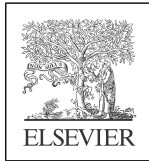




Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



## Social support and clinical improvement in COVID-19 positive patients in China

Xiao Yang<sup>a,b,c,\*</sup>, Xiufang Yang<sup>b,\*</sup>, Poornima Kumar<sup>d,e</sup>, Bingrong Cao<sup>b</sup>, Xiaohong Ma, MD<sup>a,b,†\*\*</sup>, Tao Li, MD<sup>a,b,c,†\*\*\*</sup>

<sup>a</sup>Psychiatric Laboratory, the State Key Laboratory of Biotherapy, West China Hospital of Sichuan University, Chengdu, Sichuan, China

<sup>b</sup>Mental Health Center, West China Hospital of Sichuan University, Chengdu, Sichuan, China

<sup>c</sup>Huaxi Brain Research Center, West China Hospital of Sichuan University, China

<sup>d</sup>Center for Depression, Anxiety, and Stress Research, McLean Hospital, MA

<sup>e</sup>Department of Psychiatry, Harvard Medical School, MA

### ARTICLE INFO

#### Article history:

Received 3 June 2020

Received in revised form

21 July 2020

Accepted 14 August 2020

Available online August 24,

2020.

#### Keywords:

COVID-19

Psychological problems

Mental health care

Psychosocial support

### ABSTRACT

**Objectives:** To explore the relationship between psychosocial support related factors and the mental health of COVID-19 positive patients.

**Methods:** This exploratory study of 35 COVID-19 positive patients were enrolled between February 1 to March 1, 2020. Sleep quality, depression, anxiety, and social support were measured and social support related data of participants were collected. Psychological intervention was administered and patients were followed two weeks post intervention. Linear regression was performed to explore the relationship between psychosocial risk factors and improvement of psychological symptoms.

**Findings:** Thirty-two individuals exhibited sleep, depressive and anxiety symptoms which improved post support intervention. At baseline, symptoms were associated with gender, severity of pneumonia, social support. Better social support at follow-up and improvement from COVID-19 predicted improvement in their psychological symptoms.

**Discussion:** This initial evidence from China may stress the importance of administering psychosocial intervention during the treatment of COVID-19 for better patient outcomes in other countries.

**Cite this article:** Yang, X., Yang, X., Kumar, P., Cao, B., Ma, X., & Li, T. (2020, November/December). Social support and clinical improvement in COVID-19 positive patients in China. *Nurs Outlook*, 68(6), 830–837. <https://doi.org/10.1016/j.outlook.2020.08.008>.

Conflicts of Interest: None.

**Authorship:** Xiao Yang, Tao Li and Xiaohong Ma have made substantial contributions to conception and design. Xiufang Yang made substantial contributions to acquisition of data. Xiao Yang, Xiufang Yang, Poornima Kumar, Bingrong Cao have made substantial contributions to analysis and interpretation of data. Xiao Yang, Xiufang Yang, Poornima Kumar, Bingrong Cao, Tao Li, Xiaohong Ma have been involved in drafting the manuscript and revising it critically for important intellectual content. All authors have given final approval of the version to be published.

\*\*Corresponding author: Xiaohong Ma, Social support and COVID-19, Psychiatric Laboratory of West China Hospital, Sichuan University, 1 Keyuan 4<sup>th</sup> road, Chengdu, Sichuan, 610041, China\*\*\*Corresponding author: Tao Li, Social support and COVID-19, Mental Health Center, West China Hospital, 28<sup>th</sup> Dianxin South Street, Wuhou district, Chengdu, Sichuan, 610041, China

E-mail addresses: [maxiaohong@scu.edu.cn](mailto:maxiaohong@scu.edu.cn) (X. Ma), [xuntao26@hotmail.com](mailto:xuntao26@hotmail.com) (T. Li).

\* Xiao Yang and Xiufang Yang made equal first author contributions.

† Tao Li and Xiaohong Ma should be considered joint corresponding author.

0029-6554/\$ -see front matter © 2020 Elsevier Inc. All rights reserved.

<https://doi.org/10.1016/j.outlook.2020.08.008>

## Introduction

---

The coronavirus disease 2019 (COVID-19) was declared a global pandemic on March 11, 2020 by the World Health Organization (Ducharme, 2020). COVID-19 appears more efficiently transmitted and more virulent than the severe acute respiratory syndrome (SARS) and the Middle East respiratory syndrome coronaviruses (Wang, Horby, Hayden, & Gao, 2020). The rapid rise in the number of confirmed cases and deaths along with the unknown epidemiology of this novel pathogen reportedly causes psychological problems in many people, among which stress, fear, anxiety, and depression are the most common (Lai et al., 2020).

