

ORIGINAL ARTICLE

Survey on perceived work stress and its influencing factors among hospital staff during the COVID-19 pandemic in Taiwan

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Abstract

This study aimed to investigate the perceived work stress and its influencing factors among hospital staff during the novel coronavirus (COVID-19) pandemic in Taiwan. A web-based survey was conducted at one medical center and two regional hospitals in southern Taiwan, targeting physicians, nurses, medical examiners, and administrators. The questionnaire included items on the demographic characteristics of hospital staff and a scale to assess stress among healthcare workers caring for patients with a highly infectious disease. A total of 752 valid questionnaires were collected. The hospital staff reported a moderate level of stress and nurses had a highest level of stress compared to staff in the other three occupational categories. The five highest stress scores were observed for the items “rough and cracked hands due to frequent hand washing and disinfectant use,” “inconvenience in using the toilet at work,” “restrictions on eating and drinking at work,” “fear of transmitting the disease to relatives and friends,” and “fear of being infected with COVID-19.” Discomfort caused by protective equipment was the major stressor for the participants, followed by burden of caring for patients. Among participants who experienced severe stress ($n = 129$), work stress was higher among those with rather than without minor children. The present findings may serve as a reference for future monitoring of hospital staff’s workload, and may aid the provision of support and interventions.

KEYWORDS

2019 novel coronavirus (SARS-CoV-2), hospital employee, infectious diseases, stress

1 | INTRODUCTION

The novel coronavirus pneumonia (COVID-19) caused by a novel coronavirus (SARS-CoV-2) infection emerged in 2019. It is similar to the severe acute respiratory syndrome (SARS) that broke out from 2002 to 2003, in that the pathway of transmission is unclear but it can spread with human-to-human transmission. Symptoms appear within about 2 to 14 days from virus infection, and the disease progresses rapidly

from an asymptomatic state or mild symptoms to severe symptoms or even death. The rate of transmission of COVID-19 is quite high, with 2 732 709 people diagnosed worldwide by the end of April 2020, covering 184 countries worldwide. The number of deaths continues to increase, with a fatality rate of 6.95%, exceeding the number of SARS cases worldwide.^{1,2} On April 24, 2003, when the SARS pandemic hit Taiwan, to prevent disease spread, the government ordered the closure of a hospital due to severe cross infection. Healthcare workers rushed

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out of the blockade line due to insufficient protective equipment and fear of the disease, which resulted in fear of the pandemic among medical staff and the public. As the COVID-19 pandemic continues to grow, the collective memory of SARS has been revived, and people have vowed not to repeat the same mistake. As a result, hospitals in Taiwan have quickly implemented a containment campaign in response to the currently emerging pandemic by developing emergency response measures. Staffs are required to wear protective equipment, screen patients and visitors entering and leaving the hospital, and set up an outdoor fever screening area in the emergency clinic. Additionally, a scheduling roster has been set up, and all hospital staffs are deployed to fight against the pandemic by providing comprehensive care for patients in negative stress isolation wards or general inpatient wards, and by participating in rotational shifts to implement the quarantine measures at the hospital gate. The pandemic has disrupted the original schedule of hospital staff and has caused changes in their work or lives, resulting in substantial physical and mental stress.

Stress refers to individuals' reactions to different situations. It includes changes in their physiology or psychology in the face of events in the external environment that are evaluated as more than they can bear, such that they affect their physical and mental well-being.³ Stress at work is regarded as the process of interaction between the individual and the work environment, which represents an accumulation of negative emotions generated by the work.^{4,5} These negative reactions lead to the experience of high stress for a long period, which in turn affects physical and mental health. Specifically, it causes multiple adverse symptoms, such as insomnia, headache, fatigue, anxiety, gastrointestinal discomfort, and immunity decline, as well as increased family conflicts, decreased work quality, interpersonal relationship disorders, and other negative effects.⁵⁻⁸

Hospital staffs are under high stress during the care process. They have to tackle the effects of misunderstanding by the general public, face worries from family members, experience fear of the unknown disease and of becoming a transmitter of the disease, and experience challenges related to their professional skills of personal infection control. These were major stressors for healthcare workers during SARS,⁹ and as such, several of them experienced fear, exhaustion, and stress.¹⁰ Chuang and Lou¹¹ conducted a survey on 110 physicians and 385 nurses who provided care to patients with SARS in medical centers. They found that infection control anxiety and patient care burden during the containment measures implemented to prevent the spread of highly infectious diseases that are major stressors for healthcare workers. Liu et al¹² reported that, when taking care of patients with underlying infectious diseases, nurses in southern Taiwan hospitals were under great stress due to fear of being infected and passing on the disease to their family.

