

## Article

# Mental Health of the General Population during the 2019 Coronavirus Disease (COVID-19) Pandemic: A Tale of Two Developing Countries

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**Abstract:** Background: This study aimed to compare the severity of psychological impact, anxiety and depression between people from two developing countries, Iran and China, and to correlate mental health parameters with variables relating to the COVID-19 pandemic. Although China and Iran are developing countries based on the World Bank's criteria, these two countries are different in access to resources and health care systems. We hypothesized that Iranians would show higher levels of depression, anxiety and stress as compared to Chinese. Methods: This study collected information related to the COVID-19 pandemic including physical health, precautionary measures and knowledge about the pandemic. We also used validated questionnaires such as the Impact of Event Scale-Revised (IES-R) and the Depression, Anxiety and Stress Scale (DASS-21) to assess the mental health status. Results: There were a total of 1411 respondents (550 from Iran; 861 from China). The mean IES-R scores of respondents from both countries were above the cut-off for post-traumatic stress disorder (PTSD) symptoms. Iranians had significantly higher levels of anxiety and depression ( $p < 0.01$ ). Significantly more Iranians believed COVID-19 was transmitted via contact, practised hand hygiene, were unsatisfied with health information and expressed less confidence in their doctors, but were less likely to wear a facemask ( $p < 0.001$ ). Significantly more Iranians received health information related to COVID-19 via television while Chinese preferred the Internet ( $p < 0.001$ ). Conclusions: This cross-country study found that Iranians had significantly higher levels of anxiety and depression as compared to Chinese. The difference in reported measures between respondents from Iran and China were due to differences in access to healthcare services and governments' responses to the pandemic.

**Keywords:** anxiety; China; coronavirus; COVID-19; depression; developing countries; Iran; knowledge; pandemic; precaution; psychological impact; stress

## 1. Introduction

China was one of the first countries that identified the novel coronavirus as the cause of the coronavirus disease 2019 (COVID-19) pandemic [1]. As of May 4, the number of confirmed COVID-19 cases was 82,880, the number of deaths was 4633 and the number of recovered cases was 77,766 in China [2]. Quarantine and other measures were successful in reducing the transmission of COVID-19 in the early stage of pandemic. The Chinese authorities imposed lockdown measures to restrict travel. The lockdown took place before the Chinese New Year when typically a massive annual human migration occurs in China. Due to a large number of cases, the central government of China deployed military and medical personnel at a rapidly completed hospital specially designed to treat patients suffering from COVID-19 [3].

In Iran, the number of COVID-19 cases surged on March 1, with 987 confirmed cases and 54 deaths [4]. In May, the number of confirmed cases increased to 97,424, and there were 6203 deaths in Iran [2]. One of the main reasons behind the drastic increase of COVID-19 cases was due to the new year vacation (Nowruz) when Iranians travelled across the country to visit their relatives. The Iranian Government imposed several public health measures including cancellation of prayers in mosques, closure of public facilities and the prohibition of driving cars.

The COVID-19 pandemic is putting the general public under more pressure than ever before [5]. The social isolation, disruption in everyday life and false information about the pandemic caused anxiety, depression and panic buying of daily items [6]. China and Iran are two developing countries that are most severely affected by COVID-19 in Asia [2]. The gross national income (GNI) per capita of China and Iran are USD 9460 and 5479, respectively, below the cut-off GNI per capita (set at USD 12,055) for developed countries, based on the World Bank's criteria [7]. Although China and Iran are both developing countries, these two countries are different in regards to access to resources and health care systems. Due to economic sanctions, inadequate medical supplies have taken a toll on the Iranian health systems [8]. Recent studies reported the psychological impact of the pandemic on Chinese [9–11] and Iranians [12] during the pandemic separately. A recent report found that Iranians seemed to have higher levels of peritraumatic distress than Chinese [13] but this study did not perform a direct statistical comparison between two countries. As a result, we proposed a novel study to conduct an in-depth and cross-country analysis of the mental health of the Chinese and Iranian population during the pandemic. It addressed the knowledge gaps regarding the psychological impact of the pandemic on developing countries.

This study aimed: (a) to compare the levels of psychological impact, depression, anxiety and stress between Iranians and Chinese during the pandemic; (b) to correlate psychological impact, depression, anxiety and stress scores with variables relating to precautionary measures physical symptoms, knowledge and concerns about COVID-19 and in Iranian and Chinese respondents. We hypothesized that Iranians would show higher levels of depression, anxiety and stress as compared to Chinese.

## 2. Methods

### 2.1. Study Design and Participants

We conducted a cross-country study to compare the psychological impact of the COVID-19 pandemic on people living in Iran and China. The study was conducted from February 28 to March 1 in China and March 24 to 26 in Iran when the number of COVID-19 cases peaked in both countries. A respondent driven sampling strategy was utilized to recruit participants from both countries.

### 2.2. Procedure

As both governments recommended that the public isolate themselves and reduce contact during the study period, new participants were invited by existing participants through electronic means. The respondents submitted their responses through an online survey platform after providing their informed consent. The Institutional Review Board

of both universities approved the project (Huaibei Normal University, Proposal Number: HBU-IRB-2020-002); Islamic Azad University, Protocol Number: IRB-2020-001). The collected data were anonymous and treated as confidential.

### 2.3. Outcomes

This study used the COVID-19 National University of Singapore questionnaire, and its psychometric properties had been established in the beginning and peak of the COVID-19 epidemic [14,15]. The COVID-19 National University of Singapore questionnaire covered contact history, physical health (e.g., symptoms resembling COVID-19 infection and use of medical services), knowledge about the pandemic (e.g., source of information, route of transmission), precautionary measures (e.g., hand hygiene, use of face mask) and socio-demographic information (e.g., gender, age, household size).

