The social and mental impact on healthcare workers

A comparative and cross-sectional study during two waves of the COVID-19 pandemic in Taiwan

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Abstract

The coronavirus disease 2019 (COVID-19) pandemic has caused a heavily burden on healthcare workers (HCWs) worldwide. The aim of this study was to compare differences in psychological and social impact between two waves of the pandemic among first- and second-line HCWs in Taiwan. The current study derived data from two cross-sectional surveys conducted in 2020 and 2021. Levels of depression, sleep disturbance, psychological distress, social impact, and demographic variables were collected through self-reported questionnaires. The independent *t* test was used to compare differences in scores between the first and second wave of the pandemic. Differences between first- and second-line HCWs were also analyzed. A total of 711 HCWs in the first wave and 560 HCWs in the second wave were recruited. For the first- and second-line HCWs, the social impact during the second wave was higher than during the first wave, and they expressed a higher intention to maintain social distancing and were more aware of the pandemic overseas in the second wave. The first-line HCWs had a trend of worse sleep quality during the second wave. In addition, sleep quality was worse in the first-line HCWs than in the second-line HCWs during both waves. The second-line HCWs expressed a greater desire to seek COVID-19-related information than the first-line HCWs during the first wave, and more intended to maintain social distancing during the second wave. Our results show the importance of evaluating the social and mental health burden of HCWs, and especially first-line workers.

Abbreviations: COVID-19 = coronavirus disease 2019, DRPST = The Disaster-Related Psychological Screening Test, HCWs = healthcare workers, KSPH = Kaohsiung Municipal Kai-Syuan Psychiatric Hospital, PSQI = The Pittsburgh Sleep Quality Index, PTSD = post-traumatic stress disorder, SISQ = the societal influences survey questionnaire.

Keywords: depression, healthcare worker, psychological distress, sleep disturbance, social impact

1. Introduction

1.1. Psychological impact of the COVID-19 pandemic

Coronavirus disease 2019 (COVID-19) has become a major health and socio-economic burden globally.[1] Furthermore, the policies of lockdowns and social distancing to control the spread of COVID-19 have had a massive psychological impact on the public.[2] A meta-analysis demonstrated that COVID-19 was associated with a large psychological impact on the general public,[3] and another study reported high prevalence rates of depression and anxiety in COVID-19-infected patients.[4]

In addition, a systematic review synthesized the psychological impacts on healthcare workers in African countries,[5] another literature indicated that fear of COVID-19 may impact on people's job satisfaction and performance.[6] Moreover, Alimoradi et al[7,8] illustrated the impacts of COVID-19 on sleep across different populations, such as survivors of COVID-19, healthcare workers, and general populations.

In Taiwan, people also suffer from massively psychological distress during COVID-19 pandemic. Several studies based on either the general public[9] or patients with mental disorders[10,11] in Taiwan have also reported undesirable psychological impacts during the COVID-19 pandemic, including sleep disturbance,

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depression, and even suicidal ideation. Furthermore, COVID-19 pandemic is also associated with predominantly psychological burden among elderly,[12–14] patients with mental illness,[15] and students.[16,17] Therefore, the multi-dimensional effects of COVID-19 on psychological health are an important concern and deserve further research.

1.2. Mental and social impacts on healthcare workers

In addition to the impact on the public, the heavy burden on healthcare workers is also an important issue. A previous study reported higher mortality and hospitalization rates for healthcare workers during the first six months of the COVID-19 pandemic,[18] demonstrating the high risk of infection. Furthermore, the psychological impact on healthcare workers can be pronounced, including distress, depression, and anxiety.[19] A meta-analysis reported pooled prevalence rates of anxiety, depression, post-traumatic stress disorder (PTSD) symptoms, sleep disturbance, and psychological distress among hospital staff of 34.4%, 31.8%, 11.4%, 27.8%, and 46.1%, respectively.[20] Previous study found that healthcare workers are likely to have social stigma and burnout issues.[21] Another study indicated that healthcare workers had high levels of anxiety during COVID-19 and less working experience was one of the factors explaining the anxiety.[22] In addition, such mental health problems may be due to the multi-dimensional burden and high prevalence of being infected with COVID-19 among healthcare workers.[23] In Taiwan, healthcare workers have also been reported to suffer from PTSD symptoms, sleep problems, psychological distress, and burn out due to the COVID-19 pandemic.[24,25] Moreover, healthcare workers in Taiwan were reported to have relatively higher levels of psychological distress than healthcare workers in Hong Kong.[26]

On the other hand, these psychological impacts may be associated with coping strategies or social interactions during the pandemic. An online survey for the public found that poorer mental health outcomes were associated with less support, decreased social interactions, and maladaptive coping with self-disinfection.[9] Regarding healthcare workers, a previous study demonstrated that healthcare staff with severe PTSD symptoms had higher levels of societal influences, such as maintaining social distance, getting more information on COVID-19, and greater anxiety about the pandemic.[27] However, further investigations are needed to investigate the association between these social impacts and mental health.

