# Evaluating the Depression, Anxiety, Stress, and Predictors of Psychological Morbidity Among COVID-19 Survivors in Mashhad, Iran

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## Abstract

**Background:** The outbreak of coronavirus disease 2019 (COVID-19) pandemic has led to public panic and psychological problems. In this regard, few studies have reported the post-discharge mental health status of COVID-19 survivors.

**Objectives:** This study aimed to evaluate the mental health status of COVID-19 survivors and determine the risk factors of adverse psychological outcomes.

**Methods:** This cross-sectional study consisted of 188 COVID-19 survivors discharged from hospital. Data were recorded using social media applications. To evaluate the mental health status, Hospital Anxiety and Depression Scale (HADS) and Depressive Anxiety and Stress Scale 42 (DASS-42) were used. Ordinal regression with a logit link was used to assess the simultaneous effect of variables.

**Results:** The mean age of participants was $56.4 \pm 9.6$ years, and the majority of patients were male (62.2%). According to HADS, 81 (43.1%) and 24 (12.8%) patients suffered from anxiety and depression, respectively. Using DASS-42, we reported at least a mild degree of depression [23 (12.2%)], anxiety [20 (10.6%)], and stress [74 (39.4%)] among the discharged patients. Depression, anxiety, and stress were significantly associated with length of hospital stay ($P < 0.05$). In addition, there was a direct association between stress and patients' number of children ($\beta = 0.38$, $P = 0.02$).

**Conclusions:** Depression, anxiety, and stress are relatively high among COVID-19 survivors. Length of hospital stay and number of children were identified as the predisposing factors for adverse psychological outcomes.

*Keywords:* Anxiety, COVID-19, Depression, Stress, Survivors

## 1. Background

Much information has been achieved about coronavirus disease 2019 (COVID-19), including clinical characteristics, diagnostic methods, virological information, and routes of transmission, but there is no proved effective way to treat the disease yet (1). According to the behavioral immune system, people are more likely to develop avoidance behavior, negative emotions, and negative assessment of the disease information to protect themselves (2).

As the number of patients is increasing, the worry about the possibility of contamination is improving among the general population. As some similar epidemics and pandemics, severe concerns like fear from death arise among people who are in quarantine or hospital. Besides, some symptoms of COVID-19, such as fever, cough, lack of oxygen, and adverse effects of some corticosteroid drugs, including insomnia and lack of access to specific medications, can worsen depression and psychological distress. Mandatory contact tracing and quarantine situations are considered as part of public health strategies against COVID-19, which make patients feel guilty about the effects of contagion and stigma on their friends and families (3, 4).

Also, quarantine, missing social interactions, lack of proper management in controlling the outbreak of COVID-19 by authorities, presence of excessive information with misinterpretation on social media, and being far from friends, colleagues, and daily routine works for a long time

increase the feeling of loneliness and anger among patients [5, 6]. Although previous studies have shown that depression and anxiety are associated with the COVID-19 pandemic, most of them have focused on healthcare workers and the general population. Hence, there are few studies to investigate the psychological effects of COVID-19 on hospitalized patients [7-9].

## 2. Objectives

We aimed to investigate depression and anxiety in COVID-19 patients discharged from the local referral center for COVID-19 and to analyze the risk factors associated with these symptoms.

## 3. Methods

### 3.1. Study Design

This cross-sectional study was conducted among discharged patients who were hospitalized for COVID-19 in Imam Reza Hospital of Mashhad, Iran, from 20 March to 3 April, 2020. All patients were diagnosed based on the guidelines provided by the World Health Organization (WHO). Totally, 188 consecutive individuals completed online self-reported questionnaires via common social media apps to prevent the transmission of the virus. We included the COVID-19 patients discharged from hospital. Individuals with pre-existing psychological disorders were excluded from the study. The sample size was calculated using the following formula assuming d = 0.068, $\alpha$ = 0.05, and Z1 - $\alpha$/2 = 1.96. Also, P = 0.34 represented the prevalence of depression in hospitalized COVID-19 patients, according to the study by Kong et al. [9]. Finally, the total sample size was calculated as 187 individuals.

$$n = \frac{Z^2_{1-\frac{\alpha}{2}} \, pq}{d^2}$$

All participants were requested to sign a written informed consent, and they were assured that their information would remain confidential. The study protocol was approved by the Research Ethics Committee of Mashhad University of Medical Sciences (code: IR.MUMS.REC.1399.200).