The psychological impact of COVID-19 was measured by standardized and validated questionnaires including the Impact of Event Scale-Revised (IES-R) scale [16,17] that measures avoidance, intrusion and hyperarousal after a traumatic event [18] and the Depression, Anxiety and Stress Scale (DASS-21) [19]. An IES-R score of 24–32 indicates mild psychological impact; an IES-R score of 33–36 indicates moderate psychological impact and an IES-R higher than 37 indicates severe psychological impact [20]. The IES-R score higher than 24 qualifies for post-traumatic stress disorder (PTSD) symptoms [21]. The IES-R was previously used to assess general population and workers during the haze crisis [22] and COVID-19 pandemic [23–25]. The DASS-21 was validated in Chinese [26,27] and Iranians [28] prior to the pandemic. The IES-R and DASS-21 were used in mental health research related to the COVID-19 epidemic [14,29,30]. The internal consistency of IES-R and DASS-21 stress, anxiety and depression scales were measured by the Cronbach's alpha. In this study, the Cronbach's alpha for Chinese and Iranian versions of DASS-21 was as follows: IES-R for China: 0.949, IES-R for Iran: 0.912, DASS-21 for China: stress: 0.888, anxiety: 0.845, depression: 0.878 and DASS-21 for Iran: stress: 0.934, anxiety: 0.891, depression: 0.94.

### 2.4. Statistical Analysis

Descriptive statistics were calculated for all domains under the COVID-19 National University of Singapore questionnaire. The independent sample t-test was used to analyse the differences in means in IES-R and DASS-21 subscales between the Chinese and Iranian respondents. The chi-squared test was used to analyze the differences in categorical variables between Iranian and Chinese. We used linear regressions to calculate the univariate associations between independent variables including all domains in the COVID-19 National University of Singapore questionnaire and dependent variables including the IES-S score and DASS-21 subscale scores for the Chinese and Iranian respondents separately. All tests were two-tailed, with a significance level of  $p < 0.01$  and the significance level was corrected by the Bonferroni's method due to multiple comparisons. Statistical analysis was performed using the SPSS Statistic Software Version 21.0 (IBM SPSS Statistics, New York, NY, USA).

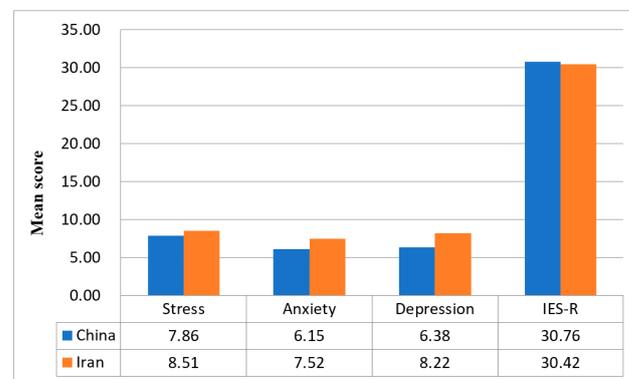
## 3. Results

### 3.1. Comparison between the Iranian and Chinese Respondents

There were 888 Iranian respondents, with 338 Iranian respondents who did not complete the questionnaires. As a result, a total of 550 Iranian respondents from 73 cities in Iran completed the questionnaires (61.94%). There were 861 Chinese respondents out of a total of 865 (99.53%) who provided valid questionnaires from 159 cities in China. There were thus a total of 1411 individual respondents from Iran and China who participated in this study.

For the DASS-stress subscale ( $M_{\text{China}} = 7.86$ ,  $SD_{\text{China}} = 7.93$ ;  $M_{\text{Iran}} = 8.51$ ,  $SD_{\text{Iran}} = 10.61$ ), the difference between two countries was insignificant ( $t = -1.24$ ,  $p > 0.05$ , 95%CI  $-1.69$  to  $0.38$ ) (see Figure 1). For the DASS-anxiety subscale ( $M_{\text{China}} = 6.15$ ,  $SD_{\text{China}} = 6.94$ ;  $M_{\text{Iran}} = 7.52$ ,  $SD_{\text{Iran}} = 8.90$ ), Chinese had significantly lower anxiety scores ( $t = -3.07$ ,  $p < 0.01$ , 95%CI  $-2.25$  to  $-0.49$ ). For the DASS-depression subscale ( $M_{\text{China}} = 6.38$ ,  $SD_{\text{China}} = 7.39$ ;  $M_{\text{Iran}} = 8.22$ ,  $SD_{\text{Iran}} = 10.90$ ), Chinese had significantly lower depression scores ( $t = -3.48$ ,  $p < 0.01$ , 95%CI

−2.88 to −0.80). For IES-R ( $M_{\text{China}} = 30.76$ ,  $SD_{\text{China}} = 16.34$ ;  $M_{\text{Iran}} = 30.42$ ,  $SD_{\text{Iran}} = 15.82$ ), there was no significant difference between two countries ( $t = 0.39$ ,  $p > 0.05$ , 95%CI −1.38 to 2.06). As the mean IES-R scores for Chinese and Iranian respondents were higher than 24 points, indicating the presence of PTSD symptoms in both samples.



**Figure 1.** Comparison of the mean scores of DASS-stress, anxiety and depression subscales as well as IES-R scores between Iranian and Chinese respondents.

### 3.2. Comparison between Socio-Demographic Characteristics and Mental Health in Iranian and Chinese

About 72.9% of Iranian respondents were women; 27.5% were young adults with an average age of 21.4 to 30.8 years; 64% lived in a households of 3–5 people size (64%); 42.7% were students and 95.5% possessed a bachelor's or higher degree. About 75% of Chinese respondents were women; 46.5% were young adults aged 21.4 to 30.8 years; 80.4% lived having a household of 3–5 people size; 62.8% were students and 87.6% possessed a bachelor's or higher degree. There were a significantly higher proportion of Iranian respondents who were older (30.8–40.2 years of age), had no children, lived alone and were employed ( $p < 0.001$ ) (see Supplementary Table S1).

### 3.3. The Relationship between Socio-Demographic Characteristics and Mental Health in Iranian and Chinese

For Chinese respondents, male gender was significantly associated with a lower score of IES-R but higher DASS depression scores ( $p < 0.01$ ) (see Table 1). There were no significant association between parental status, household size, education levels and employment status and mental health parameters in Chinese and Iranians.

### 3.4. Comparison between Physical Health Parameters and Mental Health Status in Chinese and Iranian

There were a significantly higher proportion of Iranians who reported fever ( $p < 0.001$ ), chills ( $p < 0.001$ ), headache ( $p < 0.001$ ), myalgia ( $p < 0.001$ ), cough ( $p < 0.001$ ), breathing difficulty ( $p < 0.001$ ), dizziness ( $p < 0.001$ ), coryza ( $p < 0.001$ ), sore throat ( $p < 0.001$ ), nausea and vomiting ( $p < 0.001$ ), consultation with the doctor ( $p < 0.01$ ) in past 14 days and chronic illness ( $p < 0.01$ ) as compared to Chinese (see Supplementary Table S2). There were no significant differences in the medical insurance coverage between the two countries ( $p > 0.05$ ). Significantly higher proportion of Iranians had direct and indirect contact with patients with a confirmed diagnosis of COVID-19 ( $p < 0.01$ ).

