Original Article

The Iranian Corona Stress Study: Psychological Impacts of COVID-19 Pandemic in an Iranian Population

Abstract

Background: To assess the psychological consequences of changes during the coronavirus 2019 (COVID-19) pandemic in the Iranian population. **Methods:** We performed an anonymous online survey in the first 3 weeks of March 2020. Individuals older than 14 who could read Persian, and lived in Iran, were eligible for the study. The participants had to rate their stress levels and depressive symptoms (using a nine-item Patient Health Questionnaire PHQ-9) during the last 2 weeks and before the pandemic retrospectively. The changes in the psychological measurements and their association with the sociodemographic factors and burdens due to confinement were assessed. **Results:** Overall, among the 3,210 subjects who participated in our study, both the stress levels and average depression scores increased. However, about 23% of the subjects reported a decrease in their stress levels. The burden of childcare, restrictions in private life, and thoughts about the future were positively correlated with the changes in the stress levels and depression scores ($|r| > 0.15$). However, feeling relieved in the pandemic condition, and enjoying more family time were associated with less change in the stress and depression scores. Being religious (odds ratio [OR] [CI]: 1.5 [1.3-1-8]) and older age (OR [CI]: 2.9 [1.8–4.6] for >55 years old) were identified as the resilience factors, whereas being a student (OR [CI]: 2.1 [1.6;2.7]), seeking a job (OR [CI]: 2.6 [1.8;3.9]), and history of a psychiatric disorder (OR [CI]: 3.2 [2.6;4]) were identified as the risk factors for depression. **Conclusions:** The stress levels and depressive symptoms have increased during the COVID-19 pandemic and this increase is related to different social and personal burdens due to the confinement conditions.

Keywords: *COVID-19, depression, epidemiology, psychological, stress*

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Introduction

In the last days of 2019, an outbreak of coronavirus 2019 (COVID-19) was announced in Wuhan, China. Soon, the disease spread all over the world, and a few months later, on March 11, the World Health Organization (WHO) announced a pandemic crisis.[1] Considering the lack of vaccination or treatment against the virus, and its fast rate of dissemination, many countries applied different levels of social restrictions to control the pandemic. These restrictions, confinement strategies in particular, along with the pandemic itself may cause a negative psychological impact on the societies. Acknowledging this, a position paper published in The Lancet Psychiatry explored the psychological, social, and neuroscientific effects of this situation. The authors of this paper stated an urge to gather data on the mental health consequences of the COVID-19 pandemic.

[2] In this regard, Luo *et al*.[3] used data from 17 countries and reported a pooled prevalence of 33% for anxiety and 28% for depression during the pandemic, which is assumed to be higher in comparison with the situation before the pandemic. Iran, with a total population of about 84 million people, is one of the countries seriously impacted by this outbreak (95,646 residents tested positive, 1,135 cases/million), and 6,091 deaths linked to COVID-19 (as of May 1, 2020)[4] is no exception in this scenario. According to a study conducted during the last 2 weeks of March 2020, 68% of the Iranian participants reported moderate-to-severe anxiety levels based on a six-item version of the State-Trait Anxiety Inventory (STAI-6).[5] Facing stressful situations can also trigger an adaptive stress response on an individual and a social level, which may lead to positive psychological effects. For example, a study after the first Severe acute respiratory syndrome (SARS)

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epidemic in Hong Kong reported that about 65% of the participants cared more about their mental health, which in turn correlated with a decreased likelihood of negative mental health consequences such as post-traumatic stress disorder.[6] It is of paramount importance to understand the impact of COVID-19 on mental health and to gain insight into the risk and resilience factors to effectively tackle the rising public health issues from COVID-19 and probable subsequent outbreaks. This knowledge is crucial to successfully adapt the current mental health services infrastructures and policies. In the Iranian Corona Stress Study in conjunction with the Swiss Corona Stress Study,[7] we investigated changes in the stress levels and depression scores in response to the COVID-19 outbreak and subsequent confinement policies. Furthermore, the potential risk and resilience factors concerning the development of depressive symptoms were investigated.