1.3. Aim of the current study

Due to the psychological and social impacts of the COVID-19 pandemic, there has been increasing interest in comparing the impacts during different waves of the pandemic. According to the Taiwan Centers for Disease Control, there were more confirmed cases and a higher mortality rate in 2021[28] than in 2020,[29] which may have been due to different variants of COVID-19. This suggests that different waves of the pandemic were more serious than others. Previous studies have demonstrated differences in sleep patterns[30] and fear of COVD-19[31] between the first and second waves of the pandemic in Norway, Israel and Russia. Moreover, several researchers had focused on the difference of coping strategies or behavioral problems within different period of COVID-19 pandemic. In comparison with initial assessment, previous study revealed a decreased adherence to protective COVID-19 behaviors during the follow-up assessment among Taiwan older people.[12] Furthermore, Chen and his colleagues have several studies examining the change of internet use and mental health problems across COVID-19 waves in mainland China.[32–36] However, few studies have explored changes in social impact, such as coping with COVID-19, between waves among healthcare workers. Therefore, we

conducted this comparative study to investigate differences in mental and social impact between two waves of the COVID-19 pandemic in Taiwan in 2020 and 2021. The aim of this study was to explore whether there were differences in the levels of depression, sleep disturbance, psychological distress (PTSD symptoms), and social impact between these two waves of the COVID-19 pandemic.

2. Methods

2.1. Participants, procedures and ethics

The current study derived data from two cross-sectional surveys, which were conducted to identify the psychological and social impact of the COVID-19 pandemic on medical staff and patients with mental disorders at Kaohsiung Municipal Kai-Syuan Psychiatric Hospital (KSPH). Healthcare workers were recruited through printed advertisements posted in the public area of the hospital and affiliated institutes. Online advertisements were also posted on social media. The two recruitment periods for the healthcare workers were from May 9, 2020 to May 31, 2020, and May 30, 2021 to June 30, 2021. These periods were during the COVID-19 pandemic in Taiwan in 2020 and 2021, respectively. Both cross-sectional surveys were paper-and-pencil questionnaires, and research assistants explained the procedures to the participants individually if they had any questions. The inclusion criteria were: healthcare staff who worked at KSPH or affiliated institutes; those aged more than 20 years; and those who signed inform consent before filling in the questionnaire. Both of the surveys were approved by the Institutional Review Board of KSPH (KSPH-2020-03; KSPH-2021-08).

2.2. Measures

2.2.1. The Disaster-Related Psychological Screening Test (DRPST).
The DRPST has been shown to be reliable and well-validated to rapidly screen for major depressive disorder or PTSD after a disaster.[37,38] To measure the level of depression, three items of the DRPST were selected to estimate the status of depressed mood, fatigue or loss of energy, and worthlessness which had persisted for more than 2 weeks in the recent 1 month. Each question was rated on a two-point Likert scale, with scores ranging from 0 (no) to 1 (yes). A higher total score of the three items indicated a higher level of depression.

To measure the level of COVID-19-related psychological distress, four questions were selected from the DRPST to estimate the status of hypervigilance, somatic symptoms, avoidance, and reeexperience of COVID-19, which had persisted for more than 1 week in the past month. Each question was rated on a five-point Likert scale, with scores ranging from 1 (not at all) to 5 (extreme). A higher total score indicated a higher level of psychological distress. Details of the full questionnaires are listed in Table S1, Supplemental Digital Content, http://links.lww.com/MD/H730.

2.2.2. The Pittsburgh Sleep Quality Index (PSQI).
The PSQI was established to evaluate sleep status, and it has been shown to have good validity and reliability.[39] In this study, four questions were selected from the PSQI to measure the level of sleep disturbance, including difficulty to fall asleep, waking up in the middle of the night, enthusiasm, and subjective sleep quality in the recent one month (Table S1, Supplemental Digital Content, http://links.lww.com/MD/H730). Each item was rated on a four-point Likert scale, with scores ranging from 1 to 4. A higher total score of the four items indicated more severe sleep disturbance.