### 3.2. Outcome Measurements

Patients were asked to complete three questionnaires, including demographic data, Hospital Anxiety and Depression Scale (HADS), and Depressive Anxiety and Stress Scale 42 (DASS-42).

Demographic data included such information as age, gender, education, income level, underlying disease, number of children, marital status, physical illness under medical treatment, history of smoking, history of psychiatric disorders in patients and their first-degree relatives, history of COVID-19 infection in first-degree relatives, history of hospitalization in a psychiatric hospital, and length of hospital stay due to COVID-19 infection. The monthly income of participants was also recorded. Current and ex-smokers were considered as patients with a positive history of smoking according to their self-reports in the online questionnaire.

The Persian version of DASS-42, a 42-item self-report inventory, was used for the evaluation of negative emotional symptoms among patients. The presence and severity of symptoms of depression, anxiety, and stress were assessed using this scale. The reliability and validity of DASS-42 were approved by Antony et al. [10]. Also, the reliability and validity of the Persian version of DASS-42 had been previously confirmed [11].

The HADS is a 21-item self-report questionnaire designed to identify anxiety and depression symptoms in hospitalized patients. The reliability and validity of HADS questionnaire were confirmed by Montazeri et al. [12].

### 3.3. Statistical Analysis

For quantitative variables, the central tendency and dispersion parameter, including mean and standard deviation, and for categorical variables, the frequency and percentage were reported. For univariate analysis, the Mann-Whitney test was used to investigate differences between HADS and DASS-42 scales with sex, smoking, and history of COVID-19 virus infection. Moreover, the Kruskal-Wallis test was applied to investigate the univariate relationship of HADS and DASS-42 scales with marital status, income, and Education level. Spearman's correlation coefficients were used to evaluate the correlation between ordinal variables.

Ordinal regression with logit link was used to assess the simultaneous effect of variables. We run five models in each one of the HDAS and DASS-42 subscales, which were considered as dependent variables. All statistical analysis was performed using SPSS v.16.0 (SPSS Inc., Chicago, Illinois., USA), and p-values less than 0.05 were considered as statistically significant.

## 4. Results

The age range of patients was 33 - 80 years, and the mean age was 56.4 $\pm$ 9.6 years. The majority of patients were male (62.2%) and married (64.4%). Furthermore, the mean of hospital stay duration was 7.1 $\pm$ 1.4 days (range: 4 - 16 days). Besides, 46 (24.5%) of discharged patients had at least one individual in their family who was infected with COVID-19 (Table 1).

**Table 1.** Demographic Data of the COVID-19 Survivors (N = 188) [a]

| Variables | Values |
|---|---|
| **Age (y)** | 56.4 ± 9.6 |
| **Gender (male)** | 117 (62.2) |
| **Marital status** | |
| Married | 121 (64.4) |
| Single | 5 (2.7) |
| Divorced | 22 (11.7) |
| Deceased spouse | 40 (21.3) |
| **Offspring** | |
| No | 20 (10.6) |
| Yes | 168 (89.4) |
| **Education** | |
| Illiterate | 26 (13.6) |
| Under high school diploma | 39 (20.7) |
| High school diploma | 66 (35.1) |
| Associate's degree | 13 (6.9) |
| Bachelor's degree | 32 (17.0) |
| Master's degree and higher | 12 (6.4) |
| **Family history of COVID-19** | 46 (24.5) |
| **Hospital stay (day)** | 7.1 ± 2.16 |

[a] Values are expressed as mean ± SD or No. (%).