### 3.5. The Relationship between Physical Health Parameters and Mental Health Status in Chinese and Iranian

Linear regression showed that headache and fair rating of health status were significantly associated with higher IES-R scores, DASS stress, anxiety and depression subscale scores in both countries ( $p < 0.001$ ) (see Table 2). In contrast, myalgia and gastrointestinal symptoms were significantly associated with higher DASS stress, anxiety and depression

subscale scores in both countries ( $p < 0.001$ ). Contact history with patients diagnosed with COVID patients was not associated with IES-R and DASS-21 scores ( $p > 0.05$ ) in both countries. Despite the above similarity, there were differences. Fever, chills, myalgia, cough, dizziness, sore throat, coryza were significantly associated with higher IES-R scores, DASS stress, anxiety or depression subscale scores in Chinese ( $p < 0.001$ ) but not Iranians.

**Table 1.** The linear regression analysis between demographic variables and mental health parameters in Iranian and Chinese respondents ( $n= 1411$ ).

Demographic Variables	Iran								China							
	Impact of Event		Stress		Anxiety		Depression		Impact of Event		Stress		Anxiety		Depression	
	B	t	B	t	B	t	B	t	B	t	B	t	B	t	B	t
<b>Gender</b>																
Male	-0.32	-2.60	-0.15	-1.41	-0.23	-1.60	-0.16	-1.26	-0.26	-2.61 **	0.08	1.38	0.18	1.90	0.22	2.89 **
Female			Reference								Reference					
<b>Age range (years)</b>																
12-21.4	-0.31	-1.25	0.17	0.82	0.09	0.30	0.11	0.41	0.77	2.28	-0.03	-0.16	0.29	0.92	-0.02	-0.07
21.4-30.8	-0.10	-0.41	0.29	1.39	0.11	0.38	0.19	0.72	0.59	1.75	0.02	0.08	0.36	1.17	0.09	0.36
30.8-40.2	0.01	0.04	0.25	1.20	0.10	0.33	0.17	0.67	0.63	1.62	-0.03	-0.15	0.29	0.80	0.03	0.12
40.2-49.6	-0.10	-0.36	0.10	0.43	<0.001	<0.001	0.01	0.02	0.26	0.70	-0.15	-0.70	-0.02	-0.05	-0.18	-0.63
>49.6			Reference								Reference					
<b>Status as a parent</b>																
Has a child 16 years or younger	0.20	1.61	-0.20	-1.96	-0.15	-1.04	-0.21	-1.68	0.12	0.94	0.03	0.34	0.11	0.87	0.09	0.88
Has a child older than 16 years	0.37	2.37	0.03	0.26	0.09	0.49	0.04	0.26	0.10	0.96	0.003	0.06	-0.03	-0.34	-0.02	-0.29
No children			Reference								Reference					
<b>Household size</b>																
6 people or more	-0.21	-0.98	-0.15	-0.83	-0.40	-1.56	-0.31	-1.40	1.44	2.20	0.50	1.32	0.84	1.40	0.12	0.24
3-5 people	-0.09	-0.56	-0.17	-1.23	-0.28	-1.49	-0.26	-1.56	1.32	2.04	0.45	1.19	0.77	1.29	0.06	0.13
2 people	0.02	0.08	-0.18	-0.95	-0.41	-1.52	-0.34	-1.47	1.19	1.76	0.44	1.12	0.61	0.99	-0.16	-0.31
Stay alone			Reference								Reference					
<b>Education Level</b>																
Primary school	1.50	1.17	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-0.58	-0.70	0.50	1.04	1.00	1.31	1.00	1.59
Secondary school	0.83	0.88	0.67	0.83	1.38	1.24	1.00	1.02	0.51	0.94	0.49	1.54	0.84	1.68	0.63	1.54
University-Bachelor	0.92	1.00	0.58	0.75	1.09	1.02	0.81	0.86	0.79	1.51	0.44	1.43	0.73	1.51	0.53	1.33
University-Master	0.85	0.93	0.69	0.90	1.18	1.09	0.95	1.01	0.75	1.38	0.52	1.67	0.98	1.99	0.69	1.69
University-Doctorate	0.61	0.66	0.39	0.50	0.72	0.66	0.54	0.57	0.17	0.25	0.33	0.85	0.33	0.54	0.56	1.08
None			Reference								Reference					
<b>Employment status</b>																
Student	-0.09	-0.71	-0.05	-0.46	0.03	0.21	-0.05	-0.42	-0.63	-0.85	-0.12	-0.27	-0.75	-1.10	-0.19	-0.34
Unemployed	0.17	0.69	0.11	0.53	0.02	0.06	0.03	0.13	0.06	0.30	0.10	0.91	0.29	1.67	0.32	2.25
Housewife	0.17	0.79	-0.05	-0.29	0.12	0.47	-0.10	-0.45	-0.52	-1.99	-0.03	-0.17	0.10	0.40	0.10	0.47
Retired	0.37	0.98	0.07	0.21	0.54	1.19	0.16	0.41	-0.16	-1.64	-0.01	-0.20	-0.01	-0.10	0.06	0.74
Employed			Reference								Reference					

\*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ . B represents the slope of the line between the predictor variable and the dependent variable. t represents the precision with which the regression coefficient is measured.

### 3.6. Comparison between Knowledge and Concerns about COVID-19 and Mental Health in Chinese and Iranian

Chinese and Iranian respondents held different views in terms of knowledge and concerns related to COVID-19 (see Supplementary Table S3). For the routes of transmission, there were significantly more Iranians who were uncertain about transmission by droplets ( $p < 0.001$ ). There were significantly more Iranians who agreed with transmission by contact via contaminated objects ( $p < 0.001$ ). For the detection and risk of contracting COVID-19, there were significantly more Chinese who expressed confidence in their doctors ( $p < 0.001$ ), who less likely to contract COVID-19 ( $p < 0.001$ ) and more likely to survive if infected ( $p < 0.001$ ). In contrast, there were significantly more Iranians who were worried about their family members contracting COVID-19 ( $p < 0.001$ ). For health information, there were significantly more Iranians who were unsatisfied with the amount of health information available ( $p < 0.001$ ). Most Iranians obtained information about COVID-19 from the television (48.5%) while most Chinese obtained information from the Internet (93.3%), and the difference was significant ( $p < 0.001$ ).