2.2.3. The Societal Influences Survey Questionnaire (SISQ).
The SISQ has been shown to have good validity and

reliability to estimate the social and psychological impact on subjects during the COVID-19 pandemic.[40,41] Eight of the items were selected in the current study with three domains: social distance, social information, and social adaptation (Table S1, Supplemental Digital Content, http://links.lww.com/MD/H730). Each item was scored on a four-point Likert scale, with scores ranging from 1 (never) to 4 (often). Higher total scores of social distance, social information, and social adaptation indicated higher compliance to maintaining social distance, more desire to seek related information, and greater awareness of the progress of the pandemic overseas. The full questionnaires of SISQ are listed in Table S2, Supplemental Digital Content, http://links.lww.com/MD/H731.

2.2.4. Demographic variables.
Demographic data including age, sex, marital status, smoking (yes or no), drinking alcohol (≥3 times per week or not), exercise (≥3 days per week or not), and regular diet (3 or 4 meals a day, ≥5 days per week or not) were recorded. The healthcare workers were divided into two groups, including first-line healthcare workers (physicians and nurses) and second-line healthcare workers (social workers, psychologists, occupational therapists, pharmacists, administrative staff, and other para-medical staff) in order to identify the difference in scores between groups.

2.3. Statistical analysis

Descriptive analysis was performed on the demographic variables. Pearson's χ^2 test was used to compare categorical variables, and the independent t test was for continuous variables. The independent t test was also used to compare differences in scores (DRPST-depression, DRPST-psychological distress, PSQI, SISQ-social distance, SISQ-social information, and SISQ-social adaptation) between the first wave and second wave of the COVID-19 pandemic for the first-line and second-line

healthcare workers. Differences in scores between the first-line and second-line healthcare workers were also compared using the independent t test during the first and second wave of the COVID-19 pandemic. The alpha level was set at 0.05. Since the questionnaires in the current study were all validated, Cronbach's α was used to test the reliability of each scale containing more than two questions. All data were processed using SPSS version 23.0 for Windows (SPSS Inc., Chicago, IL).

3. Results

3.1. Summary of demographic analysis and reliability of the scales

A total of 711 participants in the first wave and 560 participants in the second wave were recruited. For all first-line healthcare workers, there were no significant differences between the first and second wave of the pandemic in age, sex, marital status, smoking status, alcohol drinking status, exercise habit and diet habit. In addition, there were no significant differences between the first and second waves of the pandemic in any of the demographic characteristics among the second-line healthcare workers. Details of the comparisons are listed in Table 1. The Cronbach's α values of DRPST (depression), DRPST (psychological distress), PSQI subscales, SISQ (social distance), SISQ (social information), SISQ (social adaptation) were 0.95, 0.98, 0.8, 0.75, 0.71, and 0.72, respectively.

3.2. Comparison of scales during the first and second waves

Among the first-line healthcare workers, social distance (12.66 vs 11.43, $P < .001$), social information (5.15 vs 4.91, $P = .042$), and social adaptation (6.58 vs 6.13, $P = .001$) scores were significantly higher during the second wave than during

Table 1
Comparison of clinical characteristics between first and second wave of COVID-19 among first-line and second line healthcare workers.

	First line			Second line		
	First wave n = 340	Second wave n = 313	Statistics	First wave n = 371	Second wave n = 247	Statistics
Categorical variables	n (%)	n (%)	P	n (%)	n (%)	P
Sex						
Male	66 (19.4)	70 (22.4)	.381*	111 (29.9)	81 (32.8)	.449*
Female	274 (80.6)	243 (77.6)		260 (70.1)	166 (67.2)	
Marital status						
Single	181 (53.2)	173 (55.4)	.704*	156 (42)	102 (41.5)	.830*
Married	146 (42.9)	129 (41.3)		183 (49.3)	126 (51.2)	
Divorced	14 (3.8%)	10 (3.1%)		21 (5.7)	14 (5.7)	
Widowed	0 (0)	0 (0)		11 (2)	4 (1.6)	
Smoking						
Yes	10 (2.9)	6 (1.9)	.394*	30 (8.1)	12 (4.9)	.125*
No	329 (97.1)	307 (98.1)		340 (91.9)	232 (95.1)	
Drinking (≥3 times per wk)						
Yes	39 (11.5)	34 (10.9)	.380*	43 (11.6)	22 (9)	.310*
No	300 (88.5)	279 (89.1)		328 (88.4)	222 (91)	
Exercise (≥3 d per wk)						
Yes	171 (50.4)	149 (47.6)	.469*	258 (69.5)	155 (63.3)	.178*
No	168 (49.6)	164 (52.4)		113 (30.5)	90 (36.7)	
Regular diets (≥5 d per wk)						
Yes	247 (72.6)	222 (71.2)	.672*	334 (90.1)	223 (91)	.658*
No	93 (27.4)	90 (28.8)		37 (9.9)	22 (9)	
Continuous variables	Mean (SD)	Mean (SD)	P	Mean (SD)	Mean (SD)	P
Age (yr)	35.76 (8.72)	35.49 (9.38)	.707†	42.95 (11.14)	43.31 (11.42)	.699†

