-.006	-.009	I

Note: MDD= Major depressive disorder, PTS = posttraumatic stress, MCS = Mental Component Summary, PCS = Physical Component Summary, * P < .05, ** P < .01.

Table 3. Results of multiple linear regression analysis on psychological impacts (n = 184).

Variables	MDD		PTS		Pessimism	
	β	p	β	p	β	p
Sleep disturbance	.494	.000**	.135	.057	.349	.000**
COVID-emotion	.123	.080	.445	.000**	.417	.000**
COVID-behavior	-.71	.301	-.146	.041*	-.166	.013*
MCS-12	-.083	.192	-.51	.432	-.089	.143
PCS-12	-.063	.343	-.180	.009**	-.091	.151
F Value	17.352		13.934		21.817	
P-value	.000**		.000**		.000**	
Adjusted R ²	.309		.261		.363	

Note: MCS = Mental Component Summary, PCS = Physical Component Summary, * P<.05, ** P<.001.

results. Frontline nurses showed no significant differences in MDD, PTS, and pessimism compared with non-frontline nurses. However, the scores of psychological impacts of frontline nurses were all higher

Lazarus and Folkman (1984) defined coping as “constantly changing cognitive and behavioral efforts to manage specific internal/external demands that are appraised as exceeding the resources of the person”.²⁸ A stress response depends upon appraisal, which is defined as the individual’s interpretation of the stressor and their ability to cope with it. When a person’s appraisal indicates that their ability to cope with a situation is insufficient to meet the demands of the situation, they will experience a stress response. Stress responses are subjective and highly personal. Two basic types of coping exist: problem-focused coping and emotion-focused coping. Problem-focused coping involves the ability to develop a strategy that addresses the cause of the stress.⁵⁶⁻⁵⁸ Emotion-focused coping addresses the unpleasant emotions associated with the stress rather than finding a way to ameliorate its cause. Emotion-focused coping is considered to be less effective in reducing stressful demands. In the present study, COVID-behavior, as problem-

focused coping, was statistically significantly associated with decreased posttraumatic stress and pessimism. We hypothesized that COVID-mood, as emotion-focused coping, would be less effective than COVID-behavior in reducing psychological impacts. In our results, COVID-mood did not decrease but rather significantly increased PTS and pessimism. PTS was observed to have a major correlation with COVID-mood ($\beta = .445$, $P < .001$). Nurses who were more anxious or emotional in their response to COVID-19 had a higher chance of being affected by PTS. In a previous study in Taiwan,⁵⁰ health-care professionals who adopted more protective behavior against COVID-19, had a lower general anxiety score. Therefore, we suggest that people should adopt behaviors to protect against COVID-19, such as washing hands; wearing a mask; avoiding touching the eyes, nose, and mouth; avoiding personal contact, and avoiding going to crowded places. These measures can not only offer protection against COVID-19 but may also be associated with reduced psychological impacts.

Coping options and resources may be internal or external. Several personal factors contribute to psychological impacts. In our result, sleep disturbance had a correlation with MDD ($\beta = .494$, $P < .001$, $R^2 = .309$). Sleep disturbance was also significantly associated with pessimism. PCS-12 had a minor correlation with PTS, which implies that nurses in a bad state of physical health have a high chance of developing PTS. Sleep disturbance exerted positive effects on pessimism. A previous study revealed that people with high levels of fear and low levels of preventive behaviors would be more pessimistic.⁵⁹ We observed a similar result.

Like all other healthcare workers, nurses were entitled to a physically and psychologically safe workplace. As this study indicated, however, most nurses experienced stressful situations in this community hospital. Nurses’ mental health was substantially negatively impacted since the pandemic outbreak. In our study, nurses who adopted health-related behavior against COVID-19, experienced less psychological impacts. Sleep disturbance was also associated with psychological impacts positively. In generic Health Related

Quality of Life (HRQoL) - Medical Outcomes Study SF-12, PCS-12 had a greater effect on psychological impacts, compared with MCS-12. For reducing workplace stress and improve nurses' mental health, the study findings indicate that targeted professional development is needed to strengthen their psychological well-being and self-care, and organizational policy and strategies are needed to mitigate high-risk situations and resilience skills education.

In the long term, the COVID-19 health crisis should considerably enhance our understanding of the mental health risk factors affecting health care professionals battling pandemics. Reporting information such as that presented herein is essential for planning future prevention strategies. Protecting health care professionals is an important component of public health measures for addressing large-scale health crises. Therefore, interventions to promote the mental well-being of health care professionals exposed to COVID-19 need to be immediately implemented. Furthermore, prevention and response strategies should be strengthened by training health care professionals on crisis management and providing mental support.