**Table 2.** The linear regression analysis between physical health and mental health parameters in Iranian and Chinese respondents ( $n = 1411$ ).

Symptoms and Physical Health Status	Iran								China							
	Impact of Event		Stress		Anxiety		Depression		Impact of Event		Stress		Anxiety		Depression	
	B	t	B	t	B	t	B	t	B	t	B	t	B	t	B	t
<b>Persistent Fever</b>																
Yes	0.32	1.23	0.27	1.21	0.42	1.35	0.45	1.65	1.43	1.11	3.55	4.81 ***	3.24	2.75 **	3.44	3.56 ***
No					Reference							Reference				
<b>Chills</b>																
Yes	0.28	1.14	0.23	1.12	0.30	1.06	0.30	1.22	0.69	1.84	0.90	4.16 ***	0.83	2.42	0.87	3.08 **
No					Reference							Reference				
<b>Headaches</b>																
Yes	0.41	3.55 ***	0.49	5.13 ***	0.76	5.73 ***	0.64	5.48 ***	0.59	3.02 **	0.46	4.07 ***	0.76	4.26 ***	0.51	3.45 **
No					Reference							Reference				
<b>Myalgia</b>																
Yes	0.19	1.21	0.56	4.41 ***	0.63	3.52 ***	0.60	3.87 ***	0.50	2.83 **	0.42	4.13 ***	0.59	3.67 ***	0.58	4.42 ***
No					Reference							Reference				
<b>Cough</b>																
Yes	-0.03	-0.22	0.17	1.42	0.15	0.93	0.16	1.15	0.48	1.95	0.61	4.25 ***	0.69	3.03 **	0.68	3.64 ***
No					Reference							Reference				
<b>Difficulty Breathing</b>																
Yes	0.11	0.55	0.23	1.44	0.29	1.29	0.25	1.26	0.77	1.46	1.06	3.47 **	1.08	2.23	1.45	3.66 ***
No					Reference							Reference				
<b>Dizziness</b>																
Yes	0.41	2.27	0.29	1.90	0.36	1.70	0.31	1.65	0.98	4.20 ***	0.80	6.00 ***	0.95	4.42 ***	0.66	3.72 ***
No					Reference							Reference				
<b>Coryza</b>																
Yes	-0.03	-0.17	0.20	1.48	0.23	1.24	0.19	1.18	0.66	3.40 **	0.33	2.90 **	0.52	2.94 **	0.53	3.64 ***
No					Reference							Reference				
<b>Sore Throat</b>																
Yes	0.22	1.55	0.25	2.14	0.37	2.28	0.29	2.01	0.35	1.50	0.60	4.53 ***	0.80	3.77 ***	0.75	4.31 ***
No					Reference							Reference				
<b>Nausea, Vomiting &amp; Diarrhea</b>																
Yes	0.50	2.70 **	0.67	4.31 ***	0.89	4.08 ***	0.80	4.21 ***	0.72	1.48	1.27	4.54 ***	1.39	3.11 **	1.31	3.56 ***
No					Reference							Reference				
<b>Medical Consultation in the past 2 weeks</b>																
Yes	0.19	1.04	0.25	1.61	0.22	1.02	0.29	1.51	0.44	1.21	0.25	1.17	0.39	1.20	0.29	1.07
No					Reference							Reference				
<b>Current self-rating of health status</b>																
Very poor	0.27	0.30	1.60	2.15	1.18	1.14	1.40	1.54	-0.44	-0.91	0.64	2.29	0.82	1.86	0.73	2.01
Poor	0.11	0.28	0.60	1.94	0.59	1.39	0.56	1.50	1.56	3.23 **/	1.21	4.34 ***/	1.68	3.81 ***/	1.30	3.59 ***/
Fair	0.56	4.50 ***/	0.64	6.17 ***/	0.96	6.66 ***/	0.77	6.12 ***/	0.37	3.99 ***/	0.23	4.21 ***/	0.42	4.94 ***/	0.39	5.64 ***/
Good or Very good					Reference							Reference				
<b>Medical Insurance</b>																
Yes	0.04	0.21	-0.11	-0.69	-0.21	-0.97	-0.15	-0.79	0.02	0.13	-0.17	-1.89	-0.34	-2.43	-0.21	-1.79
No					Reference							Reference				
<b>Chronic Illness</b>																
Yes	0.64	3.34 **	0.32	1.95	0.48	2.11	0.36	1.82	0.45	2.25	0.24	2.02	0.25	1.34	0.27	1.76
No					Reference							Reference				
<b>Direct contact with patients with a confirmed diagnosis of COVID-19</b>																
Yes	-0.13	-0.27	0.17	0.44	0.30	0.55	0.19	0.40	-1.57	-1.73	0.05	0.09	0.24	0.28	0.44	0.64
No					Reference							Reference				
<b>Indirect contact with patients with a confirmed diagnosis of COVID-19</b>																
Yes	0.37	0.10	0.29	1.02	0.40	1.00	0.40	1.15	-0.24	-0.45	0.05	0.16	0.07	0.14	0.11	0.27
No					Reference							Reference				

\*\*  $p < 0.01$ , \*\*\*  $p < 0.001$  (significance levels were corrected by Bonferroni's method for multiple comparisons, \*/  $p < 0.0167$ , \*\*/  $p < 0.0033$ , \*\*\*/  $p < 0.00033$ ). B represents the slope of the line between the predictor variable and the dependent variable. t represents the precision with which the regression coefficient is measured.