SD = standard deviation.
*Pearson's χ^2 test.
†Independent t test.

the first wave. In addition, the PSQI score during the second wave showed an insignificant increasing trend compared with the first wave (5.86 vs 5.41, P = .056). In comparison, the second-line healthcare workers had significantly higher scores of social distance (13.22 vs 11.82, P < .001) and social adaptation (6.50 vs 5.93, P < .001) during the second wave than during the first wave. Details of the comparisons are listed in Tables 2 and 3.

3.3. Comparison of scales in the first-line and second-line healthcare workers

Table 4 demonstrates the differences in scores between the first- and second-line healthcare workers during the two waves of the COVID-19 pandemic. The first-line healthcare workers had a significantly higher PSQI score than the second-line healthcare workers during both the first wave (5.14 vs 4.93, P = .014) and second wave (5.86 vs 5.04, P = .001) of the COVID-19 pandemic. In comparison, the second-line healthcare workers had a significantly higher social information score during the first wave (5.17 vs 4.91, P = .029) and a significantly higher social distance score during the second wave (13.22 vs 12.66, P = .014).

4. Discussion

4.1. Main findings of the current study

In this study, we investigated the differences in social and mental impact on healthcare workers between two waves of the COVID-19 pandemic in Taiwan. For the first-line healthcare workers, the social impact during the second wave was higher than during the first wave, and they expressed a higher intention to maintain social distancing, greater desire to seek COVID-19-related information, and were more aware of the pandemic

overseas during the second wave. Moreover, the insignificant trend of increased PSQI scores demonstrated a trend of worse sleep quality during the second wave. Similarly, the second-line healthcare workers expressed greater intention to maintain social distancing and were more aware of the pandemic overseas during the second wave than during the first wave. Regarding differences between the first- and second-line healthcare workers, sleep quality was worse in the first-line healthcare workers than in the second-line healthcare workers during both waves. In addition, the second-line healthcare workers were more likely to seek COVID-19-related information than the first-line healthcare workers during the first wave, and expressed a higher intention to maintain social distancing during the second wave of the COVID-19 pandemic.

4.2. Differences in social and mental impact between waves of the pandemic

No significant changes in sleep disturbance, depression, and psychological distress were identified between the two waves of the pandemic among the second-line workers. However, slight but insignificant trends of increases in depression and sleep disturbance were noted among the first-line workers. This suggests a higher change in the burden on mental health of the second-line workers during the second wave. This finding is similar to an epidemiological survey which reported a higher monthly suicide rate during the second wave of the pandemic among Japanese public.[42] We speculate that the psychological distress caused by the COVID-19 pandemic may have had a cumulative effect in the first-line workers during the second wave, since they were at a higher risk of infection. However, a previous study of nursing staff in Norway reported a lower rate of sleep disturbance during the second wave of the COVID-19 pandemic,[30] and another observational study of nurses showed similar findings in Spain.[43] These inconsistencies may be due to differences in

Table 2

Comparison of scores between first wave and second wave of COVID-19 among first line healthcare workers.

First line workers	First wave n = 340	Second wave n = 313	Statistics	
Continuous variables	**Mean (SD)**	**Mean (SD)**	**t**	**P**
Depression*	0.34 (0.77)	0.45 (0.82)	−1.68	.094
Psychological distress*	1.48 (2.01)	1.72 (2.17)	−1.42	.156
PSQI	5.41 (2.79)	5.86 (3.08)	−1.91	.056
SISQ (social distance)	11.43 (2.95)	12.66 (2.55)	−5.73	**<.001**
SISQ (social information)	4.91 (1.56)	5.15 (1.50)	−2.04	**.042**
SISQ (social adaptation)	6.13 (1.83)	6.58 (1.68)	−3.20	**.001**

Bold values indicate statistical significance.