Extensive research has been conducted to examine the correlation between personal demographics and work stress. Studies have found that marital status, workplace, and educational level have significant effects on work stress.^{12,13} For example, Wang¹⁴ explored the relationship between work stress and social support among nurses, and found that the older they were and the higher years of work experience they had, the higher was their work stress. This finding suggests that, with the increase of age and accumulation of work

experience, nurses are likely to have better attitudes toward and abilities to respond to problems, and accordingly, they would be more likely to be assigned the responsibility to handle unexpected situations at work.^{12,15,16} Unmarried, female, younger medical staff were found to be more prone to high work stress,¹⁷ but work stress was also observed to decrease with the increase in age, years of work experience, and number of children.¹⁶ Another study found that healthcare workers are busy at work, and work stress could result from the conflict of clinical work with family or personal affairs.¹⁸ However, McGrath et al¹⁸ found that marital status, work experience, but educational level had no significant impacts on work stress.¹⁴

The contagion path of COVID-19 is still unknown. Therefore, since the outbreak of the pandemic, the Taiwanese government has formulated an emergency response plan, and hospitals have adopted several preventive measures. Moreover, hospital staffs have experienced the global impact of this highly communicable disease, whose sudden onset has caused a stress impact that is similar to that of SARS. This leads to the question, "are hospital staff suffering from the same magnitude of stress as before?" Accordingly, the objectives of the present study were (a) to understand the level of stress experienced by hospital staff caring for patients with COVID-19 and (b) to explore the relationship between the personal demographic characteristics and work stress of hospital staff. The present results could act as a reference for monitoring the work stress of hospital staff, and for accordingly providing support, adjusting manpower, and implementing interventions during the pandemic, to maintain their work stability and quality of life.

2 | METHODS

A cross-sectional survey was conducted from the end of March to the beginning of April 2020, at the peak of the COVID-19 pandemic in Taiwan. Participants were selected from a 1700-bed medical center and two 800-bed regional hospitals in southern Taiwan. The survey was conducted using a web-based questionnaire and excluded new recruits, outsourced workers, research assistants, and other non-regular hospital employees. Details of the survey website were provided to the survey participants through the mailboxes of the three hospitals, and the researchers compiled the responses from each hospital for analysis. This study recruited participants from the four main categories of hospital staff, namely physicians, nurses, medical technicians, and administrators. The questionnaire contained the following two sections^{11,19}: (a) items on participants' demographic characteristics, including age, gender, marital status, number of children, number of minor children, years of work experience, educational level, experience with caring for patients with SARS, experience with caring for patients with COVID-19, and ward unit for caring for patients with COVID-19; and (b) the Psychometric Evaluation of Healthcare Workers' Stress Related to Caring for Patients with a Highly Infectious Disease scale developed by Chuang and Lou (2005)¹¹ for SARS. The scale comprises 4 subscales, namely, "worry and social isolation" with 10 items, "discomfort caused by protective equipment" with 8 items, "difficulties and anxieties related to infection control" with 7 items, and "burden of caring for patients" with 7 items, totaling

32 items. Each item is rated on a 4-point Likert scale (0: not at all, 1: about the same as usual, 2: slightly more severe than usual, 3: more severe than usual) to assess the degree of stress caused by various stressors. The total score ranges from 0 to 96, with a higher total score indicating a greater degree of stress. A total score of 46 to 96 indicates "severe stress," that from 33 to 46 indicates "moderate stress," that from 0 to 32 indicates "low stress," and 0 indicates "no stress." The content validity index of the scale was 0.92 in the original study by Chuang and Lou (2005),¹¹ who tested it on healthcare workers (n = 543) from medical centers in Taiwan. The Cronbach's α values for the four subscales were 0.84 to 0.90 in the original study. In the present study, the Cronbach's α value of the complete scale was 0.94, and that for the four subscales was 0.84 to 0.90.

2.1 | Statistical analysis

Data were analyzed using JMP13.0 statistical package. Regarding descriptive statistics, continuous variables related to demographic characteristics and perceived work stress were presented as mean \pm SD; categorical variables were presented as counts and percentages. For inferential statistics, the Pearson product moment correlation test was used to analyze the correlations between the study variables. Since severe stress has a significant impact on the physical and mental health of employees²⁰ and willingness to care for patients,¹¹ With a projected power of 80%, an alpha of .05, and an effect size of 0.30, the required sample size was 128 participants, as calculated by G Power 3.1.9.4. The 129 employees with scores over 64 points were selected for a t test and

TABLE 1 Demographic characteristics of hospital staff participating in the present study (N = 752)