Methods

Study design and participants

To assess the impact of COVID-19 and countermeasures on stress and depression levels, we conducted a cross-sectional nationwide study, based on a fully anonymous online survey. Each individual participated in the study at a single time point. The participants were asked to answer the questions based on their current situation or retrospectively based on their condition before the pandemic when applicable (i.e., questions about physical activity, stress levels, and depressive symptoms before the pandemic). The survey went online on May 1 (70 days since the first case was reported in Iran) and was accessible until May 25. On average, there were 1,723 new cases/day and 57 deaths/day in this period. Regarding restrictions, the Iranian government gradually lifted the lockdown measures during the survey period.

The survey was publicized using media releases by the Isfahan University of Medical Sciences, social media (i.e., WhatsApp, Telegram, Instagram, Twitter), and interviews on online news websites. The individuals who were older than 14 years, could read Persian, and lived in Iran during the study period were eligible for the study.

Consent, procedure, and outcomes

Informed consent was obtained from all participants on the first webpage of the survey. On this page, the objectives of the study, its procedure, anonymity, and confidentiality terms were explained. By declaring informed consent at the bottom of the page, the participants were directed to the survey. On average, it took 15 min to fill out the survey.

In the end, the participants received recommendations respecting mental health well-being and stress management such as performing physical activities or mindfulness exercises.

Survey translation and measurements

The design of the Iranian Stress Study online survey was guided by the Swiss Corona Stress Study survey design.[7] The survey consists of three sections covering sociodemographic factors, burdens due to the pandemic and confinement, and psychological measurements (i.e., stress and depression). In the first two sections of the questionnaire, we collected the sociodemographic and burden-related data (for more detailed information, the survey is attached in Online resources). Afterward, the following outcomes of interest were assessed: the stress levels and depressive symptoms before the COVID-19 pandemic (i.e., February 5–19, 2020, rated retrospectively) and during the past 2 weeks of the lockdown (counted from the date the survey was filled out). The stress levels were assessed using a single six-point Likert scale question ranging from 0 (not at all) to 5 (extremely strong). The depressive scores were assessed by the Patient Health Questionnaire 9 (PHQ-9), a nine-item self-administered questionnaire to screen for the presence and severity of depression. Each item is scored based on a Likert system from *not at all (0 points)* to *nearly every day (3 points)*. The total score of PHQ-9 is ranged between 0 and 27. Based on the total scores, the participants were categorized as having no or minimal depression (0–4), mild depression (5–9), moderate depression (10–14), moderately severe depression (15–19), and severe depression (20–27).

We used an existing Persian translation of the PHQ-9 (see[8] for English and[9] for the Persian version). The remaining items of the survey were translated from German to Persian, then face validity and cultural adaptation of the Persian version were checked and approved by an expert panel. Finally, all the items were translated back to German by the Basel University Language Center and reviewed by the Swiss study team to confirm that the Iranian and Swiss Corona Stress Study questionnaires are equivalent.

Ethical consideration

The authors assert that all the procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008. All procedures involving human subjects/patients were approved by the Ethics Committee of the Isfahan University of Medical Sciences, Iran

(IR.MUI.MED.REC.1399.069). In respect to anonymity, only the day of participation was recorded in the survey, while the IP addresses and timestamps were not recorded.

Statistical analyses

We used R version 3.6.2 for data analysis. We applied linear models in combination with Analysis of variance (ANOVA) for nominal variables, Spearman's rank correlations for ordinal variables, and Pearson correlations for interval variables. For stress and depression, a difference score was calculated by subtracting the score before the pandemic from the score during the pandemic (we refer to the difference score as *the change in stress or depression*, respectively). Therefore, positive values indicate an increase in the stress/depression scores during the pandemic as compared to before the outbreak. The statistical models consisted of one dependent variable (one of the main outcome variables) and one independent variable. For linear models, the strength of the relationships was obtained by extracting the correlation value '*r*' from each corresponding linear model (i.e., normalized regression coefficient). We only report relationships with at least a small effect size ($|r| \geq 0.1$). The change in the number of participants reporting moderately severe to severe depression symptoms (PHQ-9 score ≥ 15) before and during the pandemic was further compared using the McNemar's Chi-square test.