### 3.7. The Relationship between Knowledge and Concerns about COVID-19 and Mental Health in Chinese and Iranian

Linear regression analysis showed that the Iranian and Chinese respondents showed parallel findings (see Table 3). Regarding the level of confidence in doctor's ability to diagnose or recognize COVID-19, Iranians who had less confidence in their doctors were significantly associated with higher DASS-21 subscale scores ( $p < 0.001$ ). Similarly, Chinese who were very confident in their doctors were significantly associated with lower DASS depression scores ( $p < 0.01$ ). Iranians who reported a very high perceived likelihood of contracting COVID-19 were significantly associated with higher IES-R and all DASS-21 subscale scores ( $p < 0.001$ ). Iranians who perceived a very high likelihood of surviving COVID-19 were significantly associated with lower IES-R and DASS anxiety scores ( $p < 0.001$ ). Satisfaction with the COVID-19 information showed similar patterns between the two countries. Iranians who were not satisfied with the health information were significantly associated with higher IES-R and all DASS-21 subscale scores ( $p < 0.001$ ). Chinese who were satisfied with health information were significantly associated with lower DASS-21 subscale scores ( $p < 0.001$ ). The dissemination of COVID-19 information via radio was associated with higher DASS anxiety ( $p < 0.001$ ) and depression ( $p < 0.001$ ) scores in Chinese but not Iranians.

### 3.8. Comparison between Precautionary Measures and Mental Health in Chinese and Iranian

A higher proportion of Iranian stated they would cover their mouths when coughing and sneezing ( $p < 0.001$ ), avoid sharing utensils ( $p < 0.001$ ) and practice hand hygiene ( $p < 0.001$ ) (see Supplementary Table S4). In contrast, there were significantly more Chinese who wore a face mask regardless of the presence and absence of symptoms ( $p < 0.001$ ), who felt that worry about the pandemic was unnecessary ( $p < 0.001$ ) and stayed at home for 20–24 h ( $p < 0.001$ ).

### 3.9. The Relationship between Precautionary Measures and Mental Health in Chinese and Iranian

Linear regression analysis showed that covering mouth when coughing and sneezing, avoidance of sharing utensils during meals, hand hygiene practices and wearing a face mask regardless of the presence or absence of symptoms were significantly associated with lower scores in IES-R and DASS sub-scales ( $p < 0.001$ ) in Chinese (see Table 4). For Iranians, all precautionary measures were not associated with lower IES-R or DASS-21 subscale scores ( $p > 0.05$ ). Chinese who felt that worry about the pandemic was unnecessary were significantly associated with lower IES-R score ( $p < 0.001$ ). The average number of hours staying at home per day was not significantly associated with the IES-R and DAS-21 subscale scores for both countries ( $p > 0.05$ ), suggesting that the number of hours at home stay did not influence outcomes in this study. Nevertheless, a lengthier quarantine period may have adverse effects on mental health [31].

### 3.10. Comparison between COVID-19 Information and Mental Health in Chinese and Iranian

Iranians and Chinese were significantly different in the information required about COVID-19. There were significantly more Iranians who needed information about the management and treatment methods as well as other countries' strategies and responses on managing COVID-19 as compared to Chinese ( $p < 0.001$ ). In contrast, there were significantly more Chinese who needed information about prevention methods, local transmission data, number of infected by geographical areas, travel advice and transmission methods ( $p < 0.001$ ). Also, more Chinese requested regular updates and more personalized information ( $p < 0.001$ ).

### 3.11. The Relationship between COVID-19 Information and Mental Health in Chinese and Iranian

Health information on management methods, local transmission data, travel advice, drugs and vaccines were significantly associated with lower IES-R scores and one of the DASS-21 subscales in Iranians ( $p < 0.01$ ) (see Table 5).

#### 4. Discussion

This study compared the mental health parameters between Iranian and Chinese respondents during the COVID-19 pandemic. The mean IES-R scores of Chinese and Iranian respondents were above the cut-off scores of PTSD symptoms. Respondents from Iran had significantly higher anxiety and depression scores as compared to Chinese respondents. The significantly higher levels of anxiety and depression among Iranians were understandable as the COVID-19 situation was not improving in Iran when the number of deaths and new COVID-19 cases were taken into account. On 1 March 2020, there were 3186 new cases and 117 deaths in Iran [2]. In contrast, there were only 79 new cases and 5 deaths in China [2]. The mortality rates in Iran (74 deaths per 1 million people) was 44 times higher than China (3 deaths per 1 million people) [2]. Although there were significantly more Iranian respondents who reported physical symptoms and had a contact history of COVID-19 patients, these physical symptoms and contact history were not associated with negative psychological impact. This may be attributed to Islamic religious directives such as endurance of hardship and resolution of stress [32].

The present study demonstrated the differences in views between Chinese and Iranian on transmission methods, precautionary measures, health information, levels of confidence in doctors and perceived risk of contracting COVID-19. These differences are not only able to help authorities understand the factors affecting mental health but provide information to formulate strategies to reduce the spread of COVID-19. In this study, significantly more Iranians believed that the transmission was via contact with contaminated objects, practiced hand hygiene, avoided sharing utensils, were unsatisfied with health information, reported a lower level of confidence in their doctors and had a higher perceived likelihood of family members contracting COVID-19. The dissatisfaction and low confidence were associated with higher levels of psychological impact or adverse mental health in Iranians.

In contrast, significantly more Chinese believed in the transmission via droplets, wore face masks, were satisfied with health information, reported higher levels of confidence in doctors and a higher likelihood of survival. These factors were associated with lesser psychological impact or better mental health in Chinese. In contrast, the Iranian Government followed the World Health Organization's advice. It discouraged wearing a face mask except for those who showed symptoms [33]. In addition, Iranian men were less receptive to wear masks perhaps due to personal discomfort or sense of embarrassment associated with wearing face masks [34]. This situation was further worsened by the economic sanctions that had prevented masks bought from the U.K. from arriving in Iran [35]. The high prices of masks made it difficult for the many Iranians to afford them, resulting in worries and hopelessness. As the number of new COVID-19 cases continued to surge in Iran [2], this could have contributed to higher levels of anxiety and depression among Iranians. In contrast, the Chinese government rapidly deployed medical personnel and treated COVID-19 patients at rapidly-built hospitals [3]. This prompt action had restored public confidence in the healthcare system and enhanced the perceived likelihood of surviving COVID-19 pandemic. Our study found that significantly more Iranians obtained information about COVID-19 from the television, while most Chinese obtained information from the Internet. Furthermore, Iranians prefer health information provided by television stations that are run by the central government and do not believe in the Internet due to the spread of online misinformation and false medical advice about COVID-19 [36]. The Iranian and Chinese health authorities should provide regular updates about the treatment methods, local transmission data, travel advice and transmission methods. The authorities should disseminate health information via television and the Internet to the largest number of the general public as this information was associated with better mental health.