Item	1. Physicians (n = 54) Mean \pm SD or n	2. Nurses (n = 493) Mean \pm SD or n	3. Medical technicians (n = 89) Mean \pm SD or n	4. Administrative staff (n = 116) Mean \pm SD or n	All hospital staff (n = 752) Mean \pm SD or n (%)
Age (range: 23-65 y)	42.6 \pm 10.2	37.5 \pm 8.8	38.3 \pm 8.5	42.6 \pm 9.8	38.7 \pm 9.3
Gender					
Male	37	9	24	16	86 (11.4)
Female	17	484	65	100	666 (88.6)
Married					
No	15	241	39	45	340 (45.2)
Yes	39	252	50	71	412 (54.8)
Children					
No	33	220	35	68	356 (47.3)
Yes	21	273	54	48	396 (52.7)
Minor children					
No	24	182	30	44	280 (37.2)
Yes	30	311	59	72	472 (62.8)
Years of work experience (range: 1-41 years)	9.9 \pm 7.9	12.0 \pm 8.6	11.1 \pm 8.8	13.2 \pm 10.3	11.9 \pm 8.9
Educational level					
Senior high school (vocational)	0	2	1	6	10 (1.3)
University (junior college)	24	456	58	82	610 (81.9)
Research institute (including master's and doctoral degrees)	28	32	31	34	125 (16.8)
Experience in caring for patients with SARS					
No	41	435	83	112	671 (89.7)
Yes	12	56	6	3	77 (10.3)
Experience in caring for inpatients with COVID-19					
No	35	388	72	114	609 (81.0)
Yes	19	105	17	2	143 (19.0)
Negative pressure isolation ward	7	27	2	0	36 (25.2)
Emergency department	11	23	10	1	45 (31.4)
Special ward	0	11	0	0	11 (7.7)
Intensive care unit	1	29	5	0	35 (24.5)
General ward	0	15	0	1	16 (11.2)

Abbreviations: COVID-19, coronavirus disease 2019; SARS, severe acute respiratory syndrome.

TABLE 2 Comparison of scores on different stressors among different types of hospital staff (n = 752)

Item	All participants (n = 752)	1. Physicians (n = 54)	2. Nurses (n = 493)	3. Medical technicians (n = 89)	4. Administrative staff (n = 116)	F	Tukey Kramer
Fear of social isolation (10 items)	13.0 ± 6.4	11.9 ± 6.6	13.6 ± 6.4	12.3 ± 5.9	11.5 ± 6.0	4.20**	2 > 4
Discomfort caused by protective equipment (8 items)	14.7 ± 5.1	13.8 ± 4.9	15.5 ± 5.1	13.5 ± 4.7	13.0 ± 4.8	11.18**	2 > 3, 2 > 4
Difficulties and anxieties related to infection control (7 items)	9.1 ± 4.0	8.8 ± 4.6	9.4 ± 4.0	9.6 ± 3.9	8.0 ± 3.8	4.22**	3 > 4, 2 > 4
Burden of caring for patients (7 items)	10.9 ± 4.8	11.0 ± 4.3	11.9 ± 4.6	9.0 ± 4.0	7.8 ± 4.5	32.27**	2 > 3 > 4, 1 > 4
Total stress scale (32 items)	47.7 ± 16.8	45.5 ± 17.3	50.4 ± 16.9	44.3 ± 14.4	40.3 ± 15.1	15.02**	2 > 3 > 4

Note: A score of 0 indicates “not at all,” 1 “about the same as usual,” 2 “slightly more severe than usual,” and 3 “more severe than usual.”

Note: Rating scales: 4-point Likert scale (0: not at all, 1: about the same as usual, 2: slightly more severe than usual, 3: more severe than usual).

*P < .05.

**P < .01.

TABLE 3 Comparison of scores on different stressors (n = 752)

Item	Number of items	Mean score	SD	Rank
Perceived stress	32	1.5	0.5	
Fear of social isolation	10	1.3	0.6	3
Discomfort caused by protective equipment	8	1.8	0.6	1
Difficulties and anxieties related to infection control	7	1.3	0.6	3
Burden of caring for patients	7	1.6	0.7	2

Note: Rating scales: 4-point Likert scale (0: not at all, 1: about the same as usual, 2: slightly more severe than usual, 3: more severe than usual).

one-way analysis of variance (ANOVA) to identify if stress levels differed based on demographic characteristics, followed by a post hoc Tukey-Kramer comparison to identify groups with significant differences.

2.2 | Ethics

This study was reviewed and approved by the Institutional Review Board (Project Number: KMUHIRB-EXEMPT[I]-20 200 008) of the participating hospitals, and a web-based questionnaire survey was announced in the hospital's bulletin board with the consent of the head of the relevant hospital unit. Data were collected anonymously, and background data were deidentified. The information obtained in this study was subject to the principles of confidentiality and privacy.

3 | RESULTS

3.1 | Demographic characteristics of hospital employees

The sample comprised 752 hospital staff from one medical center and two regional hospitals in southern Taiwan. As shown in Table 1, participants included 54 physicians, 493 nurses, 89 medical technicians, and 116 administrative staff, with a mean age of 38.7 ± 9.3 years (age range: 23-65 years). The study subjects were sampled from a web-based questionnaire and the subject answered the questionnaire

voluntarily. The distributions of respondents was similar to the workers in the hospitals (excluding new employees, contractors, and research assistants) from a hospital in southern Taiwan based on staff ratio (Doctor:Nurse:Clinical technologist:administration staff = 1:4:1:1). Majority of the hospital staff were female, married, and with minor children. The years of work experience ranged from 1 to 41 years, with a mean of 11.9 ± 8.9 years. Majority of the participants had received university education, and 10.3% had experience in caring for patients with SARS, with the physicians having the highest percentage of those with such experience, followed by nurses. A total of 19.0% had experience in caring for patients with COVID-19, among which, most had provided emergency care, followed by care in the negative pressure isolation ward and intensive care unit.