As illustrated in Table 2, according to the results of the HADS questionnaire, the frequency of patients in the borderline of anxiety and depression was 42 (22.3%) and 84 (44.7%), respectively. Also, the level of abnormal anxiety in discharged patients was 81 (43.1%), while this frequency for depression was 24 (12.8%).

**Table 2.** Distribution of DASS-42 and HADS in COVID-19 Survivors (N = 188) [a]

| Scale | Depression | Anxiety | Stress |
|---|---|---|---|
| **DASS-42** | | | |
| Normal | 23 (12.2) | 20 (10.6) | 74 (39.4) |
| Mild | 18 (9.6) | 2 (1.1) | 25 (13.3) |
| Moderate | 70 (37.2) | 67 (35.6) | 27 (14.4) |
| Severe | 54 (28.7) | 26 (13.8) | 61 (32.4) |
| Extremely severe | 23 (12.2) | 73 (38.8) | 1 (0.5) |
| **HADS** | | | |
| Normal | 80 (42.6) | 65 (34.6) | - |
| Borderline/abnormal | 84 (44.7) | 42 (22.3) | - |
| Abnormal | 24 (12.8) | 81 (43.1) | - |

Abbreviations: DASS, Depression Anxiety Stress Scale; HADS, Hospital Anxiety and Depression Scale.
[a] Values are expressed as No. (%).

According to the cut points of the DASS-42 questionnaire, 23 (12.2%) and 73 (38.8%) COVID-19 patients discharged from the hospital had extremely severe depression and anxiety, respectively; meanwhile, only one patient had extremely severe stress. It should be noted that 23 (12.2%), 20 (10.6%), and 74 (39.4%) patients did not have any sign of depression, anxiety, or stress. Further details are presented in Table 2.

We also evaluated the relationship between age, sex, marital status, level of education, income, the number of children, and days of hospitalization and all HDAS and DASS-42 subscales by using both univariate analysis and ordinal regressions.

In univariate correlation analysis, hospitalization days and gender were significantly related to hospital anxiety (r = 0.150, P = 0.041). After controlling the effect of age, sex, marital status, level of education, income, and the number of children, we observed a significant positive association between duration of hospitalization and HADS and DASS-42 subscales. Gender was found to have a significant association with hospital anxiety ($\beta$ = 0.80, P = 0.047). The number of children and hospital depression was significantly associated in univariate analysis (r = 0.159, P = 0.03). By controlling the effect of age, sex, marital status, level of education, income, and the duration of hospitalization, the association of the number of children and stress was significant ($\beta$ = 0.38, P = 0.02) (Tables 3 and 4).

## 5. Discussion

Survivors of critical illness may face various psychiatric disorders after hospitalization. However, few studies have investigated post-discharge psychological issues in COVID-19 patients. Here, we reported the prevalence of depression, anxiety, and stress in COVID-19 patients after their discharge.

Based on the clinical cut off point of 11 for anxiety and depression subscales of the HADS questionnaire, we found that 43.1 and 12.8% of participants experienced anxiety and depression after their hospitalization period, respectively. Also, most of the patients experienced some degree of stress (60.6%). Psychological symptoms among COVID-19 survivors may be attributed to several factors, including the high mortality rate of COVID-19 and long-term quarantine (13), which isolate the patients from their family and society (14). Besides, most of the general population receive their COVID-19-related information through social media, which often exaggerate the disease consequences leading to patients' panic and anxiety (15).

Depression reported in this study was in line with previous reports during the severe acute respiratory syndrome (SARS) epidemic (16, 17) and COVID-19 pandemic (18). However, the proportion of patients who experience anxiety was relatively high in our study. A high rate of anxiety was expected since the study was conducted in the