Previous studies found that some patients with SARS experienced anxiety and depression which can potentially make their treatment more challenging and less effective (Cheng & Wong, 2005; Yunping Yang, Ma, & Wang, 2003). One practitioner's report found that the provision of psychological intervention to those who were suffering from SARS or other comparable infectious diseases led to significant clinical implications such as maintaining psychological wellbeing and help fight against emerging infectious diseases (Sim & Chua, 2004). With regard to this current pandemic, early psychological intervention (Ma, Du, & Guo, 2004) or timely mental health care (Xiang et al., 2020) were addressed. However, more evidence-based outcomes of psychosocial interventions for COVID-19 need to be evaluated (Cheng & Wong, 2005).

Psychosocial support usually refers to the care or support that a person feel they get from others or the feeling of belonging to a social network that provides mutual assistance (Bluestone, 1998). Adequate and positive psychosocial support has been reported to help relieve the level of stress, anxiety (Yang et al., 2018), depressive symptoms (Yang, 2006), and have a positive effect on sleep quality (Kent de Grey, Uchino, Trettevik, Cronan, & Hogan, 2018; Prati & Pietrantoni, 2010). By releasing cytokines, better sleep may also indirectly help patients maintain optimal immune function and thus help them fight against the infection (Irwin, 2002; Lange, Dimitrov, & Born, 2010). Psychosocial intervention studies on sufferers with SARS found that psychological distress emerging in the acute stage were ameliorated with social support including certain types of behavioral and verbal responses of health workers (Cheng & Wong, 2005). A recent research during the COVID-19 pandemic also confirmed the effects of social support on the improvement of psychological problems (Xiao, Zhang, Kong, Li, & Yang, 2020).

It is possible that early psychological intervention and social support can play a critical role in both the physical and mental health status of COVID-19 positive patients. As anxiety and depression problems are common negative emotion experienced by patients during epidemics of such an infectious disease (Yunping Yang et al., 2003), social support may help reduce the level of stress and anxiety (Yang et al., 2018). Also,

sleep quality is an important indicator of health status. The positive effect of social network factors (particularly the relationships with relatives/friends) for sleep quality may help people maintain optimal immune function (Irwin, 2002; Lange et al., 2010), which indirectly help them fight the virus.

Nevertheless, studies on sleep, anxiety, and depressive symptoms of COVID-19 positive patients and those on the psychological intervention for them are still limited. The exploratory research on the factors associated with the symptoms and the remission of those symptoms after intervention is almost none. Moreover, psychological impact of those infectious diseases may persist or evolve over time. Longitudinal studies are warranted to assess the important determinant factors of psychosocial distress and the protective factors of some coping strategies, with potential application in early identification of cases experiencing psychological problems.

Therefore, based on both physical and psychological intervention in the isolated intensive care unit (ICU) in the East District of Wuhan People's Hospital, the aim was to achieve three objectives with this study. First, to explore the sleep quality, psychosocial status of confirmed positive COVID-19 patients using psychological scales. Second, to explore the change of their psychological status after the clinical treatment and psychological intervention during the hospitalization. Third, to identify the social support related risk factors of mental health and their improvement.

---

## Methods

### Sample

Thirty-five confirmed positive COVID-19 patients in the isolated ICU in the East District of Wuhan People's Hospital were enrolled February 1, 2020 to March 1, 2020. The diagnosis of COVID-19 was confirmed for each patient according to the Novel Coronavirus Infection Pneumonia Diagnosis and Treatment Standards (Shen et al., 2020).

### Data Collection

This study was conducted in accordance with the Declaration of Helsinki and was approved by the Ethics Committee of our hospital. Verbal informed consent was provided by every subject and participants were allowed to terminate the survey at any time they desired. The survey was anonymous, and confidential.

### Study Measures

A descriptive exploratory design was employed. Demographic and social support related data were collected including age, gender, education, marital status, number of family members infected, psychiatric

history, psychiatric family history, any close relatives or friends who died in the pandemic, the number of children, and their living status. Information on the severity of pneumonia (highest mode of oxygenation: nasal catheter for oxygen, high flow oxygen, endotracheal intubation) and the results of serology test for COVID-19 (positive or negative) were also collected to provide the information of the severity and improvement of COVID-19. Sleep quality, depression, anxiety, and social support were assessed using the Chinese version of Pittsburgh Sleep Quality Index (PSQI) (Carpenter & Andrykowski, 1998), Patient Health Questionnaire (PHQ-9) (Kroenke, Spitzer, & Williams, 2001), Generalized Anxiety Disorder Assessment (GAD-7) (Spitzer, Kroenke, Williams, & Lowe, 2006), and the Social Support Rate Scale (SSRS) (Dai et al., 2016), respectively at two stages: Stage 1: the day when they were hospitalized, and Stage 2: two weeks after they were hospitalized.