3.2 | Relationship between hospital employees' work stress during the COVID-19 pandemic and their demographic characteristics

Table 2 shows that the mean total score on perceived work stress was 47.7 ± 16.8, representing moderate stress. The main stressor for the hospital staff was discomfort caused by protective equipment, followed by burden of caring for patients. Nurses' mean total score was 50.4 ± 16.9, which was significantly higher than that of medical technicians (44.3 ± 14.4) and administrative staff (40.3 ± 15.1), with the latter two representing moderate stress. The comparison of sub-scale score among the four types of hospital staff showed that nurses'

TABLE 4 Perceived stress in hospital staff (N = 752) caring for patients with COVID-19

Item	Moderate to severe stress, n (%)	Mild stress, n (%)	No stress, n (%)	Mean	SD	Rank
<i>Fear of social isolation</i>				1.3	0.6	
1. Experiencing suspected COVID-19 symptoms, such as a cold, increased body temperature, and diarrhea	117 (15.5)	212 (28.2)	423 (56.3)	0.7	0.9	14
2. Fear of being quarantined	366 (49.7)	260 (34.6)	126 (16.8)	1.5	0.9	7
3. Restriction on socializing and activities	471 (62.7)	224 (29.8)	57 (7.6)	1.7	0.9	5
4. Fear of passing on COVID-19 to relatives and friends	532 (70.8)	167 (22.2)	53 (7.0)	1.9	0.9	3
5. Fear of being separated from one's family and not being able to see one's children and family	468 (62.2)	200 (26.6)	84 (11.2)	1.8	1.0	4
6. Inconvenience of taking care of children or family members in person and difficulty in settling them down	341 (45.3)	249 (33.1)	162 (21.5)	1.4	1.0	8
7. Discrimination or exclusion of oneself or one's family by others	276 (36.7)	279 (37.1)	197 (26.2)	1.2	1.0	10
8. No place to stay and no place to live after work	126 (28.7)	233 (31.0)	303 (40.3)	1.0	1.0	12
9. Relatives and friends do not support, such as asking one to refuse to take care of patients with COVID-19 or resign from the job	144 (19.1)	237 (31.5)	371 (49.3)	0.8	0.9	13
10. Do not dare to talk about work in a public place or disclose the place and nature of work	209 (27.8)	297 (39.5)	246 (32.7)	1.0	0.9	12
<i>Discomfort caused by protective equipment</i>				1.8	0.6	
1. Feeling breathless with an N95 or P100 face mask	418 (55.6)	260 (34.6)	74 (9.8)	1.6	0.8	6
2. Sultry, uncomfortable and inflexible in protective equipment	524 (69.7)	191 (25.5)	37 (4.9)	1.8	0.8	4
3. Impaired vision when wearing protective panels and paper caps	486 (64.6)	215 (28.6)	51 (6.8)	1.8	0.8	4
4. Communication barriers due to protective equipment	448 (59.6)	247 (32.8)	57 (7.6)	1.7	0.8	5
5. Inconvenient to use the toilet at work	553 (73.5)	154 (20.5)	45 (6.0)	2.0	0.9	2
6. Restrictions on eating and drinking at work	561 (74.6)	157 (20.9)	34 (4.5)	2.0	0.8	2
7. Facial skin irritation and bruises due to wearing face masks	480 (63.8)	221 (29.4)	51 (6.8)	1.8	0.8	4
8. Rough and cracked hands due to frequent hand washing and disinfectant use	608 (80.9)	127 (16.9)	17 (2.3)	2.2	0.8	1
<i>Difficulties and anxieties related to infection control</i>				1.3	0.6	
1. Fear of being infected	541 (71.9)	179 (23.8)	32 (4.3)	1.9	0.8	3
2. Insufficient knowledge of emerging infectious diseases	107 (14.2)	382 (50.8)	263 (35.0)	0.8	0.7	14
3. Worried about the adequacy and safety of existing protective measures	322 (42.8)	324 (43.1)	106 (14.1)	1.4	0.8	8
4. Failing to quickly adapt to the frequently-changing containment measures and other related information	411 (54.7)	259 (34.4)	82 (10.9)	1.6	0.9	6
5. Technical immaturity of protective measures	185 (24.6)	419 (55.7)	148 (19.7)	1.1	0.7	11
6. Inadequate protective equipment (eg, masks and protective clothing out of stock)	240 (31.9)	319 (42.4)	193 (25.7)	1.1	0.9	11
7. Professional responsibility, as taking care of patients is the responsibility of healthcare workers and they should not refuse to do so	178 (23.7)	490 (65.2)	84 (11.2)	1.2	0.7	10
<i>Burden of caring for patients</i>				1.6	0.7	