Risk and resilience factors analysis

We defined 'vulnerable' individuals as those reporting PHQ scores ≥ 15 during the pandemic (corresponding to 'moderately severe' and 'severe' categories) while having a PHQ score <15 before the pandemic. 'Resilient' subjects were defined as participants reporting PHQ scores ≤ 4 ('None-Minimal') both before and during the pandemic. To identify the risk and resilience factors, we first applied the Chi-square tests comparing the distribution of demographic factors between each defined subset (resilient or vulnerable) and all remaining individuals. The variables showing at least small effect sizes (Cramer's V ≥ 0.1) were further investigated under a logistic regression model. Only associations with an OR corresponding to at least a small effect Cohen's d ($log(OR) * \frac{\sqrt{3}}{\pi} > 0.2$) were interpreted. Marginal effects from logistic regression were obtained using the ggeffect command in the R package ggeffects. To avoid individual variable categories with low frequencies in these analyses, some demographic variables were regrouped as follows: occupational status (working in a sector affected by pandemic restrictions, working in a sector not affected by pandemic restrictions, retired or disabled, housekeeper, job seeking, student); age group (14–24, 25–34, 35–44, 45–54, ≥ 55); education (with a university degree, without a university degree); household (living alone, not alone). Besides, as only a small portion of the participants ($N = 21$) reported their sex different from 'male' or 'female', data

from these participants were excluded from the final analysis to maintain statistical power. For comparing the effect of age, sex, having child (ren), religiosity, and prior psychiatric disorders history on the probability to belong to the resilient group, we evaluated the effect of each variable in the logistic regression model employing Nagelkerke pseudo-R^2, comparing the full model to the model without the considered variable (only variables with Nagelkerke pseudo-$R^2 \geq 0.01$ were interpreted).

Results

Population and descriptive statistics

In total, data from 3,210 participants were included in the final analysis. Although the participants took part in the study from all 31 states of the country, most participants were from Isfahan (37.4%) and Tehran (23.3%), which are the third and the first most populated provinces, respectively, and contribute to approximately 23% of Iran's population.

The mean age of the participants was 34.1 (SD = 10.9) and 63.8% were females (according to the last Iranian Population and Housing Census, the Iranian population had a mean age of 31.1 years and male to female ratio of 1.03 as of the year 2016[10]), 4.5% lived alone and 45.4% had one or several children. As per the educational level, 74.7% had a degree in higher education. The high school and university students comprised 26.8% of the participants. Regarding occupational status, 7.2% of the study population was seeking a job, while 48.8% reported having a job. Among those with a job, 19.0% worked in sectors that were affected by reduced working hours or closure due to the government's policy. Under religiosity, 54.1% of the participants reported being religious.

Concerning the COVID-19 disease, 86.8% of the participants had been symptom-free and not tested for the disease, 68.8% of the participants knew someone with the COVID-19 disease personally, and 45.8% knew someone deceased because of it.

Regarding the pre-existing health conditions, 604 (18.8%) subjects reported having a medical history of a chronic physical condition and 31.7% had a history of psychiatric disorder/disease (the most prevalent being depression [20.1%] and anxiety disorders [16.3%]). For further details, see Supplementary Table 1.