**Table 3.** The linear regression analysis of knowledge and concerns related to COVID-19 and mental health parameters in Iranian and Chinese respondent ( $n = 1411$ ).

Knowledge and Concerns Related to COVID-19	Iran								China							
	Impact of Event		Stress		Anxiety		Depression		Impact of Event		Stress		Anxiety		Depression	
	B	t	B	t	B	t	B	t	B	t	B	t	B	t	B	t
<b>Route of transmission</b>																
<b>Droplets</b>																
Agree	-0.12	-0.94	0.03	0.24	0.01	0.05	-0.01	-0.09	0.07	0.45	-0.11	-1.36	-0.12	-0.91	-0.15	-1.33
Disagree	0.07	0.23	-0.26	-0.97	-0.46	-1.25	-0.42	-1.29	0.13	0.30	0.46	1.91	0.68	1.81	0.50	1.61
Do not know	Reference								Reference							
<b>Contact via contaminated objects</b>																
Agree	-0.32	-0.90	-0.19	-0.62	-0.46	-1.09	-0.35	-0.93	-0.06	-0.54	-0.08	-1.17	-0.05	-0.47	-0.10	-1.24
Disagree	-1.19	-1.22	-0.77	-0.93	-1.54	-1.34	-1.15	-1.15	0.13	0.66	0.003	0.03	-0.16	-0.90	-0.16	-1.05
Do not know	Reference								Reference							
<b>Airborne</b>																
Agree	-0.06	-0.48	0.10	0.88	0.06	0.37	0.06	0.42	0.06	0.55	0.04	0.63	0.03	0.29	-0.03	-0.30
Disagree	-0.26	-1.61	-0.07	-0.47	-0.14	-0.71	-0.14	-0.83	0.02	0.11	-0.05	-0.57	-0.04	-0.32	-0.08	-0.75
Do not know	Reference								Reference							
<b>Level of confidence in own doctor's ability to diagnose or recognize COVID-19</b>																
Very confident	-0.35	-1.97	-0.16	-1.08	-0.19	-0.90	-0.13	-0.73	0.12	0.35	-0.33	-1.67	-0.42	-1.37	-0.85	-3.34 **/
Somewhat confident	<0.001	-0.001	0.03	0.26	0.18	1.02	0.15	1.02	0.42	1.24	-0.25	-1.27	-0.34	-1.08	-0.72	-2.82 **/
Not very confident	0.45	2.15	1.01	5.91 **/	1.41	5.88 **/	1.33	6.38 **/	0.48	1.10	0.03	0.11	0.11	0.26	-0.43	-1.31
Not at all confident	-0.06	-0.24	0.61	2.92 **/	0.61	2.08	0.69	2.72 **/	-0.33	-0.35	-0.23	-0.42	0.37	0.41	-0.33	-0.46
Do not know	Reference								Reference							
<b>Likelihood of contracting COVID-19 during the pandemic</b>																
Very likely	0.90	3.71 **/	0.62	3.00 **/	1.04	3.69 **/	0.82	3.30 **/	-0.34	-1.75	-0.06	-0.57	0.07	0.38	-0.06	-0.42
Somewhat likely	0.04	0.33	0.09	0.76	0.16	1.03	0.13	0.97	-0.03	-0.23	-0.14	-1.58	-0.03	-0.24	-0.14	-1.25
Not very likely	-0.14	-0.89	-0.15	-1.14	-0.23	-1.24	-0.18	-1.13	0.05	0.34	-0.15	-1.77	-0.08	-0.57	-0.15	-1.36
Not likely at all	-0.25	-1.11	-0.32	-1.68	-0.62	-2.39	-0.49	-2.12	-0.12	-0.65	-0.19	-1.90	-0.15	-0.92	-0.31	-2.33
Do not know	Reference								Reference							
<b>Likelihood of surviving if infected with COVID-19</b>																
Very likely	-0.59	-4.19 **/	-0.19	-1.63	-0.43	-2.60 **/	-0.31	-2.13	-0.32	-2.27	-0.14	-1.71	-0.18	-1.37	-0.23	-2.14
Somewhat likely	-0.04	-0.30	0.09	0.79	0.05	0.33	0.07	0.50	0.02	0.12	-0.09	-1.18	-0.09	-0.83	-0.19	-2.00
Not very likely	0.20	0.67	0.70	2.79 **/	0.62	1.75	0.73	2.38	-0.01	-0.06	0.06	0.52	0.39	2.20	0.21	1.45
Not likely at all	0.25	0.73	1.25	4.38 **/	1.33	3.33 **/	1.31	3.77 **/	-0.24	-0.69	0.08	0.39	0.52	1.62	0.18	0.67
Do not know	Reference								Reference							
<b>Satisfaction with the amount of COVID-19 information</b>																
Very satisfied	-0.16	-0.72	-0.34	-1.91	-0.53	-2.11	-0.40	-1.83	-0.07	-0.25	-0.60	-3.92 **/	-0.69	-2.87 **/	-0.72	-3.63 **/
Somewhat satisfied	0.07	0.39	-0.13	-0.85	-0.06	-0.31	-0.11	-0.60	0.36	1.40	-0.48	-3.21 **/	-0.60	-2.56 **/	-0.61	-3.13 **/
Not very satisfied	0.31	1.41	-0.01	-0.06	0.17	0.67	0.07	0.32	0.12	0.38	-0.30	-1.66	-0.41	-1.43	-0.31	-1.30
Not satisfied at all	0.87	3.47 **/	0.77	3.68 **/	0.86	2.92 **/	0.83	3.24 **/	0.80	2.13	0.08	0.36	0.18	0.52	-0.15	-0.54
Do not know	Reference								Reference							

\*\*  $p < 0.01$ , \*\*\*  $p < 0.001$  (significance level was corrected by Bonferroni's method for multiple comparisons, \*\*/  $p < 0.0125$ , \*\*/  $p < 0.0025$ , \*\*\*/  $p < 0.00025$ ) B represents the slope of the line between the predictor variable and the dependent variable. t represents the precision with which the regression coefficient is measured.