TABLE 4 (Continued)

Item	Moderate to severe stress, n (%)	Mild stress, n (%)	No stress, n (%)	Mean	SD	Rank
1. Inability to deal with patients' problems immediately as it is time-consuming to wear protective equipment	417 (55.5)	250 (33.2)	85 (11.3)	1.6	0.9	6
2. Limited number of staff allowed access to the isolation room and thus inability to obtain adequate assistance	388 (51.6)	250 (33.2)	114 (15.2)	1.5	0.9	7
3. Feeling overburdened with work	493 (65.6)	227 (30.2)	32 (4.3)	1.8	0.8	4
4. Fear of patient deterioration or death	418 (55.6)	272 (36.2)	62 (8.2)	1.7	0.9	5
5. Lack of patients' cooperation with medical treatment, such as trying to self-extubate and wanting to rush out of the ward	253 (33.6)	377 (50.1)	122 (16.2)	1.3	0.9	9
6. Worried about not being able to deal with the psychological/emotional problems of patients and their families	331 (44.0)	348 (46.3)	73 (9.7)	1.5	0.8	7
7. Ethical dilemma as humanitarian visitation is banned due to quarantine measures	378 (50.3)	287 (38.2)	87 (11.6)	1.5	0.9	7

Note: A score of 0 indicates "not at all," 1 "about the same as usual," 2 "slightly more severe than usual," and 3 "more severe than usual." Abbreviations: COVID-19, coronavirus disease 2019.

TABLE 5 Differences in demographic characteristics of hospital staff with severe stress (N = 129)

Item	Perceived stress	t/F	P
Gender			
Male	71.9 ± 6.1	0.87	.385
Female	74.4 ± 7.5		
Married			
No	74.9 ± 0.8	-1.30	.197
Yes	73.1 ± 1.1		
Minor children			
No	72.6 ± 6.8	-2.89**	.005
Yes	76.3 ± 7.8		
Years of work experience			
<5 years	71.0 ± 6.3	1.58	.210
6-10 years	73.8 ± 6.8		
>11 years	75.0 ± 7.8		
Educational level			
University (junior college)	74.6 ± 7.5	-0.9	.372
Research institute (including master's and doctoral degrees)	73.0 ± 7.1		
Type of hospital staff			
Physician	71.1 ± 2.8	1.37	.256
Nurse	74.6 ± 0.7		
Medical technician	75.7 ± 2.5		
Administrative staff	70.0 ± 2.8		
Experience with caring for patients with SARS			
No	74.1 ± 7.2	1.18	.280
Yes	76.0 ± 8.5		

Abbreviation: SARS, severe acute respiratory syndrome.

stress could be attributed more to their fear of social isolation, discomfort due to protective equipment, and burden of patient care. In contrast, medical technicians had a higher degree of stress related to difficulties and anxieties related to infection control.

The mean score for each of the 32 items on work stress was 1.5 ± 0.5 (Table 3), representing mild to moderate stress. The mean scores of each dimension and each item, and score rankings are presented in Table 4. On 19 items, more than 50% of the participants experienced moderate to severe work stress (with mean scores of over 2 points). The five highest stress scores were observed for the items "rough and cracked hands due to frequent hand washing and disinfectant use," "inconvenience in using the toilet at work," "restrictions on eating and drinking at work," "fear of transmitting the disease to relatives and friends," and "fear of being infected with COVID-19". "Hospital staff experienced discomfort caused by the use of protective equipment" and "the burden of caring patients" reported higher scores than other two dimensions of the scale.

Further, for hospital staff with severe stress ($n = 129$), we performed a *t* test or one-way ANOVA to explore whether their stress levels differed based on their demographic characteristics of gender, marital status, years of work experience, educational level, staff type, and experience with caring for patients with SARS. As shown in Table 5, findings indicated a significant difference in stress scores ($t = -2.89$, $P = .005$) among staff with and without minor children at home. That is, staff with children aged below 18 years were more stressed than were those without young children. Results of the analysis by scores on the four subscales indicated that staff who experienced stress related to the burden of caring for patients ($t = -2.38$, $P = .019$) and fear of social isolation ($t = -2.73$, $P = .007$) were more stressed as compared to those without these stressors. The Pearson product-moment correlation matrix revealed a significant positive correlation ($r = .19$, $P = .031$) between having minor children and experiencing work stress.

4 | DISCUSSION

This study was the first one conducted in Taiwan to investigate the perceived stress of hospital staff and to identify relevant influencing factors during the COVID-19 pandemic, using a web-based structured questionnaire. The results showed that the total stress was moderate and discomfort caused by protective equipment emerged as the major stressor. Nurses generally perceived higher stress as compared to the other types of hospital staff. Difficulties and anxieties related to infection control were major stressors for medical technicians, while administrators were the least stressed among all types of staff. Further, those with minor children experienced a higher degree of work stress.