Limitations

There were some limitations in our study. First, this study was conducted during a period when no new patients were diagnosed with COVID-19 in Taiwan. Nurses were less stressed at that time. This might not reflect the stress of nurses during an intensive stage of COVID-19. Secondly, the survey was conducted in a community hospital. Future research should perform at different sizes or settings of hospitals. Last, further longitudinal study is required to distinguish between the psychological symptoms during and after the COVID-19 outbreak. Third, we used short screening scales for detecting MDD and PTS (rather than the gold standard for psychiatric diagnosis), one-item to evaluate pessimism, and the limitation of self-reported measures for all variables.

Conclusion

In our study, poor sleep quality and a high score in emotional responses to COVID-19 were found to increase the psychological impacts of COVID-19. A high score in behavioral responses to COVID-19 was associated with less psychological impacts of COVID-19. The scores on the PCS-12 of the MOS SF-12 were negatively associated with psychological impacts, especially PTS; the scores on the MCS-12 of the MOS SF-12 did not influence psychological impacts significantly. Health-care professionals should build resilience, prevent illness, optimize health, improve the quality of their sleep, and increase preventive behaviors to help ease their worries and fears concerning COVID-19.

Appendix I Psychological Impact: Disaster-Related Psychological Screening Test and Pessimism (MDD and PTS); No: 1, Yes: 2

MDD	1. Most of the time, I feel bad and depressed. 2. I get tired or lose vitality almost daily. 3. I feel worthless or guilty almost daily.
PTS	1. Most of the time, I cannot be happy or lose interest in things. 2. It is difficult to relax or feel safe even when I have not seen the news or events of the novel coronavirus. 3. When exposed to novel coronavirus news or events, the body has reactions (such as palpitations, tremors, muscle tightness, and sweating). 4. I avoid (or don't want to see) places, events, people, or reports that trigger memories of novel coronavirus. 5. I do my best or force myself not to think about the novel coronavirus news or events. 6. I often experience imagining or feeling being injured and feel pain, as if the injury has happened again. 7. I have repeated dreams about events or topics related to novel coronavirus.
Pessimism	Do you feel pessimistic and uncertain about the future? (grade 1-5)

Appendix 2 Sleep disturbance and behavioral and emotional responses to COVID-19

Sleep disturbance (grade 1-4):	1. Cannot sleep for 30 minutes after going to bed? (1. Never; 2. <1 time/week; 3. 1-2 times/week; 4. ≥3 times/week) 2. When you wake up in the middle of the night or early morning, are you unable to sleep again? (1. Never; 2. <1 time/week; 3. 1-2 times/week; 4. ≥3 times/week) 3. In the past month, have you slept well overall? (1. Very good; 2. Fairly good; 3. Not good; 4. Very bad) 4. In the past month, has your sleep affected your mood, work efficiency, and daily life? (1. Very good; 2. Fairly good; 3. Not good; 4. Very bad)
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Behavioral response to COVID-19 (grade 1-4: none, seldom, sometimes, often)	1. Whenever I go out, I wear a mask, whether indoors or outdoors. 2. I use water or alcohol hand sanitizer to wash my hands to make sure my hands are clean. 3. I avoid touching my eyes, nose, and mouth. 4. I avoid going shopping and traveling and have reduced unnecessary social activities at this time. 5. I avoid close conversations with strangers.
Emotional response to COVID-19 (grade 1-4: none, seldom, sometimes, often)	1. I get angry with people and things that may cause the spread of the virus. 2. I feel anxious or fearful about the impact of the pandemic. 3. I am afraid that I have fever, cough, and other symptoms.

Authors' Contributions

Yeh and Chan wrote the main manuscript text; Yen and Lin: data collection; Chan: data analyses and prepared Tables; All authors reviewed the manuscript

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This study was partially funded by Kaohsiung Ming-Sheng Hospital, Kaohsiung, Taiwan (KMSH-11005).

Ethics Approval and Consent to Participate

The study protocol was approved by the Institutional Review Board of Municipal Kai-Syuan Psychiatric Hospital (KSPH-2020-04). Informed consent was also obtained during the survey.

Availability of Data and Materials

Please contact Dr Shu-Chuan Jennifer Yeh for data and materials.

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