Change in stress levels

The stress levels among the participants had increased during the pandemic (difference score: mean = 0.20, median = 0, SD = 1.36; before the pandemic: mean = 2.89, median = 3, SD = 1.44; during the pandemic: mean = 3.10, median = 3, SD = 1.63, see Figure 1). In total, 29.9% of the participants experienced an increase in the stress levels, 47.3% reported the same level of stress both before and during the pandemic, and 22.8% had perceived less stress than before [Figure 2].
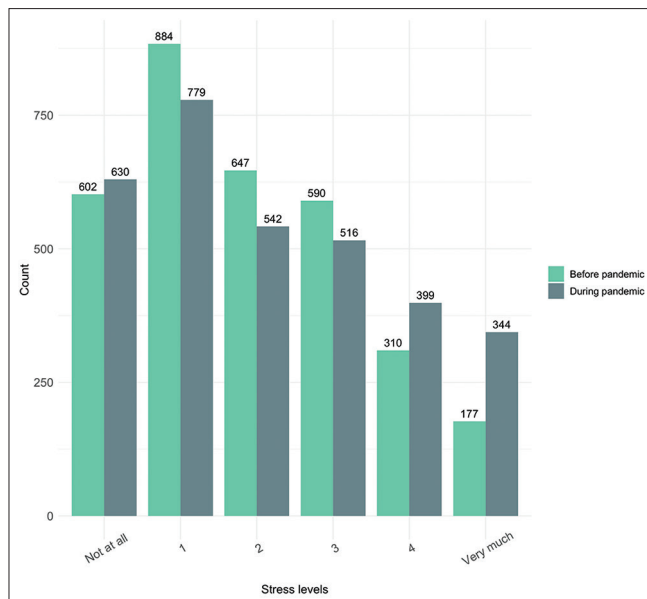
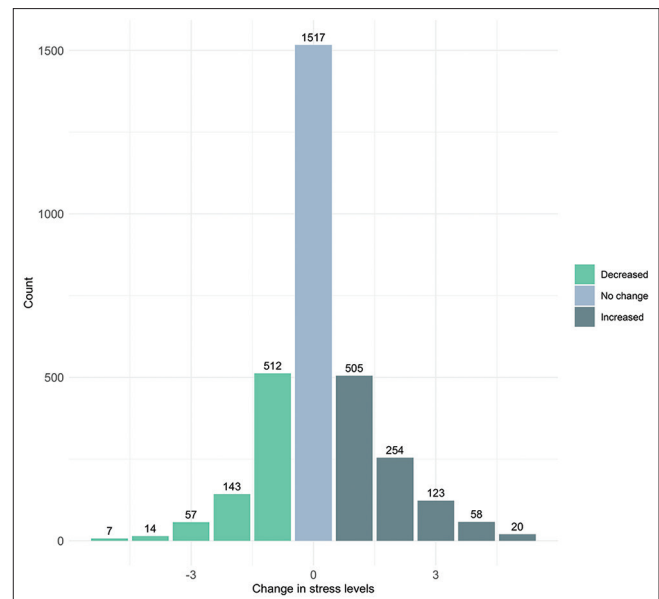Figure 1: Distribution of stress levels before and during the pandemic

Figure 2: Distribution of change in the stress levels

No significant correlation was observed between the change in stress levels and sociodemographic variables. The following impacts of COVID-19 restrictions show the strongest association with stress levels change: the burden of child care ($r = 0.21$), the burden due to thoughts about the future ($r = 0.20$), the burden due to living alone ($r = 0.19$), and limitations in personal freedom ($r = 0.17$). On the other hand, the change in the stress levels was negatively correlated with feeling more relieved during the pandemic ($r = -0.24$) as well as with confidence in overcoming the COVID-19 crisis ($r = -0.16$). For further details, see Supplementary Table 2.

A positive correlation was observed between the stress levels change and the change in the depression score ($r = 0.40$). The stress levels were also correlated to the depression score both before ($r = 0.43$) and after the ($r = 0.58$) pandemic.