This study found that discomfort caused by protective equipment was the major stressor for the participants, followed by burden of caring for patients. The overall stress was slight to moderate. This result was consistent with the findings of Yu et al,²¹ but it was different from other similar studies conducted during the SARS pandemic. Specifically, those studies found that the main stressor among hospital staff was difficulties and anxieties related to infection control.^{11,22,23}

Participants in the present study were more stressed by the discomfort caused by wearing protective equipment for a long period, probably because, to effectively prevent the source of infection from entering the hospital and causing cross infection, the hospital staff were required to wear masks throughout their stay in the hospital. Additionally, they had to set up simple triage stations at the emergency and outpatient departments' entrances, while different types of staff took turns to participate in monitoring individuals entering the hospital. The staff on duty was required to wear basic protective gear, including goggles, protective clothing, surgical masks or N95 masks, and gloves, which made it inconvenient for them to eat and drink at work, as well as to use the toilet. They were required to wash their hands and use disinfectants frequently, and the fear that hands would become rough and cracked made them stressed. The COVID-19 pandemic has changed the work style and environment of the healthcare system, leading to physical and mental imbalance, and thereby, an increased level of stress among hospital staff.²⁴

When the SARS pandemic hit Taiwan on April 24, 2003, Medical staff caring for patients with SARS were stressed due to misunderstanding from the general public, fear of becoming carries of the SARS infection, and public panic over the unknown route of infection transmission.^{11,23,25} The painful experience with SARS made people realize that infectious diseases can spread rapidly across national borders and can have far-reaching impact on the international community and economy. Government in Taiwan has been implementing pandemic prevention and management measures even before the status of the COVID-19 pandemic was clear. We focused on providing and deploying adequate pandemic prevention equipment in the early stage of the pandemic. Meanwhile, hospitals have also been cooperating with the government in promoting many emergency action plans for pandemic prevention and control, to keep the public informed of changes in the pandemic situation and to provide updated information on prevention and control measures. As a result, there have been very few incidents of people denying or excluding healthcare workers during the COVID-19 pandemic, unlike what happened during the SARS pandemic. During COVID-19 control measures, healthcare workers have continually received warm greetings and assistance from people from all walks of life, across the country. Therefore, hospital staff experienced lower levels of difficulties and anxieties related to infection control and stress of social isolation during the COVID-19 pandemic than during the SARS pandemic.

Stressful events or stressors in the workplace can cause stress reactions, and an employee's personal characteristics and behaviors interact with the practice environment.²⁶ Strong physical and mental demands lead to an increase in stress levels of hospital staff, which may in turn influence patient care.²⁷ A survey of 532 regional hospital staff examined the correlation between perceived overwork and musculoskeletal symptoms. Findings revealed that nurses ranked the highest among hospital staff in terms of overwork, followed by administrative staff, medical technicians, and physicians, in order of decreasing overwork.²⁸ By nature, nursing is a highly stressful occupation. Nurses reported highest stress level in this study. This could be attributed to physical discomfort caused by protective equipment, also, nurses often

exposed to patients with frontline infectious diseases for a longer period of time. Compared with other healthcare staff in the hospital, nurses experienced a relatively higher risk of exposure to COVID-19 patients during the containment period. They also experienced high level of fear of being infected by the virus. Consequently, they experienced a higher level of stress.^{11,16} Doctors experienced lower level of stress and anxiety, they are also more confident in making clinical decisions. This is due to their ability to access and update their knowledge faster on new SARS related informations.¹¹ This finding is consistent with the present result that nurses had higher level of stress during the COVID-19 pandemic compared to other hospital staff. During the pandemic, hospitals could help to reduce frontline nursing staff stress level and increase their confidence at work by setting up standardized work protocol and keeping supply system transparent.

Meanwhile, in addition to oropharyngeal examination, chest X-ray examination is also considered an important part of the process to identify pneumonia symptoms in patients suspected to have COVID-19. Medical technicians are required to wear protective equipment when they come in contact with highly-infectious patients in the outdoor area of the emergency tents. Therefore, as compared to administrative staff, medical technicians experienced higher levels of stress in the area of difficulties and anxieties related to infection control. It is recommended that future education and protection drills on emerging infectious diseases include medical technicians, as this would enhance their infection control awareness and familiarize them with wearing protective equipment. This would in turn help reduce their stress related to unknown infectious diseases.