PSQI = Pittsburgh Sleep Quality Index, SD = standard deviation, SISQ = Societal Influences Survey Questionnaire.

*Measured with Disaster-Related Psychological Screening Test.

Table 3

Comparison of scores between first wave and second wave of COVID-19 among second line healthcare workers.

Second line workers	First wave n = 371.	Second wave n = 247	Statistics	
Continuous variables	**Mean (SD)**	**Mean (SD)**	**t**	**P**
Depression*	0.31 (0.77)	0.35 (0.71)	−0.68	.500
Psychological distress*	1.32 (1.89)	1.95 (1.99)	−1.12	.263
PSQI	4.93 (2.38)	5.04 (2.44)	−0.54	.591
SISQ (social distance)	11.82 (3.10)	13.22 (2.74)	−5.84	**<.001**
SISQ (social information)	5.17 (1.62)	5.39 (1.49)	−1.74	.087
SISQ (social adaptation)	5.93 (1.95)	6.50 (1.72)	−3.79	**<.001**

Bold values indicate statistical significance.

PSQI = Pittsburgh Sleep Quality Index, SD = standard deviation, SISQ = Societal Influences Survey Questionnaire.

*Measured with Disaster-Related Psychological Screening Test.

Table 4

Comparison of scores between non-first line and first line healthcare workers within first wave and second wave of COVID-19.

First wave	First line n = 340	Second line n = 371	Statistics	
Continuous variables	Mean (SD)	Mean (SD)	t	P
Depression*	0.34 (0.77)	0.31 (0.77)	0.58	.564
Psychological distress*	1.48 (2.01)	1.32 (1.89)	1.11	.269
PSQI	5.41 (2.79)	4.93 (2.38)	2.46	**.014**
SISQ (social distance)	11.43 (2.95)	11.82 (3.10)	−1.72	.087
SISQ (social information)	4.91 (1.56)	5.17 (1.62)	−2.19	**.029**
SISQ (social adaptation)	6.13 (1.83)	5.93 (1.95)	1.43	.154

Second wave	First line n = 313	Second line n = 247	Statistics	
Continuous variables	Mean (SD)	Mean (SD)	t	P
Depression*	0.45 (0.82)	0.35 (0.71)	1.48	.146
Psychological distress*	1.72 (2.17)	1.95 (1.99)	1.21	.226
PSQI	5.86 (3.08)	5.04 (2.44)	3.47	**.001**
SISQ (social distance)	12.66 (2.55)	13.22 (2.74)	−2.46	**.014**
SISQ (social information)	5.15 (1.50)	5.39 (1.49)	−1.87	.062
SISQ (social adaptation)	6.58 (1.68)	6.50 (1.72)	0.55	.585

Bold values indicate statistical significance.

PSQI = Pittsburgh Sleep Quality Index, SD = standard deviation, SISQ = Societal Influences Survey Questionnaire.

*Measured with Disaster-Related Psychological Screening Test.

the severity of the pandemic and sociocultural factors, and further longitudinal studies are warranted to elucidate this issue. In this study, the pandemic was more severe during the second wave survey, so the participants, and especially the first-line workers, were affected more.

Regarding the social impact factors, the scores were higher during the second wave for both the first- and second-line healthcare workers. This implies that healthcare workers exhibited more social-adaptive behavior during the second wave, such as greater intention to maintain social distancing, greater desire to seek COVID-19-related knowledge, and were more aware of the pandemic status overseas. These findings are comparable with previous research, and reflect that a higher proportion of the participants wore masks and stayed at home during the second wave.[44] The level of worry has been reported to be higher in both physicians and nurses during the COVID-19 pandemic.[44] However, a study of college students reported that the level of task-oriented coping styles (problem solving or planning) was lower during the second wave than during the first wave of the pandemic.[45] The differences between occupations (first-line workers and others) may have contributed to the inconsistent results. However, further studies are needed to explore these differences.