**Table 3.** Ordinal Regression of Factors Affecting Hospital Anxiety or Depression in COVID-19 Survivors

| Variables | Hospital Anxiety | | | | Hospital Depression | | | |
|---|---|---|---|---|---|---|---|---|
| | Estimate | P-Value | 95% CI | | Estimate | P-Value | 95% CI | |
| | | | LB | UB | | | LB | UB |
| **Age** | -0.008 | 0.75 | -0.06 | 0.04 | -0.009 | 0.74 | -0.06 | 0.04 |
| **Number of children** | 0.11 | 0.53 | -0.22 | 0.44 | 0.28 | 0.11 | -0.06 | 0.62 |
| **Days of hospitalization** | 0.37 | 0.007 | 0.09 | 0.64 | 0.32 | 0.007 | 0.08 | 0.54 |
| **Sex** | | | | | | | | |
| Male | 0.80 | 0.047 | 0.01 | 1.60 | 0.12 | 0.76 | -0.69 | 0.94 |
| Female | 0 [a] | - | - | - | 0 [a] | - | - | - |
| **Marital status** | | | | | | | | |
| Married | -0.23 | 0.62 | -1.14 | 0.68 | 0.41 | 0.39 | -0.52 | 1.35 |
| Single | -0.30 | 0.79 | -2.50 | 1.91 | -0.07 | 0.95 | -2.47 | 2.33 |
| Divorced | -0.34 | 0.58 | -1.57 | 0.88 | -0.71 | 0.29 | -2.01 | 0.60 |
| Widow/er | 0 [a] | - | - | - | 0 [a] | - | - | - |
| **Studies** | | | | | | | | |
| Illiterate | 0.12 | 0.91 | -1.90 | 2.14 | -0.66 | 0.54 | -2.77 | 1.46 |
| Secondary school | 0.50 | 0.57 | -1.24 | 2.24 | -0.05 | 0.96 | -1.88 | 1.78 |
| Highschool diploma | 0.69 | 0.41 | -0.94 | 2.31 | -0.09 | 0.92 | -1.82 | 1.63 |
| Associate's degree | 0.37 | 0.68 | -1.41 | 2.14 | 0.20 | 0.83 | -1.68 | 2.09 |
| Undergraduate | 0.69 | 0.35 | -0.77 | 2.16 | 0.10 | 0.89 | -1.47 | 1.68 |
| Postgraduate | 0 [a] | - | - | - | 0 [a] | - | - | - |
| **Monthly Income ($)** | | | | | | | | |
| 0 | 0.56 | 0.52 | -1.13 | 2.25 | 0.24 | 0.79 | -1.53 | 2.00 |
| < 70 | 0.29 | 0.71 | -1.27 | 1.86 | 0.86 | 0.30 | -0.78 | 2.50 |
| 70 - 200 | 0.49 | 0.51 | -1.00 | 1.99 | 0.02 | 0.98 | -1.55 | 1.59 |
| 200 - 350 | 0.004 | 0.99 | -1.62 | 1.69 | -0.90 | 0.31 | -2.64 | 0.84 |
| More than 350 | 0 [a] | - | - | - | 0 [a] | - | - | - |
| **Smoking** | | | | | | | | |
| No | 0.54 | 0.13 | -0.17 | 1.26 | 0.36 | 0.34 | -0.38 | 1.09 |
| Yes | 0 [a] | - | - | - | 0 [a] | - | - | - |
| **Family history of COVID-19** | | | | | | | | |
| No | 0.31 | 0.38 | -0.38 | 1.01 | 0.33 | 0.36 | -0.39 | 1.06 |
| Yes | 0 [a] | - | - | - | 0 [a] | - | - | - |

Abbreviations: LB, lower bound; UP, upper bound.
[a] This parameter is reference.

period COVID-19 was newly emerged in Iran, making the country one of the most endemic regions in the world. This situation, along with the unknown disease progress and the lack of sufficient treatment in the early phases of the COVID-19 epidemic raised the fear of survival among patients. Anxiety and psychoticism were indicated as the two major mental health problems in COVID-19 survivors [19]. A similar prevalence of anxiety and depression was reported among the survivors of SARS and Middle East respiratory syndrome (MERS) epidemics [20, 21]. Conversely, Wu et al. [18] observed a lower level of anxiety (13.5%) among COVID-19 survivors compared to our study. Also, several studies reported the anxiety range as 10 - 18% among discharged pa-

tients with SARS infection [17, 22]. The discrepancy between our study and these investigations may result from different sociodemographic backgrounds between the study populations, follow-up intervals, and tools for evaluating anxiety.