The questionnaire of PSQI was used to measure sleep quality (Carpenter & Andrykowski, 1998). According to the suggested criteria, a total score of 0–5 points means having a very good night's sleep; 6–10 points means the sleep quality is not bad; 11–15 points means the sleep quality is fairly bad; and 16–21 points means the sleep quality is very bad. The total score ranged from 0 to 21. Higher the score, worse is the sleep quality. The Cronbach's alpha for internal consistency of the PSQI was 0.811.

PHQ-9 is a reliable, valid, and widely used measurement of depression severity (Kroenke et al., 2001). A total score of <4 indicates minimal depression; 5–9 indicates mild depression; 10–14 indicates moderate depression; 15–19 refers to moderately severe depression; and 20–27 indicates severe depression. The Cronbach's alpha for internal consistency was 0.81.

GAD-7 is a valid, efficient and widely used tool for screening for generalized anxiety disorder and assessing the severity in clinical practice and research (Spitzer et al., 2006). A total score of 5, 10, and, 15 are interpreted as the cut-off points for mild, moderate, and severe levels of anxiety, respectively. This is also similar to levels of depression on the PHQ-9. The Cronbach's alpha for internal consistency was 0.92.

SSRS was used to measure the level of social support received by individuals. It consists of 10 questions (graded 1–4) with a total SSRS score ranges from 12 to 66 points. Higher scores mean a higher and satisfactory social support. The SSRS has good reliability and validity, with a Cronbach's alpha for internal consistency ranging between 0.89 and 0.94.

### Clinical Psychological Intervention

All participants were assessed by a trained psychotherapist and nurse who voluntarily travelled to work in the ICU, East District of Wuhan People's Hospital. According to basic principles and timely mental health care for emergency psychological crisis interventions for the COVID-19 (China; Xiang et al., 2020), she

provided mental health care for those hospitalized patients during that time. Psychological intervention mainly included the following steps. First, an in-person interview was conducted to collect a systemic perspective. In order to evaluate the psychosocial impact of such an infectious disease on patients and their family members and close friends. This will help us make a plan for a more comprehensive efforts to alleviate their psychosocial burden for current or in the future. Next, face-to-face intervention and online consulting was given, including listening, positive attention, supportive psychotherapy, empathy, muscle and breath relaxation, and cognitive behavioral therapy. We instructed them do the training of body detection and control, muscle and respiratory relaxation. Cognitive behavioral therapy was applied based on an ever-evolving formulation of patients' problems and the individual conceptualization. For example, we helped a person who always felt chest tightness to notice those uncomfortable experience, the trigger factors and distinguish the physical and psychological uncomfortable. Then helped them build the rational cognitive processing of those symptoms. All treatments were conducted depending on the physical and mental situation of each patient, ranging from 15 to 30 minutes each time, usually three times a week.

### Statistical Analysis

Data in this study were analyzed using the Statistical Package for the Social Sciences (SPSS 24.0 for Mac). The ANOVA and chi-squared ( $\chi^2$ ) tests were used to analyze clinical information of patients at baseline. Linear regression was used to determine the relationship between the measured social support-related factors and baseline sleep, anxiety, and depression symptoms and the improvement of these measures.

For Stage 1, three linear regression models for three variables (PSQI, PHQ9, GAD7), separately. Social support-related factors for linear regression included age, gender, marital status, education level, number of family members infected, any close relatives or friends who died in the pandemic, severity of pneumonia, and score of SSRS. The method for linear regression was stepwise. A  $p$  value < .05 was considered to be statistically significant.

For Stage 2, three linear regression models for the reduction of three variables (PSQI, PHQ9, GAD7), were used separately. Social support related factors for linear regression included age, gender, marital status, education level, number of family members infected, any close relatives or friends who died in the pandemic, severity of pneumonia, nucleic acid test at Stage 2, and score of SSRS at Stage 2. Reductions of score were calculated for patients with PSQI  $\geq 6$ , PHQ9  $\geq 5$ , and GAD7  $\geq 5$ , separately. Three patients with score of PSQI less than 6, 3 patients with score of PHQ9 less than 5, and 4 patients with score of GAD7 less than 5 were excluded in each model. The method for linear regression was

stepwise. A  $p$  value  $< .05$  was considered to be statistically significant.