Change in depression score

On average, the total PHQ-9 score increased during the pandemic (difference score: mean = 2.45, median = 1, SD = 5.44; before the pandemic: mean = 5.41, median = 4, SD = 5.10; during the pandemic: mean = 7.86, median = 6, SD = 6.55). Overall, 54.8% of the participants reported an increase in the depression score, while 21.4% had the same score as before, and 23.8% had a lower depression score during the pandemic [Figure 3]. Based on the participants' retrospective assessment of their depressive symptoms, 191 (6.0%) of them were in the moderately severe or severely depressed category (PHQ-9 score ≥15) before the pandemic. This number almost tripled to 526 (16.4%) during the pandemic (McNemar's test *P* value <5.9e-57; Cohen's g = 0.38; Figure 4).

The depression score increased more in the participants who reported having a psychiatric disorder history ($r = 0.13$). Confinement impacted the depression score in several ways. The burden due to living alone ($r = 0.31$), the burden of childcare at home ($r = 0.30$), the burden due to thoughts about the future ($r = 0.28$), and the burden due to restrictions in spending time with others in private life ($r = 0.25$) are the items with the highest effect size. Changing the regularity of meals and sleeping time are also accompanied by an increase in the depression score with an effect size of $r = 0.27$ and $r = 0.22$, respectively. On the other hand, changes in the depression score negatively correlate with feeling relieved ($r = -0.36$) and enjoying more family time ($r = -0.20$) in the confinement situation. For more information see Supplementary Table 3.

Risk factors for the development of clinically-relevant depressive symptoms during the pandemic

During the pandemic, 388 (12.1%) participants shifted from lower categories of depression (PHQ-9 score <15) to a clinically-relevant depression score (moderately severe or severe category; PHQ-9 score ≥15). To identify the potential risk factors, we compared these 'vulnerable participants' to other participants in terms of sociodemographic and medical history. Having a prior history of psychiatric disorders was more prevalent in the vulnerable participants (Cramer's V = 0.20); among the prior psychiatric disorders, history of depression (Cramer's V = 0.17), and anxiety disorder (Cramer's V = 0.16) are noteworthy. The occupational status also played a role in this group with a Cramer's V effect size of 0.15.

We included these variables in a logistic regression model and found that there are more vulnerable cases among the
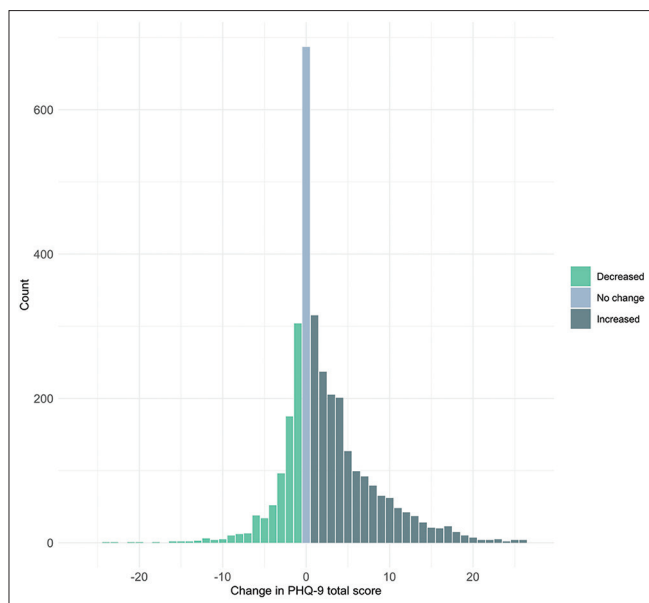
Figure 3: Distribution of change in the depression score (PHQ-9)

Figure 4: Distribution of the depression score category before and during the pandemic

participants with a psychiatric disorder history (OR: 3.2, 95% CI [2.5–4]). Considering contrasts for occupational status, there was a higher risk for students and those who were seeking a job to be in the vulnerable group [Supplementary Table 4].

Resilience factors concerning the depressive symptoms

A total of 994 (31.0%) subjects have been categorized as having non or minimal depressive symptoms (PHQ-9 ≤4) both before and after the pandemic. We considered this group as the "resilient group" and compared it to all other participants in terms of sociodemographic factors and medical history. The resilient participants were significantly different from the other participants in terms of psychiatric disorder history (Cramer's V = 0.24), age group (Cramer's V = 0.20), occupational status (Cramer's V = 0.18), being religious (Cramer's V = 0.14), having child (ren) (Cramer's V = 0.13), and sex (Cramer's V = 0.11) [Supplementary Table 5].