Various factors, including post-discharge respiratory symptoms, gender, and concerns about recurrence and disease transmission to others, have been described as the determinant of adverse psychological evens during the recovery period of COVID-19 patients [18]. We found that longer hospitalization is independently associated with higher stress, anxiety, and depression. The association of psychological outcome with length of hospital stay has

**Table 4.** Ordinal Regression of Factors Affecting DASS-42 Scores in COVID-19 Survivors (Link = Logit) [a]

| Variables | Depression | | | | Anxiety | | | | Stress | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | Estimate | P-Value | 95% CI | | Estimate | P-Value | 95% CI | | Estimate | P-Value | 95% CI | |
| | | | LB | UB | | | LB | UB | | | LB | UB |
| Age | -0.02 | 0.47 | -0.07 | 0.03 | -0.01 | 0.64 | -0.06 | 0.04 | -0.04 | 0.15 | -0.08 | 0.01 |
| Number of children | 0.31 | 0.06 | -0.01 | 0.62 | 0.15 | 0.35 | -0.17 | 0.47 | 0.38 | 0.02 | 0.05 | 0.71 |
| Hospitalization days | 0.33 | 0.003 | 0.11 | 0.55 | 0.27 | 0.02 | 0.03 | 0.51 | 0.39 | 0.002 | 0.14 | 0.64 |
| Sex | | | | | | | | | | | | |
| Male | 0.30 | 0.44 | -0.45 | 1.06 | 0.07 | 0.86 | -0.70 | 0.84 | 0.22 | 0.58 | -0.55 | 0.99 |
| Female | 0 [a] | - | - | - | 0 [a] | - | - | - | 0 [a] | - | - | - |
| Marital status | | | | | | | | | | | | |
| Married | -0.66 | 0.14 | -1.53 | 0.22 | -0.76 | 0.10 | -1.68 | 0.15 | -0.56 | 0.22 | -1.45 | 0.33 |
| Single | -0.36 | 0.74 | -2.45 | 1.78 | -0.08 | 0.94 | -2.27 | 2.11 | 0.008 | 0.99 | -2.19 | 2.21 |
| Divorced | -0.02 | 0.97 | -1.19 | 1.14 | -0.82 | 0.18 | -2.03 | 0.38 | -0.41 | 0.50 | -1.62 | 0.79 |
| Widow/er | 0 [a] | - | - | - | 0 [a] | - | - | - | 0 [a] | - | - | - |
| Studies | | | | | | | | | | | | |
| Illiterate | 0.20 | 0.84 | -1.74 | 2.13 | 0.36 | 0.72 | -1.61 | 2.33 | 1.09 | 0.29 | -0.95 | 3.12 |
| Secondary school | 0.65 | 0.44 | -1.01 | 2.32 | 0.57 | 0.51 | -1.13 | 2.26 | 0.72 | 0.42 | -1.04 | 2.48 |
| Highschool diploma | 0.90 | 0.25 | -0.65 | 2.44 | 0.82 | 0.31 | -0.75 | 2.39 | 1.11 | 0.19 | -0.54 | 2.76 |
| Associate's degree | 0.61 | 0.48 | -1.09 | 2.29 | 0.41 | 0.64 | -1.31 | 2.13 | 0.72 | 0.43 | -1.08 | 2.52 |
| Undergraduate | 0.91 | 0.20 | -0.49 | 2.31 | 0.96 | 0.19 | -0.46 | 2.38 | 1.25 | 0.10 | -0.25 | 2.75 |
| Postgraduate | 0 [a] | - | - | - | 0 [a] | - | - | - | 0 [a] | - | - | - |
| Monthly income ($) | | | | | | | | | | | | |
| 0 | 0.28 | 0.73 | -1.34 | 1.91 | -0.42 | 0.62 | -2.08 | 1.24 | -0.04 | 0.96 | -1.74 | 1.66 |
| < 70 | 0.54 | 0.48 | -0.96 | 2.04 | 0.18 | 0.82 | -1.35 | 1.71 | 0.46 | 0.57 | -1.12 | 2.04 |
| 70 - 200 | 0.50 | 0.49 | -0.93 | 1.93 | 0.06 | 0.94 | -1.40 | 1.52 | 0.53 | 0.49 | -0.98 | 2.04 |
| 200 - 350 | 0.15 | 0.85 | -1.39 | 1.69 | -0.41 | 0.61 | -1.98 | 1.16 | 0.09 | 0.91 | -1.57 | 1.75 |
| More than 350$ | 0 [a] | - | - | - | 0 [a] | - | - | - | 0 [a] | - | - | - |
| Smoking | | | | | | | | | | | | |
| No | 0.42 | 0.23 | -0.26 | 1.09 | 0.35 | 0.33 | -0.34 | 1.04 | 0.70 | 0.06 | -0.02 | 1.41 |
| Yes | 0 [a] | - | - | - | 0 [a] | - | - | - | 0 [a] | - | - | - |
| Family history of COVID-19 | | | | | | | | | | | | |
| No | 0.55 | 0.11 | -0.12 | 1.22 | 0.27 | 0.43 | -0.41 | 0.95 | 0.67 | 0.06 | -0.03 | 1.37 |
| Yes | 0 [a] | - | - | - | 0 [a] | - | - | - | 0 [a] | - | - | - |