## Findings

### Descriptions of Sample Characteristics

Thirty-five patients (21 men and 14 women) were included in this study (age  $57 \pm 13.5$  years). Nine of them had negative test results at Stage 2. Besides the social support measured by SSRS, other social support related factors of patients are presented in Table 1.

### Social Support Related Factors and Baseline Psychosocial Symptoms

This study found that sleep quality measured by PSQI of COVID-19 positive patients were positively associated with gender and severity of pneumonia ( $\beta_1 = 6.275$ ,  $p_1 = .00$ ;  $\beta_2 = 3.774$ ,  $p_2 = .013$ ). Other factors included in the model were not found to be significantly related to sleep symptoms. Depression symptoms were positively associated with severity of pneumonia, gender, and lower social support at Stage 1 ( $\beta_1 = 5.913$ ,  $p_1 = .00$ ;  $\beta_2 = 2.941$ ,  $p_2 = .005$ ;  $\beta_3 = -0.229$ ,  $p_3 = .04$ ).

Other factors of interest in the model were not found to be significantly related to depression symptoms. Anxiety symptoms were associated with number of family members infected ( $\beta = 2.057$ ,  $p = .001$ ). Other factors of interest in the model were not found to be significantly related to anxiety symptoms (Tables 2 and 3).

### Changes in the Score of Social Support and Psychological Symptoms After Intervention

After 2 weeks of treatment, an assessment of SSRS, PSQI, PHQ9, and GAD7 was performed for every participant. After intervention, SSRS was significantly higher ( $p = .000$ ) and the scores of PSQI, PHQ9, and GAD7 were significantly lower ( $p = .000$ ,  $p = .000$ ,  $p = .000$ ) than those at baseline (Figure 1).

### Social Support Related Factors and the Improvement of Psychosocial Symptoms of COVID-19 Positive Patients

This study also found that improvement of sleep quality for patients were positively associated with the improvement from COVID-19 and better social support at Stage 2 ( $\beta_1 = -38.122$ ,  $p_1 = .000$ ;  $\beta_2 = 2.867$ ,  $p_2 = .046$ ). Other factors of interest were not found significantly related to the change. Improvement of depression was positively associated with higher education level ( $\beta = 13.965$ ,  $p = .026$ ). Other factors were not found significantly related to the change. Improvement of anxiety was not significantly associated with any factors of interest.

**Table 1 – Demographic Information of COVID-19 Positive Patients**

Variable	mean $\pm$ SD / N (%)
Age (year)	57.00 $\pm$ 13.44
Gender	
Male	21 (60%)
Female	14 (40%)
Marital status	
Married	30 (85.71%)
Divorced	2 (5.71%)
Widowed	2 (5.71%)
Single	1 (2.86%)
Education level	
Primary school	5 (14.29%)
Junior high school	4 (11.43%)
High school	12 (34.29%)
College	12 (34.29%)
Graduate	2 (5.71%)
Number of family members infected (patient excepted)	1.11 $\pm$ 1.47
0	15 (42.86%)
1	12 (34.29%)
2	2 (5.71%)
3	4 (11.43%)
4	0 (0%)
5	1 (2.86%)
6	1 (2.86%)
Any close relatives or friends who died in the pandemic	
No	27 (77.14%)
Yes	8 (22.86%)
Severity of pneumonia	
Highest mode of oxygenation: nasal catheter for oxygen	30 (85.71%)
High flow oxygen	4 (11.43%)
Endotracheal intubation	1 (2.86%)
Nucleic acid test after treatment	
Negative	9 (25.71%)
Positive	26 (74.29%)
Mean score of social support rating scale	
At stage 1	25.57 $\pm$ 4.60
At stage 2	29.94 $\pm$ 3.15