4.3. Differences in social and mental impact between the first- and second-line healthcare workers

The first-line healthcare workers (physicians and nurses) had worse sleep quality than the second-line workers during both waves of the pandemic, which may have been due to their working style such as shift-work or being on duty. These factors have been associated with a higher incidence of sleep interruption, sleep deprivation, and poor quality of sleep.[46,47] On the other hand, the second-line workers expressed a greater desire to seek COVID-19-related knowledge during the first wave. Although no similar research has investigated this issue, we hypothesize that it may be due to a greater need to obtain information about infectious diseases. The second-line workers may have sought knowledge related to infectious diseases less actively than the first-line workers before the pandemic, but they may have had more motivation during the pandemic due to insufficient knowledge. Another interesting difference during the

second wave is the higher intention to maintain social distancing among the second-line workers than the first-line workers, although both groups expressed a higher intention to maintain social distancing during the second wave than during the first wave. Psychological burden has been reported to affect coping strategies with COVID-19 among healthcare workers.[48] We hypothesize that psychological burden may compromise coping strategies with COVID-19. However, further research is warranted to explore the detailed etiology.

4.4. Limitations

There are several limitations to this study. First, the study was conducted at a single center, and this may limit the interpretation of the results, generalizability and applicability to other populations. Second, the data were derived from two cross-sectional surveys conducted in 2020 and 2021. It is unclear if all of the respondents completed the both surveys. Thus, it may not be controlled as well as a prospective follow-up study. Third, all of the measures are self-reports, and therefore the recall biases could exist to impact the findings. Fourth, participants might have their original work burden (i.e., taking care of patients with psychiatric illness) on their mental health, which may be a confounder to the current study. Finally, the details of confirmed cases during study period are unavailable now, which may provide more information about the severity of the pandemic during study period.

5. Conclusions

This study identified differences in depression, sleep disturbance, psychological distress, and social impact between first- and second-line healthcare workers during two waves of the COVID-19 pandemic in Taiwan. The increase in social impact and coping strategies manifest the effect of social adaptation among healthcare workers. In addition, increased levels of depression and sleep disturbance across the two waves demonstrate the psychological burden among first-line workers. On the other hand, a higher level of sleep disturbance in the first-line workers may suggest a greater mental impact compared with the second-line workers. Our results show the importance of evaluating the social and mental health burden of healthcare workers, especially for

first-line workers. Regular screening and prompt interventions will be beneficial for the mental health of healthcare workers. Moreover, a study with longitudinal follow-up is suggested to better understand the psychological and social impacts on healthcare workers at different stages of the pandemic.

Acknowledgments

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References

[1] Gebru AA, Birhanu T, Wendimu E, et al. Global burden of COVID-19: situational analysis and review. Hum Antibodies. 2021;29:139–48.

[2] Prati G, Mancini AD. The psychological impact of COVID-19 pandemic lockdowns: a review and meta-analysis of longitudinal studies and natural experiments. Psychol Med. 2021;51:201–11.

[3] Luo M, Guo L, Yu M, et al. The psychological and mental impact of coronavirus disease 2019 (COVID-19) on medical staff and general public – a systematic review and meta-analysis. Psychiatry Res. 2020;291:113190.

[4] Deng J, Zhou F, Hou W, et al. The prevalence of depression, anxiety, and sleep disturbances in COVID-19 patients: a meta-analysis. Ann N Y Acad Sci. 2021;1486:90–111.

[5] Olashore A, Akanni O, Fela-Thomas A, et al. The psychological impact of COVID-19 on health-care workers in African Countries: a systematic review. Asian J Soc Health Behav. 2021;4:85.

[6] Rajabimajd N, Alimoradi Z, Griffiths M. Impact of COVID-19-related fear and anxiety on job attributes: a systematic review. Review Article. Asian J Soc Health Behav. 2021;4:51–5.

[7] Alimoradi Z, Brostrom A, Tsang HWH, et al. Sleep problems during COVID-19 pandemic and its' association to psychological distress: a systematic review and meta-analysis. EClinicalMedicine. 2021;36:100916.

[8] Alimoradi Z, Gozal D, Tsang HWH, et al. Gender-specific estimates of sleep problems during the COVID-19 pandemic: systematic review and meta-analysis. J Sleep Res. 2022;31:e13432.

[9] Li DJ, Ko NY, Chen YL, et al. COVID-19-Related factors associated with sleep disturbance and suicidal thoughts among the Taiwanese public: a facebook survey. Int J Environ Res Public Health. 2020;17:4479.

[10] Li DJ, Chou LS, Chou FH, et al. COVID-related psychological distress fully mediates the association from social impact to sleep disturbance among patients with chronic schizophrenia. Sci Rep. 2021;11:16524.