Abbreviations: LB, lower bound; UP, upper bound.

[a] This parameter is reference.

been described in numerous studies (23, 24). However, this factor is not mentioned as a risk factor for psychological problems in COVID-19 survivors.

The current study found that people having more children had higher post-discharge stress. Arguably, this may be resulted from the parents' concerns about disease transmission to their children and what might happen to them should they fall ill. In this regard, Lauri Korajlija et al. (25) showed that parents, especially mothers, are at a greater risk of amplified concerns during the COVID-19 pandemic. The same results were obtained by studies during the swine flu epidemic, where parental status was recognized as a risk factor for anxiety and fear (26, 27).

This study had some potential limitations. First, we did not consider the effect of recurrence, reinfection, or the residual symptoms of the disease in the patients. Previous studies showed that recurrence is a significant determinant of decreased mental status. Second, the use of HADS to evaluate anxiety and depression is debated in the literature. Coyne et al. (28) showed that the HADS is unable to differentiate anxiety and depression. However, various studies applied HADS as a reliable and valid instrument. Besides, our findings were consistent with HADS when using an alternative tool (DASS-21). Finally, it should be mentioned that no operational definitions of being 'smoker', 'ex-smoker', and having a 'history of smoking' were provided to the participants in our demographic questionnaire because we supposed that technical detailed defini-

tions might result in confusion in a self-administered online questionnaire for subjects with different educational levels; this might have caused some inaccuracy in smoking data.

*5.1. Conclusion*

We found relatively high rates of anxiety (43.1%), severe stress (32.4%), and depression (12.8%) among COVID-19 survivors. Length of hospital stay, number of children, and gender were associated with adverse psychological outcomes, including anxiety, depression, and stress. Our results also suggested that COVID-19 patients commonly experience some degree of anxiety and stress.

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## Footnotes

## References

1. Guan WJ, Ni ZY, Hu Y, Liang WH, Ou CQ, He JX, et al. Clinical characteristics of coronavirus disease 2019 in China. *N Engl J Med*. 2020;**382**(18):1708–20. doi: 10.1056/NEJMoa2002032. [PubMed: 32109013]. [PubMed Central: PMC7092819].

2. Terrizzi JA, Shook NJ, McDaniel MA. The behavioral immune system and social conservatism: A meta-analysis. *Evol Hum Behav*. 2013;**34**(2):99–108. doi: 10.1016/j.evolhumbehav.2012.10.003.