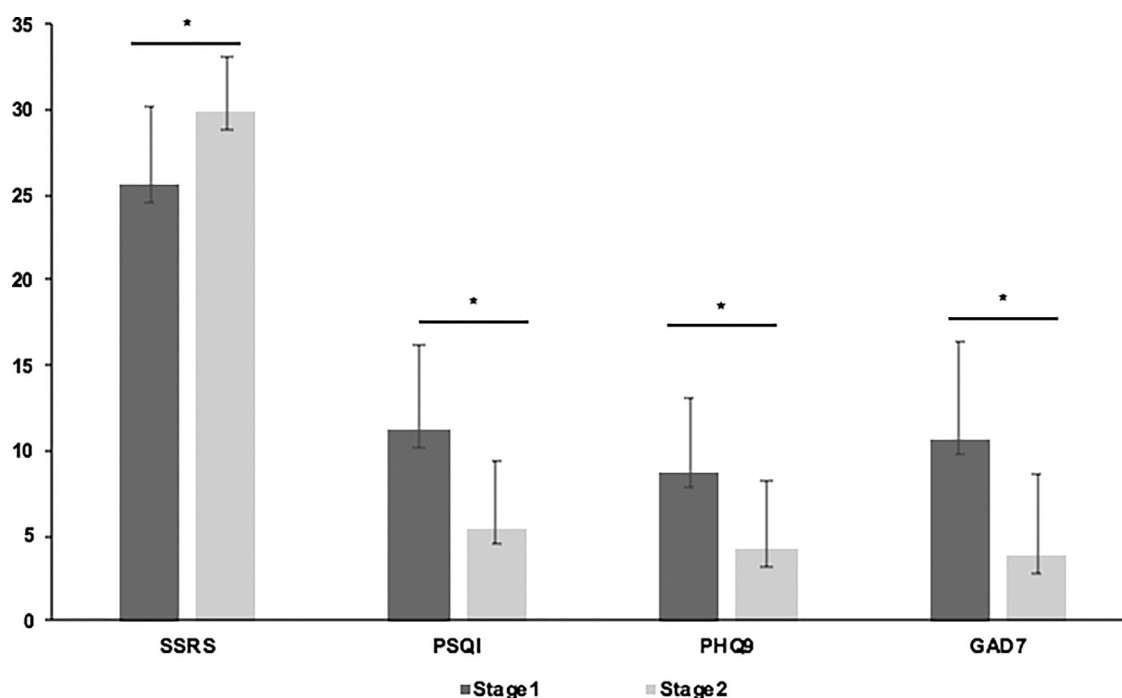
COVID-19: coronavirus disease-19. Stage 1: at baseline. Stage 2: at follow-up.

**Table 2 – Relationship Between Social Support Related Factors and Clinical Symptoms of COVID-19 Positive Patients at Baseline (Stage 1)**

Dependent Variables	Stage 1 (N = 35)	Independent Variable	Unstandardized B Score	Partial Beta Squared	t Score	p-Value
PSQI-stage1 R <sup>2</sup> = 0.47 (Adjusted R <sup>2</sup> = 0.44)	11.20 ± 5.06	gender	6.28	0.42	4.79	0.000
		severity of pneumonia	3.77	0.18	2.62	0.013
PHQ9-stage1 R <sup>2</sup> = 0.60 (Adjusted R <sup>2</sup> = 0.56)	8.80 ± 4.26	severity of pneumonia	5.91	0.49	5.45	0.000
		gender	2.94	0.23	3.00	0.005
		SSRS	-0.23	0.13	-2.14	0.040
GAD7-stage1 R <sup>2</sup> = 0.29 (Adjusted R <sup>2</sup> = 0.27)	10.69 ± 5.62	Number of family members infected	2.06	0.29	3.67	0.001

**Table 3 – Relationship Between Social Support Related Factors and Reduction (Stage 1 - Stage 2) in Clinical Symptoms of COVID-19 Positive Patients**

Dependent Variables	Mean ± SD	Independent Variable	Unstandardized B Score	Partial Beta Squared	t Score	p-Value
Reduction of PSQI R <sup>2</sup> = 0.42 (Adjusted R <sup>2</sup> = 0.39)	(N = 32) 49.16 ± 1.27	nucleic acid test at stage 2	-38.12	0.32	-3.89	0.000
		SSRS at stage 2	2.87	0.12	2.08	0.046
Reduction of PHQ9 R <sup>2</sup> = 0.14 (Adjusted R <sup>2</sup> = 0.12)	(N = 32) 52.15 ± 42.35	Education level	13.97	0.14	2.34	0.026
Reduction of GAD7	(N = 31) 63.86 ± 42.62	None				

**Figure 1 – Clinical information of COVID-19 positive patients at baseline (stage 1) and follow-up (stage 2).**

## Discussion

---

Overall this study found that most COVID-19 positive patients had sleep, depressive, and anxiety symptoms. Many factors could have accounted for this high proportion of patients having psychological problems during this global pandemic. For instance, factors including person-to-person virulent virus, uncertainty, misinformation, overinformation, shortage of health care, isolation and separation from loved ones, loss of lives etc. could have contributed to their mental health symptoms. In addition, the relatively older age (mean = 57 years) and more critical condition of (all recruited from the ICU) the participants may partially explain the high ratio of psychosocial problems. Specifically, older people were more likely to be anxious, depressive, and suffer from sleep disturbance, even more than those in need of physical and mental health care (Dai et al., 2016).