Previous studies have shown that work stress is related to one's demographic characteristics,^{13,17} and that child care at home is a common problem for hospital staff,^{28,29} which is an important factor leading to work-family conflicts.³⁰ The present results showed that hospital staff with minor children was more stressed, confirming the viewpoint presented in prior research. However, these findings were different from those reported by Wang et al¹⁴ and Lambert et al,¹⁶ who found that employees with children were less stressed than those without. Perhaps this is due to the parenting style difference between the East and the West world.³¹ In the West, parents are more likely to respect each child's individuality and encourage children to explore and develop their own interests. Whereas in the East, parents are more inclined to expect children to follow the rules, society expectations, and achieve high success in career. As the staff included in the present study were around 40 years old, their children would have been closer to adolescence. Adolescents are in the transitional stage of physical development, and in the process of self-identity development and self-esteem exploration to gain a sense of independence and control.³² This stage of development requires more attention and accompaniment from parents. However, during the pandemic prevention period, some staff was worried that they would fail to respond promptly to changes in the condition of COVID-19 patients under their care, and that they themselves could spread the infection to their family and relatives. Staff working in special or isolation wards either stay in the hospital temporarily for self-quarantine or return home after 14 days of self-quarantine following their special ward

duty. During their hospital stay, they could be concerned that their minor children would not receive appropriate care in their absence, which could lead to high work stress in such individuals.

In the face of the COVID-19 pandemic, since the end of January 2020, hospitals started hospital-wide staff mobilization to contain the pandemic, such as setting up triage stations at the entrances and exits, and medical tents and special wards at the emergency department. These measures changed the existing work pattern of staff and caused unprecedented stress on all types of healthcare workers. As the temperature rises in southern Taiwan, wearing of protective equipment for prolonged periods causes discomfort in staff. Such discomfort can be alleviated by shortening shift durations and installing more mobile air conditioners in emergency and outpatient departments. Since healthcare workers are in a high-stress occupation, it is recommended that they should be assessed and monitored regularly, and appropriate interventions need to be implemented. It is necessary to provide psychological counselling and stress relief measures for this population. During the pandemic containment, some staff was concerned that they could be carries of the infection after caring for patients with COVID-19, and that they would bring the source of infection home to their family and relatives. This led to higher work stress on hospital staff with minor children. To cope with this situation, it is recommended to assess the needs of hospital staff with minor children and provide appropriate arrangements for the transportation of employees' children to and from school or offer after-school programs. This would reduce the burden on frontline healthcare staff who are responsible for pandemic containment. In addition, hospitals may consider recruiting medical technicians as members in the Emerging Infectious Diseases Response Drills in future, as this would familiarize them with various disposal processes. This would enable hospitals to commission these staff, as soon as necessary, for pandemic containment. Such measures would in turn promote the response ability of medical technicians and reduce their stressors.

Due to workforce, financial, and time limitations, this study collected data only from one medical center and two regional hospitals in southern Taiwan. Therefore, we recommend cautions when attempting to generalize the results to the employees in all medical institutions. It is recommended that future studies include other countries, as appropriate, such as some European countries and the United States. Other recommendations for future studies include increasing the sample size, comparing groups with the same number of study subjects, and adopting a longitudinal study design. The stress scale utilized in the present study can be used by hospitals to measure and track changes in the work stress and related influencing factors in hospital staff during pandemics. Additionally, it could serve as a reference instrument to evaluate the effectiveness of the continuous monitoring or intervention measures for improving hospital staff's workload. Together, such findings could be used to provide appropriate support and response measures for hospital staff during a pandemic.

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CONFLICT OF INTEREST

The authors declare no potential conflict of interest.