3. Xiang YT, Yang Y, Li W, Zhang L, Zhang Q, Cheung T, et al. Timely mental health care for the 2019 novel coronavirus outbreak is urgently needed. *Lancet Psychiatry*. 2020;**7**(3):228–9. doi: 10.1016/S2215-0366(20)30046-8. [PubMed: 32032543]. [PubMed Central: PMC7128153].

4. Lai J, Ma S, Wang Y, Cai Z, Hu J, Wei N, et al. Factors associated with mental health outcomes among health care workers exposed to Coronavirus disease 2019. *JAMA Netw Open*. 2020;**3**(3). e203976. doi: 10.1001/jamanetworkopen.2020.3976. [PubMed: 32202646]. [PubMed Central: PMC7090843].

5. Jakovljevic M, Bjedov S, Jaksic N, Jakovljevic I. COVID-19 pandemia and public and global mental health from the perspective of global health securit. *Psychiatr Danub*. 2020;**32**(1):6–14. doi: 10.24869/psyd.2020.6. [PubMed: 32303023].

6. Dong L, Bouey J. Public mental health crisis during COVID-19 pandemic, China. *Emerg Infect Dis*. 2020;**26**(7):1616–8. doi: 10.3201/eid2607.200407. [PubMed: 32202993]. [PubMed Central: PMC7323564].

7. Dai Y, Hu G, Xiong H, Qiu H, Yuan X. Psychological impact of the coronavirus disease 2019 (COVID-19) outbreak on healthcare workers in China. *medRxiv*. 2020;**Preprint**. doi: 10.1101/2020.03.03.20030874.

8. Zhu Z, Xu S, Wang H, Liu Z, Wu J, Li G, et al. COVID-19 in Wuhan: Sociodemographic characteristics and hospital support measures associated with the immediate psychological impact on healthcare workers. *EClinicalMedicine*. 2020;**24**:100443. doi: 10.1016/j.eclinm.2020.100443. [PubMed: 32766545]. [PubMed Central: PMC7311903].

9. Kong X, Zheng K, Tang M, Kong F, Zhou J, Diao L, et al. Prevalence and factors associated with depression and anxiety of hospitalized patients with COVID-19. *medRxiv*. 2020;**Preprint**. doi: 10.1101/2020.03.24.20043075.

10. Antony MM, Bieling PJ, Cox BJ, Enns MW, Swinson RP. Psychometric properties of the 42-item and 21-item versions of the Depression Anxiety Stress Scales in clinical groups and a community sample. *Psychol Assess*. 1998;**10**(2):176–81. doi: 10.1037/1040-3590.10.2.176.

11. Habibi M, Dehghani M, Pooravari M, Salehi S. Confirmatory factor analysis of persian version of depression, anxiety and stress (DASS-42): Non-clinical sample. *Razavi Int J Med*. 2017;**5**(4). e12021. doi: 10.5812/rijm.12021.

12. Montazeri A, Vahdaninia M, Ebrahimi M, Jarvandi S. The Hospital Anxiety and Depression Scale (HADS): Translation and validation study of the Iranian version. *Health Qual Life Outcomes*. 2003;**1**:14. doi: 10.1186/1477-7525-1-14. [PubMed: 12816545]. [PubMed Central: PMC161819].

13. Webster P. Virtual health care in the era of COVID-19. *Lancet*. 2020;**395**(10231):1180–1. doi: 10.1016/S0140-6736(20)30818-7. [PubMed: 32278374]. [PubMed Central: PMC7146660].

14. Yao H, Chen JH, Xu YF. Patients with mental health disorders in the COVID-19 epidemic. *Lancet Psychiatry*. 2020;**7**(4). e21. doi: 10.1016/S2215-0366(20)30090-0. [PubMed: 32199510]. [PubMed Central: PMC7269717].

15. Chen Q, Min C, Zhang W, Wang G, Ma X, Evans R. Unpacking the black box: How to promote citizen engagement through government social media during the COVID-19 crisis. *Comput Human Behav*. 2020;**110**:106380. doi: 10.1016/j.chb.2020.106380. [PubMed: 32292239]. [PubMed Central: PMC7151317].