We performed a logistic regression model with all the significant variables identified above. Only the effects of age, religiosity, and psychiatric disorder history remained significant (Nagelkerke pseudo-R^2 <1%).

The logistic regression model showed that there were more resilient participants among those with no psychiatric disorder history (OR = 3.5, 95% CI [2.9–4.3]). It also indicated a higher resilience rate among those who reported being religious (OR = 1.5, 95% CI [1.3–1.8]). According to the age group, those with an age of 55 or higher showed higher resilience compared to the other age groups (OR = 2.9, 95% CI [1.8–4.6] against 35–44-year age group; Supplementary Figure 1).
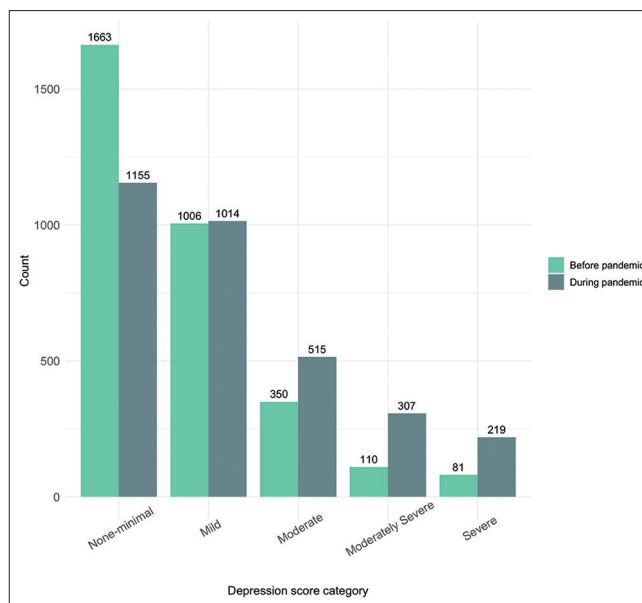
Discussion

Key findings

In this study, we assessed how the COVID-19 pandemic and following confinement strategies impacted the mental health and well-being in the Iranian population. We observed an increase in both averages of the depression scores and stress levels among the study population. This increase correlates with various burdens triggered by confinement policies and fear of the COVID-19 infection. On the other hand, enjoying more family time, feeling relieved in this period, and being confident to survive the pandemic without problem have a negative association with the changes in the average depression and stress scores. Additionally, we were able to identify several risk and resilience factors: being a student, seeking a job, and having a psychiatric disorder history are risk factors, whereas higher age, negative psychiatric disorder history, and being religious are resilience factors.

Changes in the stress levels and depression score

The stress levels and depression scores among the participants increased on average. This result is in line with most studies assessing the psycho-behavioral changes during this pandemic.[11] In the recent studies conducted in Iran, Wong *et al*.[5] reported 68% of the participants having/suffering from moderate-to-severe anxiety using the State-Trait Anxiety Inventory, while in another one, Maarefvand *et al*.[12] observed an above-average mean score of stress (3.3 out of 5) in 3,787 participants. Regarding the depression scores, the same trend can be seen. In two meta-analyses, the prevalence of depression was estimated to be 23–33%, which is higher than the normal prevalence range before the pandemic.[3,13] Our study supports these

findings with an increase in the mean scores of depression and a 10% increase in the prevalence of moderately severe and severe depression during the pandemic crisis. Comparing this study to the Swiss Corona Stress Study,[7] the average stress levels and depression scores before and during the pandemic were higher in the Iranian sample, but interestingly, despite all the cultural and economic differences, the changes in these scores followed the same pattern in both studies.