From the linear regression analysis between the clinical symptoms at Stage 1 and social support related factors of COVID-19 positive patients, revealed that psychosocial symptoms had a significantly positive association with several social support related factors. Specifically, sleep and depression were associated with both gender and severity of pneumonia. In addition, poor social support at Stage 1 was observed to be associated with depression. In contrast, anxiety was associated with number of infected family members. Gender differences in depression have been widely reported in prior studies with twice the number of women diagnosed with depression than men (Seedat et al., 2009). Interestingly, previous findings have also shown that women with depression suffered more sleep disturbance (Yang et al., 2017). Association between clinical symptoms and severity of pneumonia is not entirely surprising, as it is commonly believed that poor physical situation are usually associated with psychological problems and worse outcomes (Henderson & Moran, 1983). Positive social support may help relieve the level of stress, anxiety. Elderly individuals may tend to be more sensitive to social support and afraid of being neglected (Lamont, Nelis, Quinn, & Clare, 2017). This may have contributed to depressive symptoms of participants in this study. Those who having family members infected is anxiety provoking, especially when the individual themselves got infected. This was confirmed in this study when anxiety was uniquely related to family members infected.

The study found that patients' psychological symptoms improved after intervention. This was positively associated with the improvement from COVID-19, better social support at Stage 2 and higher education level. The improvement of physical situation reflects effective physical support which may help relieve their stress and maintain good psychosocial status. Moreover, a higher education level is recognized to be an important social determinant of health (Shankar et al.,

2013). It can afford people better economic, social, and personal resources needed for better physical and mental health as well as increase people's capacity for better decision making regarding their health (Kim, Choi, Kim, & Pop-Eleches, 2018; Shankar et al., 2013).

Indeed, physical and psychological wellbeing and sleep are affected by many sociocultural factors (Yao, Yu, Cheng, & Chen, 2008). Social support was reported to be strongly associated with mental status as well as the significant predictors of psychological symptoms at follow-up (George, Blazer, Hughes, & Fowler, 1989). A study about the COVID-19 pandemic confirmed the effects of social support for improvement of psychological problems (Xiao et al., 2020). Our current study also found that the psychosocial status improved after treatment (Anderson & Ozakinci, 2018) and better social support (relationship with family, close friends, colleagues, health care worker, mental health care worker etc.) can help patients improve sleep quality and ameliorate their psychological distress, thus helping reduce their negative emotion levels during the pandemic (Cheng & Wong, 2005).

## Limitation

---

Despite the findings, this research study had three major limitations. First, the absence of a control group made the comparison of psychological intervention between groups impossible. Such an absence was unavoidable though because we provided mental health care for anyone who needed it according to the ethical principle and requirements. Second, more details about the severity of the COVID-19 and the exact quantized measures of improvement for those patients hospitalized at ICU. The highest mode of oxygenation and the results of COVID-19 to provide some information about the situation and the change of the disease since there were no objective and quantified measures to be used. Finally, a long-term follow-up may be helpful even after the patients were discharged because mental health is as important as physical health.

## Conclusion

---

The current research found that a large proportion of COVID-19 positive patients in ICU suffered from psychosocial problems. Physical and psychological well-being and sleep are affected by many social support related factors. Adequate social support and early intervention may help these patients achieve better clinical prognosis during such pandemic of infectious disease. The findings from this study of Chinese COVID-19 positive patients may stress the importance of administering

psychological intervention during the treatment of COVID-19 for better outcomes in other countries.

## Data Availability

The data that support the findings of this study will be available from the corresponding author on reasonable request.

## ACKNOWLEDGEMENTS

We thank all health-care workers involved in the diagnosis and treatment of patients in the East District of Wuhan People's Hospital. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.outlook.2020.08.008](https://doi.org/10.1016/j.outlook.2020.08.008).