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REFERENCES

- Taiwan Centers for Disease Control: Coronavirus disease 2019 (COVID-19). Available at https://www.cdc.gov.tw/En/Category/ListContent/bgOg_VU_Ysrkes_KRUDgQ?uaid=0nAzwpXdBNIAPovJhwrGoQ. Accessed April 26, 2020.
- World Health Organization. Global alert and response (GAR): Novel coronavirus infection in the United Kingdom. Geneva, Switzerland: World Health Organization. Available at <http://www.emro.who.int/index.html>. Accessed April 26, 2020.
- Lazarus RS, Folkman S. Stress, appraisal, and coping. New York: Springer publishing company, 1984. Available at <https://is.gd/g84ta4>. Accessed April 26, 2020.
- Tsai SL, Chen MA. Test of the reliability and validity of nurse stress checklist. *J Nurs Res*. 1996;4(4):355–362.
- Kristensen TS, Borritz M, Villadsen E, Christensen KB. The Copenhagen burnout inventory: A new tool for the assessment of burnout. *Work Stress*. 2005;19(3):192–207.
- Reardon M, Abrahams R, Thyer L, Simpson P. Prevalence of burnout in paramedics: A systematic review of prevalence studies. *Emerg Med Australas*. 2020;32(2):182–189.
- Begat I, Ellefsen B, Severinsson E. Nurses' satisfaction with their work environment and the outcomes of clinical nursing supervision on nurses' experiences of well-being—a Norwegian study. *J Nurs Manag*. 2005;13(3):221–230.
- Raines ML. Ethical decision making in nurses. Relationships among moral reasoning, coping style, and ethics stress. *JONAS Healthc Law Ethics Regul*. 2000;2(1):29–41.
- Hung HC, Weng LC, Fang CY. Stresses and adjustment behaviors of surgical nurses caring for SANS patients. *J Evid Based Nurs*. 2005;1(1):45–51.
- Jonas-Simpson C. Courage and commitment: Working the front during the first wave of the SARS outbreak, nurses from Toronto share their stories. *Can Nurse*. 2003;99(8):9.
- Chung PY, Lou MF. Health care workers' stress and willingness to Care for Patients with severe acute respiratory syndrome. *National Taiwan University Hospital J Nurs*. 2005;3(4):23–35.
- Liu PY, Lin YH, Wu TH, Yang PY, Wu LC, Wang SC. Stress level of nurses of caring patients with concealed infectious disease. *Chang Gung Nursing*. 2007;18(1):1–10.
- Chen ML, Lin SL, Lian JY, Yu SM, Tsai SL. A study of the work stress and intention to quit related to nurses' turnover in a medical center. *VGH Nursing*. 2000;17(3):260–269.
- Wang CL, Huang CY, Lu KY, Ho MY. A study of the social support and job stress among nursing staff. *VGH Nursing*. 2007;24(1):59–68.
- Tzeng HM. The influence of nurses' working motivation and job satisfaction on intention to quit: An empirical investigation in Taiwan. *Int J Nurs Stud*. 2002;39(8):867–878.16.
- Lambert VA, Lambert CE, Ito M. Workplace stressors, ways of coping and demographic characteristics as predictors of physical and mental health of Japanese hospital nurses. *Int J Nurs Stud*. 2004;41(1):85–97.
- Kesarwani V, Husaain ZG, George J. Prevalence and factors associated with burnout among healthcare professionals in India: A systematic review and meta-analysis. *Indian J Psychol Med*. 2020;42(2):108–115.
- McGrath A, Reid N, Boore J. Occupational stress in nursing. *Int J Nurs Stud*. 2003;40(5):555–565.
- Chuang PY, Lou MF. Psychometric evaluation of the stress scale of caring for highly infectious disease patients among health care workers-based on SARS. *Taiwan J Public Health*. 2005;24(5):420–430.
- Sutton S, Baum A, Johnston M, . editors. The sage handbook of health psychology. London: Sage, 2004. Available at <https://pse.is/TLJDQ>. Accessed April 26, 2020.
- Yu WC, Lee SH, Yuan SC, Yin YC. Job stress and coping in emergency room nurses confronting severe acute respiratory syndrome crisis. *Chung Shan Med J*. 2007;18(1):25–41.
- Kuo CN, Lee BO, Lee SH. Work-related stress and coping behaviors during SARS outbreak period among emergency nurses in Taiwan. *Chang Gung Nursing*. 2005;16(2):139–151.
- Mauder R, Hunter J, Vincent L, Bennett J, Peladeau N, Leszcz M, et al. The immediate psychological and occupational impact of the 2003 SARS outbreak in a teaching hospital. *CMAJ*. 2003;168(10):1245–1251.
- Shanafelt T, Ripp J, Trockel M. Understanding and addressing sources of anxiety among health care professionals during the COVID-19 pandemic. *JAMA*. 2020;323(21):2133–2134. <https://doi.org/10.1001/jama.2020.5893>. Accessed April 7, 2020.
- Lee SH, Juang YY, Su YJ, Lee YH, Lin YH, Chao CC. Facing SARS: Psychological impacts on SARS team nurses and psychiatric services in a Taiwan general hospital. *Gen Hosp Psychiatry*. 2005;27(5):352–358.
- Hart PM, Cooper CL. Occupational stress: Toward a more integrated framework. Available at <http://www.insightsrc.com.au/portal/resources/4ee81ac98c30d.pdf> Accessed May 6, 2020.
- Adriaenssens J, De Gucht V, Van Der Doef M, Maes S. Exploring the burden of emergency care: Predictors of stress-health outcomes in emergency nurses. *J Adv Nurs*. 2011;67(6):1317–1328.
- Tzeng IS, Lin SJ, Wang YT, Lai YM. Analyses of burnout and musculoskeletal symptoms questionnaires and their relationships among employees in a regional hospital. *Chin J Occup Med*. 2019;26(1):47–54.
- Wang ML, Tsai LJ. Work–family conflict and job performance in nurses: The moderating effects of social support. *J Nurs Res*. 2014;22(3):200–207.
- Jerg-Bretzke L, Limbrecht-Ecklundt K, Walter S, Spohrs J, Beschoner P. Correlations of the “work–family conflict” with occupational stress—A cross-sectional study among university employees. *Front Psych*. 2020;11:134.
- Chua A. Battle hymn of the Tiger mom. New York, NY: Penguin Books, 2011.
- Jou YH, Wu MY, Huang LW. When middle-aged parents meet adolescent children: Parent-child relationship patterns and parent's midlife perceptions. *Taiwanese Sociology*. 2010;20:1–37.

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