**Table 4.** The linear regression analysis between precautionary measures related to COVID-19 and mental health parameters in Iranian and Chinese participants ( $n = 1411$ ).

Precautionary Measures	Iran								China							
	Impact of Event		Stress		Anxiety		Depression		Impact of Event		Stress		Anxiety		Depression	
	B	t	B	T	B	t	B	t	B	t	B	t	B	t	B	t
<b>Covering mouth when coughing and sneezing</b>																
Always	0.07	0.19	0.20	0.67	0.37	0.90	0.27	0.75	-0.37	-2.52 <sup>*/</sup>	-0.35	-4.11 <sup>***/</sup>	-0.51	-3.81 <sup>***/</sup>	-0.42	-3.84 <sup>***/</sup>
Most of the time	0.27	0.74	0.33	1.06	0.72	1.68	0.47	1.26	-0.10	-0.60	-0.37	-3.93 <sup>***/</sup>	-0.47	-3.14 <sup>**/</sup>	-0.31	-2.48 <sup>*/</sup>
Sometimes	-0.19	-0.47	0.32	0.94	0.53	1.14	0.45	1.10	0.03	0.12	-0.24	-1.98	-0.47	-2.42 <sup>*/</sup>	-0.26	-1.61
Never	Reference								Reference							
<b>Avoidance of sharing utensils</b>																
Always	-0.07	-0.33	-0.12	-0.65	-0.21	-0.81	-0.12	-0.53	-0.48	-4.28 <sup>***/</sup>	-0.21	-3.09 <sup>**/</sup>	-0.29	-2.72 <sup>*/</sup>	-0.28	-3.18 <sup>**/</sup>
Most of the time	0.18	0.76	-0.17	-0.85	-0.05	-0.19	-0.15	-0.61	-0.01	-0.07	-0.20	-2.44 <sup>*/</sup>	-0.18	-1.37	-0.19	-1.78
Sometimes	0.10	0.40	0.13	0.64	0.35	1.21	0.27	1.06	0.05	0.36	-0.17	-1.99	-0.17	-1.29	-0.24	-2.20 <sup>*/</sup>
Never	Reference								Reference							
<b>Hand hygiene practice</b>																
Always	-1.09	-2.24	0.13	0.30	0.02	0.04	0.05	0.11	-0.39	-2.30 <sup>*/</sup>	-0.24	-2.44 <sup>*/</sup>	-0.25	-1.60	-0.34	-2.66 <sup>*/</sup>
Most of the time	-0.96	-1.86	0.32	0.73	0.51	0.84	0.38	0.72	0.16	0.88	-0.15	-1.45	-0.03	-0.16	-0.21	-1.51
Sometimes	-0.55	-0.84	1.07	1.91	1.13	1.45	1.16	1.71	-0.10	-0.49	-0.27	-2.24	-0.06	-0.29	-0.34	-2.13
Never	Reference								Reference							
<b>Washing hands immediately after coughing, rubbing the nose or sneezing</b>																
Always	0.11	0.46	-0.09	-0.44	-0.07	-0.24	-0.02	-0.06	-0.55	-4.44 <sup>***/</sup>	-0.22	-2.96 <sup>**/</sup>	-0.27	-2.34	-0.26	-2.76 <sup>*/</sup>
Most of the time	0.07	0.26	-0.13	-0.60	-0.02	-0.08	-0.02	-0.06	0.01	0.09	-0.11	-1.34	-0.08	-0.63	-0.15	-1.40
Sometimes	0.18	0.64	0.23	0.98	0.43	1.32	0.42	1.50	-0.06	-0.37	-0.12	-1.28	-0.13	-0.93	-0.14	-1.17
Never	Reference								Reference							
<b>Wearing a face mask regardless of the presence or absence of symptoms</b>																
Always	0.14	0.86	-0.15	-1.12	-0.17	-0.90	-0.18	-1.10	-0.70	-2.70 <sup>*/</sup>	-0.34	-2.20	-0.54	-2.23	-0.46	-2.32
Most of the time	0.14	0.76	-0.19	-1.24	-0.11	-0.49	-0.21	-1.08	-0.30	-1.10	-0.27	-1.68	-0.34	-1.34	-0.26	-1.24
Sometimes	0.11	0.57	-0.07	-0.47	0.15	0.66	-0.05	-0.23	-0.36	-1.13	-0.27	-1.46	-0.37	-1.27	-0.32	-1.30
Never	Reference								Reference							
<b>Washing hands after touching contaminated objects</b>																
Always	-0.65	-1.57	-0.24	-0.70	-0.18	-0.37	-0.23	-0.54	-0.39	-1.34	-0.53	-3.12 <sup>**/</sup>	-0.81	-3.04 <sup>**/</sup>	-0.80	-3.66 <sup>***/</sup>
Most of the time	-0.60	-1.36	-0.11	-0.29	0.20	0.39	0.04	0.08	0.003	0.01	-0.48	-2.71 <sup>*/</sup>	-0.60	-2.15	-0.62	-2.73 <sup>*/</sup>
Sometimes	-0.57	-1.08	0.06	0.13	0.59	0.94	0.21	0.39	0.22	0.59	-0.38	-1.74	-0.43	-1.25	-0.59	-2.07
Never	Reference								Reference							
<b>Feeling that unnecessary worry has been made about the pandemic</b>																
Always	-0.41	-0.99	-0.62	-1.78	-0.92	-1.91	-0.76	-1.79	-0.46	-3.60 <sup>***/</sup>	0.10	1.35	0.08	0.65	0.08	0.78
Most of the time	-0.69	-1.99	-0.26	-0.89	-0.34	-0.82	-0.36	-0.99	0.004	0.03	0.19	2.13	0.36	2.57 <sup>*/</sup>	0.28	2.39
Sometimes	-0.11	-0.49	-0.24	-1.29	-0.20	-0.78	-0.26	-1.16	-0.01	-0.06	-0.05	-0.69	-0.02	-0.17	-0.01	-0.10
Never	Reference								Reference							
<b>The average number of hours of home stay</b>																
0–10 h	0.13	0.61	0.06	0.33	-0.03	-0.12	0.04	0.18	-0.41	-1.41	0.16	0.96	0.26	0.96	0.35	1.58
10–20 h	0.11	0.81	-0.09	-0.74	-0.13	-0.78	-0.09	-0.62	0.22	1.45	0.10	1.13	0.17	1.18	0.01	0.12
20–24 h	Reference								Reference							

\*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$  (significance level was corrected by Bonferroni's method for multiple comparisons, <sup>\*/</sup>  $p < 0.0167$ , <sup>\*\*/</sup>  $p < 0.0033$ , <sup>\*\*\*/</sup>  $p < 0.00033$ ) B represents the slope of the line between the predictor variable and the dependent variable. t represents the precision with which the regression coefficient is measured.