## REFERENCES

- Anderson, N., & Ozakinci, G. (2018). Effectiveness of psychological interventions to improve quality of life in people with long-term conditions: rapid systematic review of randomised controlled trials. *BMC Psychology*, 6(1), 11, doi:10.1186/s40359-018-0225-4.
- Bluestone, H. (1998). Social Support and Psychiatric Disorder: Research Findings and Guidelines for Clinical Practice. *American Journal of Psychiatry*, 155(7), 988a–9989, doi:10.1176/ajp.155.7.988a.
- Carpenter, J. S., & Andrykowski, M. A. (1998). Psychometric evaluation of the Pittsburgh Sleep Quality Index. *J Psychosom Res*, 45(1), 5–13, doi:10.1016/s0022-3999(97)00298-5.
- Cheng, S. K. W., & Wong, C. W. (2005). Psychological intervention with sufferers from severe acute respiratory syndrome (SARS): lessons learnt from empirical findings. *Clinical Psychology & Psychotherapy*, 12(1), 80–86, doi:10.1002/cpp.429.
- Dai, W., Chen, L., Tan, H., Wang, J., Lai, Z., Kaminga, A. C., . . . , Liu, A. (2016). Association between social support and recovery from post-traumatic stress disorder after flood: a 13-14 year follow-up study in Hunan, China. *BMC Public Health*, 16, doi:10.1186/s12889-016-2871-x 194-194.
- Dai, Y., Zhang, C.-Y., Zhang, B.-Q., Li, Z., Jiang, C., & Huang, H.-L. (2016). Social support and the self-rated health of older people: A comparative study in Tainan Taiwan and Fuzhou Fujian province. *Medicine (Baltimore)*, 95(24), doi:10.1097/MD.0000000000003881 e3881-3881.
- Ducharme, J. (2020). World Health Organization declares COVID-19 a 'Pandemic'. Here's what that means. *Time Magazine Retrieved June 21 2020*.
- George, L. K., Blazer, D. G., Hughes, D. C., & Fowler, N. (1989). Social Support and the Outcome of Major Depression. *British Journal of Psychiatry*, 154(4), 478–485, doi:10.1192/bjp.154.4.478.
- Henderson, A. S., & Moran, P. A. (1983). Social relationships during the onset and remission of neurotic symptoms. A prospective community study. *Br J Psychiatry*, 143, 467–472, doi:10.1192/bjp.143.5.467.
- Irwin, M. (2002). Effects of sleep and sleep loss on immunity and cytokines. *Brain, Behavior, and Immunity*, 16(5), 503–512. [https://doi.org/10.1016/S0889-1591\(02\)00003-X](https://doi.org/10.1016/S0889-1591(02)00003-X).
- Kent de Grey, R. G., Uchino, B. N., Trettevik, R., Cronan, S., & Hogan, J. N. (2018). Social support and sleep: A meta-analysis. *Health Psychol*, 37(8), 787–798, doi:10.1037/hea0000628.
- Kim, H. B., Choi, S., Kim, B., & Pop-Eleches, C. (2018). The role of education interventions in improving economic rationality. *Science*, 362(6410), 83–86, doi:10.1126/science.aar6987.
- Kroenke, K., Spitzer, R. L., & Williams, J. B. (2001). The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med*, 16(9), 606–613, doi:10.1046/j.1525-1497.2001.016009606.x.
- Lai, J., Ma, S., Wang, Y., Cai, Z., Hu, J., Wei, N., . . . , Hu, S. (2020). Factors Associated With Mental Health Outcomes Among Health Care Workers Exposed to Coronavirus Disease 2019. *JAMA Network Open*, 3(3), doi:10.1001/jamanetworkopen.2020.3976 e203976-e203976.
- Lamont, R. A., Nelis, S. M., Quinn, C., & Clare, L. (2017). Social Support and Attitudes to Aging in Later Life. *Int J Aging Hum Dev*, 84(2), 109–125, doi:10.1177/0091415016668351.
- Lange, T., Dimitrov, S., & Born, J. (2010). Effects of sleep and circadian rhythm on the human immune system. *Ann NY Acad Sci*, 1193, 48–59, doi:10.1111/j.1749-6632.2009.05300.x.
- Ma, Z., Du, W., & Guo, J. (2004). Clinical observation of mental disorders associated with severe acute respiratory syndrome. *Chinese Journal of Psychiatry (in Chinese)*, 37(2), 119–120, doi:10.3760/j.issn:1006-7884.2004.02.025.
- Prati, G., & Pietrantonio, L. (2010). The relation of perceived and received social support to mental health among first responders: a meta-analytic review. *Journal of Community Psychology*, 38(3), 403–417, doi:10.1002/jcop.20371.
- Seedat, S., Scott, K. M., Angermeyer, M. C., Berglund, P., Bromet, E. J., Brugha, T. S., . . . , Kessler, R. C. (2009). Cross-national associations between gender and mental disorders in the World Health Organization World Mental Health Surveys. *Arch Gen Psychiatry*, 66(7), 785–795, doi:10.1001/archgenpsychiatry.2009.36.
- Shankar, J., Ip, E., Khalema, E., Couture, J., Tan, S., Zulla, R. T., & Lam, G. (2013). Education as a social determinant of health: issues facing indigenous and visible minority students in postsecondary education in Western Canada. *International journal of environmental research and public health*, 10(9), 3908–3929, doi:10.3390/ijerph10093908.
- Shen, K., Yang, Y., Wang, T., Zhao, D., Jiang, Y., Jin, R., . . . , Gao, L. (2020). Diagnosis, treatment, and prevention of 2019 novel coronavirus infection in children: experts'