[11] Li DJ, Hsu ST, Chou FH, et al. Predictors for depression, sleep disturbance, and subjective pain among inpatients with depressive disorders during the COVID-19 pandemic: a cross-sectional study. Int J Environ Res Public Health. 2021;18:6523.

[12] Kuo YJ, Chen YP, Wang HW, et al. Community outbreak moderates the association between COVID-19-related behaviors and COVID-19 fear among older people: a one-year longitudinal study in Taiwan. Front Med (Lausanne). 2021;8:756985.

[13] Li YP, Lin CY, Kuo YJ, et al. Gender differences in the factors associated with the fear of COVID-19 among Taiwanese older people. Inquiry. 2021;58:469580211055587.

[14] Pakpour AH, Liu CH, Hou WL, et al. Comparing fear of COVID-19 and preventive COVID-19 infection behaviors between Iranian and Taiwanese older people: early reaction may be a key. Front Public Health. 2021;9:740333.

[15] Chang KC, Strong C, Pakpour AH, et al. Factors related to preventive COVID-19 infection behaviors among people with mental illness. J Formos Med Assoc. 2020;119:1772–80.

[16] Ahorsu DK, Pramukti I, Strong C, et al. COVID-19-Related variables and its association with anxiety and suicidal ideation: differences between international and local university students in Taiwan. Psychol Res Behav Manag. 2021;14:1857–66.

[17] Pramukti I, Strong C, Sitthimongkol Y, et al. Anxiety and suicidal thoughts during the COVID-19 pandemic: cross-country comparative study among Indonesian, Taiwanese, and Thai University Students. J Med Internet Res. 2020;22:e24487.

[18] Gholami M, Fawad I, Shadan S, et al. COVID-19 and healthcare workers: a systematic review and meta-analysis. Int J Infect Dis. 2021;104:335–46.

[19] Shreffler J, Petrey J, Huecker M. The impact of COVID-19 on healthcare worker wellness: a scoping review. West J Emerg Med. 2020;21:1059–66.

[20] Batra K, Singh TP, Sharma M, et al. Investigating the psychological impact of COVID-19 among healthcare workers: a meta-analysis. Int J Environ Res Public Health. 2020;17:9096.

[21] Patel B, Khanpara B, Mehta P, et al. Evaluation of perceived social stigma and burnout, among health-care workers working in covid-19 designated hospital of India: a cross-sectional study. Original Article. Asian J Soc Health Behav. 2021;4:156–62.

[22] Hasannia E, Mohammadzadeh F, Tavakolizadeh M, et al. Assessment of the anxiety level and trust in information resources among Iranian health-care workers during the pandemic of coronavirus disease 2019. Original Article. Asian J Soc Health Behav. 2021;4:163–8.

[23] Gomez-Ochoa SA, Franco OH, Rojas LZ, et al. COVID-19 in health-care workers: a living systematic review and meta-analysis of prevalence, risk factors, clinical characteristics, and outcomes. Am J Epidemiol. 2021;190:161–75.

[24] Chen R, Sun C, Chen JJ, et al. A large-scale survey on trauma, burnout, and posttraumatic growth among nurses during the COVID-19 Pandemic. Int J Ment Health Nurs. 2021;30:102–16.

[25] Lu MY, Ahorsu DK, Kukreti S, et al. The prevalence of post-traumatic stress disorder symptoms, sleep problems, and psychological distress among COVID-19 frontline healthcare workers in Taiwan. Front Psychiatry. 2021;12:705657.

[26] Chung GK, Strong C, Chan YH, et al. Psychological distress and protective behaviors during the COVID-19 pandemic among different populations: Hong Kong general population, Taiwan healthcare workers, and Taiwan outpatients. Front Med (Lausanne). 2022;9:800962.

[27] Kao WT, Hsu ST, Chou FH, et al. The societal influences and quality of life among healthcare team members during the COVID-19 pandemic. Front Psychiatry. 2021;12:706443.

[28] Center CEC. CECC confirms 335 more COVID-19 cases, including 333 indigenous cases and 2 imported cases. Taiwan Centers for Disease Control. Available at: https://www.cdc.gov.tw/En/Bulletin/Detail/fVb-MYlM8GpKgzQCN4TnDyg?typeid=158. [access date January 12, 2022].