**Table 5.** The linear regression analysis between the needs for COVID-19 information and metal health parameters in Iranian and Chinese participants ( $n = 1411$ ).

Information Needs	Iran								China								
	Impact of Event		Stress		Anxiety		Depression		Impact of Event		Stress		Anxiety		Depression		
	<i>B</i>	<i>t</i>	<i>B</i>	<i>t</i>	<i>B</i>	<i>t</i>	<i>B</i>	<i>t</i>	<i>B</i>	<i>t</i>	<i>B</i>	<i>t</i>	<i>B</i>	<i>t</i>	<i>B</i>	<i>t</i>	
<b>Symptoms</b>																	
Yes	0.34	2.18	0.22	1.7	0.33	1.8	0.26	1.64	0.23	1.83	0.03	0.43	0.11	0.96	0.01	0.10	
No				Reference								Reference					
<b>Prevention methods</b>																	
Yes	0.29	2.07	0.22	1.82	0.25	1.48	0.21	1.40	0.28	1.91	-0.10	-1.17	-0.15	-1.12	-0.15	-1.37	
No				Reference								Reference					
<b>Management methods</b>																	
Yes	0.52	2.80 **	0.15	0.92	0.30	1.37	0.21	1.11	0.24	2.33	0.09	1.54	0.21	2.24	0.10	1.23	
No				Reference								Reference					
<b>Regular information update</b>																	
Yes	0.37	2.31	0.13	0.94	0.25	1.33	0.16	0.97	0.47	2.29	-0.14	-1.18	-0.12	-0.63	-0.21	-1.32	
No				Reference								Reference					
<b>Local transmission data</b>																	
Yes	0.54	3.49 **	0.27	2.03	0.35	1.89	0.30	1.88	0.15	0.66	-0.33	-2.60	-0.30	-1.49	-0.37	-2.20	
No				Reference								Reference					
<b>More personalized information, such as those with preexisting medical conditions</b>																	
Yes	0.29	2.02	0.27	2.23	0.28	1.63	0.24	1.61	0.07	0.48	-0.13	-1.56	-0.16	-1.24	-0.19	-1.81	
No				Reference								Reference					
<b>Effectiveness of drugs and vaccines</b>																	
Yes	0.58	2.62 **	0.30	1.59	0.42	1.59	0.37	1.61	0.17	1.01	-0.17	-1.68	-0.08	-0.53	-0.22	-1.71	
No				Reference								Reference					
<b>Number of infected by geographical location</b>																	
Yes	0.35	2.21	0.31	2.32	0.48	2.63 **	0.38	2.37	0.17	1.01	-0.08	-0.81	-0.13	-0.86	-0.17	-1.31	
No				Reference								Reference					
<b>Travel advice</b>																	
Yes	0.39	3.22 **	0.20	1.96	0.24	1.67	0.19	1.49	0.14	1.04	-0.16	-2.06	-0.06	-0.51	-0.25	-2.45	
No				Reference								Reference					
<b>Transmission method</b>																	
Yes	0.39	2.34	0.14	0.97	0.31	1.60	0.20	1.14	0.53	2.94 **	-0.11	-1.07	-0.17	-1.03	-0.15	-1.12	
No				Reference								Reference					
<b>Other countries' response</b>																	
Yes	0.27	1.82	0.31	2.46	0.37	2.10	0.34	2.24	0.32	3.45 **	-0.02	-0.33	-0.13	-1.54	-0.16	-2.33	
No				Reference								Reference					

\*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$  *B* represents the slope of the line between the predictor variable and the dependent variable. *t* represents the precision with which the regression coefficient is measured.

## 5. Strengths and Limitations

The strength was direct statistical comparison on different outcomes between Iranian and Chinese respondents because a previous report mainly described differences between two separate studies conducted in Iran and China without statistical comparison [13]. We performed in-depth analyses and studied the relationship between psychological outcomes and variables related to COVID-19. However, there are several limitations to be considered when interpreting the results. One major limitation was the risk of sampling bias. This could be due to the online administration of questionnaires, and the majority of respondents from both countries were young adults from a good educational background with Internet access. Potential respondents without Internet access could not be reached. Another limitation is that self-reported levels of mental health parameters may not always be aligned with objective assessment by mental health professionals. Furthermore, we could not assess cultural differences in health beliefs between Chinese and Iranian. Future research is required to develop a cross cultural questionnaire to examine health beliefs during the COVID-19 pandemic. Finally, causal inferences could not be inferred from this cross-sectional study.

## 6. Conclusions

During the early stage of COVID-19 pandemic, this cross-country study found that Iranians had significantly higher levels of anxiety and depression as compared to Chinese. However, mean IES-R scores of Chinese and Iranian respondents were above the cut-off for PTSD symptoms. Chinese and Iranians demonstrated significantly different views on the mode of transmission, precautionary measures and satisfaction of health information. The economic sanctions could have further weakened the confidence of Iranians on their healthcare systems and worsen their mental health status. Our findings urge all nations in the world to demonstrate unity to fight COVID-19 pandemic and safeguard global mental health by providing humanitarian aids to countries that need support.

**Supplementary Materials:** The following are available online at <https://www.mdpi.com/2673-5318/2/1/6/s1>. Table S1: Comparison of demographic characteristics between Iranian and Chinese respondents (N = 1411). Table S2. Comparison of physical symptoms related to COVID-19, health status and contact history between Iranian and Chinese respondents (N = 1411). Table S3: Comparison of knowledge and concerns related to COVID-19 and the psychological impact as well as adverse mental health status between Iranian and Chinese respondents (N = 1411). Table S4: Comparison of precautionary measures related to COVID-19 between Iranian and Chinese respondents (N = 1411). Table S5: Comparison of information needs about COVID-19 between Iranian and Chinese respondents (N = 1411).

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