16. Mak IW, Chu CM, Pan PC, Yiu MG, Chan VL. Long-term psychiatric morbidities among SARS survivors. *Gen Hosp Psychiatry*. 2009;**31**(4):318–26. doi: 10.1016/j.genhosppsych.2009.03.001. [PubMed: 19555791]. [PubMed Central: PMC7112501].

17. Wu KK, Chan SK, Ma TM. Posttraumatic stress after SARS. *Emerg Infect Dis*. 2005;**11**(8):1297–300. doi: 10.3201/eid1108.041083. [PubMed: 16102324]. [PubMed Central: PMC3320475].

18. Wu H, Hu X, Song J, Du C, Song Y, Yang D, et al. Mental health status of survivors following COVID-19 in Wuhan, China: A descriptive study. *SSRN Electronic Journal*. 2020;**Preprint**. doi: 10.2139/ssrn.3559616.

19. Chen B, Wang Y, Yang T, Li C, Sun Z. Mental health among COVID-19 survivors and healthcare workers exposed to COVID-19 in Wuhan, China: A cross-sectional study. *Research Square*. 2020;**Preprint**. doi: 10.21203/rs.3.rs-30351/v1.

20. Cheng SKW, Wong CW. Psychological intervention with sufferers from severe acute respiratory syndrome (SARS): Lessons learnt from empirical findings. *Clin Psychol Psychother*. 2005;**12**(1):80–6. doi: 10.1002/cpp.429.

21. Shin J, Park HY, Kim JL, Lee JJ, Lee H, Lee SH, et al. Psychiatric Morbidity of Survivors One Year after the Outbreak of Middle East Respiratory Syndrome in Korea, 2015. *J Korean Neuropsychiatr Assoc*. 2019;**58**(3):245–51. doi: 10.4306/jknpa.2019.58.3.245.

22. Wu KK, Chan SK, Ma TM. Posttraumatic stress, anxiety, and depression in survivors of severe acute respiratory syndrome (SARS). *J Trauma Stress*. 2005;**18**(1):39–42. doi: 10.1002/jts.20004. [PubMed: 16281194]. [PubMed Central: PMC7166878].

23. O'Brien KH, Lushin V. Examining the impact of psychological factors on hospital length of stay for burn survivors: A systematic review. *J Burn Care Res*. 2019;**40**(1):12–20. doi: 10.1093/jbcr/iry040. [PubMed: 30020458]. [PubMed Central: PMC6784411].

24. Basak F, Hasbahceci M, Guner S, Sisik A, Acar A, Yucel M, et al. Prediction of anxiety and depression in general surgery inpatients: A prospective cohort study of 200 consecutive patients. *Int J Surg*. 2015;**23**(Pt A):18–22. doi: 10.1016/j.ijsu.2015.09.040. [PubMed: 26384837].

25. Lauri Korajlija A, Jokic-Begic N. COVID-19: Concerns and behaviours in Croatia. *Br J Health Psychol*. 2020. doi: 10.1111/bjhp.12425. [PubMed: 32779816]. [PubMed Central: PMC7276766].

26. Remmerswaal D, Muris P. Children's fear reactions to the 2009 Swine Flu pandemic: The role of threat information as provided by parents. *J Anxiety Disord*. 2011;**25**(3):444–9. doi: 10.1016/j.janxdis.2010.11.008. [PubMed: 21159486].

27. Rubin GJ, Amlot R, Page L, Wessely S. Public perceptions, anxiety, and behaviour change in relation to the swine flu outbreak: Cross sectional telephone survey. *BMJ*. 2009;**339**:b2651. doi: 10.1136/bmj.b2651. [PubMed: 19574308]. [PubMed Central: PMC2714687].

28. Coyne JC, van Sonderen E. No further research needed: Abandoning the Hospital and Anxiety Depression Scale (HADS). *J Psychosom Res*. 2012;**72**(3):173–4. doi: 10.1016/j.jpsychores.2011.12.003. [PubMed: 22325694].