- consensus statement. *World J Pediatr*, doi:[10.1007/s12519-020-00343-7](https://doi.org/10.1007/s12519-020-00343-7).
- Sim, K., & Chua, H. C. (2004). The psychological impact of SARS: a matter of heart and mind. *CMAJ: Canadian Medical Association journal = journal de l'Association medicale canadienne*, 170(5), 811–812, doi:[10.1503/cmaj.1032003](https://doi.org/10.1503/cmaj.1032003).
- Spitzer, R. L., Kroenke, K., Williams, J. B., & Lowe, B. (2006). A brief measure for assessing generalized anxiety disorder: the GAD-7. *Arch Intern Med*, 166(10), 1092–1097, doi:[10.1001/archinte.166.10.1092](https://doi.org/10.1001/archinte.166.10.1092).
- Wang, C., Horby, P. W., Hayden, F. G., & Gao, G. F. (2020). A novel coronavirus outbreak of global health concern. *Lancet*, 395(10223), 470–473, doi:[10.1016/s0140-6736\(20\)30185-9](https://doi.org/10.1016/s0140-6736(20)30185-9).
- Xiang, Y. T., Yang, Y., Li, W., Zhang, L., Zhang, Q., Cheung, T., & Ng, C. H. (2020). Timely mental health care for the 2019 novel coronavirus outbreak is urgently needed. *Lancet Psychiatry*, 7(3), 228–229, doi:[10.1016/s2215-0366\(20\)30046-8](https://doi.org/10.1016/s2215-0366(20)30046-8).
- Xiao, H., Zhang, Y., Kong, D., Li, S., & Yang, N. (2020). The Effects of Social Support on Sleep Quality of Medical Staff Treating Patients with Coronavirus Disease 2019 (COVID-19) in January and February 2020 in China. *Med Sci Monit*, 26 e923549, doi:[10.12659/msm.923549](https://doi.org/10.12659/msm.923549).
- Yang, N., Xiao, H., Wang, W., Li, S., Yan, H., & Wang, Y. (2018). Effects of doctors' empathy abilities on the cellular immunity of patients with advanced prostate cancer treated by orchiectomy: the mediating role of patients' stigma, self-efficacy, and anxiety. *Patient preference and adherence*, 12, 1305–1314, doi:[10.2147/PPA.S166460](https://doi.org/10.2147/PPA.S166460).
- Yang, X., Peng, Z., Ma, X., Meng, Y., Li, M., Zhang, J., . . . , Ma, X. (2017). Sex differences in the clinical characteristics and brain gray matter volume alterations in unmedicated patients with major depressive disorder. *Sci Rep*, 7(1), 2515, doi:[10.1038/s41598-017-02828-4](https://doi.org/10.1038/s41598-017-02828-4).
- Yang, Y. (2006). How does functional disability affect depressive symptoms in late life? The role of perceived social support and psychological resources. *J Health Soc Behav*, 47(4), 355–372, doi:[10.1177/002214650604700404](https://doi.org/10.1177/002214650604700404).
- Yang, Y., Ma, Z., & Wang, C. (2003). A preliminary analysis of stress-related disorders and psychological intervention in patients with severe acute respiratory syndrome. *Chinese Journal of Psychiatry (in Chinese)*, 183, 183, doi:[10.3760/j.issn:1006-7884.2003.03.024](https://doi.org/10.3760/j.issn:1006-7884.2003.03.024).
- Yao, K. W., Yu, S., Cheng, S. P., & Chen, I. J. (2008). Relationships between personal, depression and social network factors and sleep quality in community-dwelling older adults. *J Nurs Res*, 16(2), 131–139, doi:[10.1097/01.jnr.0000387298.37419.ff](https://doi.org/10.1097/01.jnr.0000387298.37419.ff).