[29] Center CEC. Cumulative total of 439 COVID-19 cases confirmed in Taiwan; 339 patients released from isolation. Taiwan Centers for Disease Control. Available at: https://www.cdc.gov.tw/En/Category/ListContent/tov1jahKUv8RGSbvmzLwFg?uaid=RxN5FrhSe-qKvCO8tMoxO8Q [access date January 12, 2022].

[30] Waage S, Pallesen S, Vedaa O, et al. Sleep patterns among Norwegian nurses between the first and second wave of the COVID-19 pandemic. BMC Nurs. 2021;20:105.

[31] Reznik A, Gritsenko V, Konstantinov V, et al. First and second wave COVID-19 fear impact: Israeli and Russian social work student fear, mental health and substance use. Int J Ment Health Addict. 2021;20:1806–13.

[32] Chen CY, Chen IH, Hou WL, et al. The relationship between children's problematic internet-related behaviors and psychological distress during the onset of the COVID-19 pandemic: a longitudinal study. J Addict Med. 2022;16:e73–80.

[33] Chen I-H, Lin Y-C, Lin C-Y, et al. The trajectory of psychological distress and problematic Internet gaming among primary school boys: a longitudinal study across different periods of COVID-19 in China. JOMH. 2022;18:70.

[34] Chen IH, Chen CY, Liu CH, et al. Internet addiction and psychological distress among Chinese schoolchildren before and during

the COVID-19 outbreak: a latent class analysis. J Behav Addict. 2021;10:731–46.

[35] Chen IH, Chen CY, Pakpour AH, et al. Problematic internet-related behaviors mediate the associations between levels of internet engagement and distress among schoolchildren during COVID-19 lockdown: a longitudinal structural equation modeling study. J Behav Addict. 2021;10:135–48.

[36] Fung XCC, Siu AMH, Potenza MN, et al. Problematic use of internet-related activities and perceived weight stigma in schoolchildren: a longitudinal study across different epidemic periods of COVID-19 in China. Front Psychiatry. 2021;12:675839.

[37] Chou FH, Su TT, Ou-Yang WC, et al. Establishment of a disaster-related psychological screening test. Aust N Z J Psychiatry. 2003;37:97–103.

[38] Choul FH, Chou P, Lin C, et al. The relationship between quality of life and psychiatric impairment for a Taiwanese community post-earthquake. Qual Life Res. 2004;13:1089–97.

[39] Buysse DJ, Reynolds CF, 3rd, Monk TH, et al. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry Res. 1989;28:193–213.

[40] Li DJ, Kao WT, Shieh V, et al. Development and implementation of societal influences survey questionnaire (SISQ) for peoples during COVID-19 pandemic: a validity and reliability analysis. Int J Environ Res Public Health. 2020;17:6246.

[41] Lo A, Jun BO, Shieh V, et al. A comparative study of social impacts of the COVID-19 pandemic on Republic of Korea, Japan, and Taiwan. Psychiatry Investig. 2021;18:1006–17.

[42] Tanaka T, Okamoto S. Increase in suicide following an initial decline during the COVID-19 pandemic in Japan. Nat Hum Behav. 2021;5:229–38.

[43] Sanchez-Sanchez E, Garcia-Alvarez JA, Garcia-Marin E, et al. Impact of the COVID-19 pandemic on the mental health of nurses and auxiliary nursing care Technicians – a voluntary online survey. Int J Environ Res Public Health. 2021;18:8310.

[44] Nazar W, Leszkowicz J, Pienkowska A, et al. Before-and-after online community survey on knowledge and perception of COVID-19 pandemic. BMC Infect Dis. 2020;20:861.

[45] Rogowska AM, Kusnierz C, Ochnik D. Changes in stress, coping styles, and life satisfaction between the first and second waves of the COVID-19 pandemic: a longitudinal cross-lagged study in a sample of university students. J Clin Med. 2021;10:4025.

[46] Mansukhani MP, Kolla BP, Surani S, et al. Sleep deprivation in resident physicians, work hour limitations, and related outcomes: a systematic review of the literature. Postgrad Med. 2012;124:241–9.

[47] Shao MF, Chou YC, Yeh MY, et al. Sleep quality and quality of life in female shift-working nurses. J Adv Nurs. 2010;66:1565–72.

[48] Shahrour G, Dardas LA. Acute stress disorder, coping self-efficacy and subsequent psychological distress among nurses amid COVID-19. J Nurs Manag. 2020;28:1686–95.