Considering the stressful situation of a pandemic, we expected the worsening of mental health in our participants, but to our surprise, we also found a reduction in stress and depression for a considerable number of participants in both the Iranian and Swiss populations. This might result from an adaptive stress response in these participants. This response has been seen in previous crises at both the individual and social levels. In a similar condition to the COVID-19 crisis, after the first SARS epidemic in Hong Kong in 2003, Lau *et al*.[6] reported that about 60% of the subjects cared more about their families after the epidemic, over 65% of them paid more attention to their mental health, and up to 40% spent more time relaxing and exercising, and these behavioral changes were accompanied by fewer psychological problems. Notably, 23% of the participants in our study reported being highly relieved in the current situation, which might be due to a reduction of daily stressors compared to before the pandemic. Furthermore, over 18% of the participants reported enjoying the possibility of having more family time due to confinement. Both variables were negatively associated with the change in the stress levels and depression scores both in our study and in the Swiss study. Thus, it can be supposed that such a break in today's stressful life can act in favor of mental well-being, at least for some individuals.

Risk and resilience factors

Although no sociodemographic variable was observed to be associated with the stress levels change, being a student or seeking a job were identified as a risk factor in the 'vulnerable group'. Universities and schools were closed due to governmental counter measurements and many classes took place on online platforms suddenly which was a big change for the educational system. On the other hand, due to the economic effects of the pandemic, many companies and industries had to reduce their workforce, leading to a significant decrease in job opportunities and employment all over the world.[14] These factors caused a high level of uncertainty about the future and economic concerns for students and those seeking jobs. Uncertainty is a known source of stress[15] and the professional future being unpredictable can be an extra burden for these participants. Moreover, it was also shown in our study that both factors (e.g., economic consequences and worries about the future) were associated with a higher level of stress and depression per se. In line with this, Cao *et al*.[16]

reported economic worry as a risk factor to increase anxiety in a Chinese population.

Psychiatric disorder history is the only item that plays a role both as a risk and a resilience factor. It is a well-known fact that those with a positive psychiatric disorder history are more vulnerable in challenging situations.[17] This effect was also observed in other studies assessing psychological risk factors during the COVID-19 pandemic.[18,19] This highlights again the importance of excessive attention to this part of society when it comes to maintaining mental health in challenging situations.

We identified being religious as a resilience factor in our study on the Iranian population. This association was not observed in the Swiss study.[7] In scientific literature, the relationship between religiosity and depressive symptoms is discussed controversially.[20] However, to get a better understanding of religiosity's impact on psychosocial well-being, it should be interpreted in the context of socio-cultural aspects of the population. To our knowledge, there is no study assessing religiosity's effect on mental health among the general Iranian population, but a small number of studies assessed this association in college students, confirming a negative correlation between religiosity and depressive symptoms.[21]

We also found that participants aged 55 or higher were more resilient than the younger ones. Reviewing recent similar studies, the results are quite controversial regarding the effect of age.[11] In a review, studying psychological resilience to disasters, this controversy is highlighted: age is introduced to be a risk factor in some and a resilience factor in other studies.[22] Two studies investigating the Iranian population's mental health during the COVID-19 pandemic report younger age groups to be more susceptible to stress and anxiety.[5,12] The focus of these studies is on anxiety and stress, whereas the resilience factors in our study are defined based on the depression scores. Therefore, these results cannot be directly compared to each other. However, considering the high correlation between the stress levels and depression scores in our study, a common trend can be seen among all three studies: the older age groups are less affected by the COVID-19 crisis concerning stress and depression.

Strengths and limitations

In this study, we benefited from a reasonable number of participants with various sociodemographic characteristics who participated from all over the country. Various kinds of burdens due to the pandemic and confinement were included in this study, which enabled us to have a discriminatory appraisal of the sources of possible stressors. Most studies investigating the impact of COVID-19 on mental health conducted so far have compared mental health indicators with a reference population. In most cases, this reference population is different from the study's participants in

terms of the sociodemographic characteristics which makes further interpretations less precise. However, in our study, by comparing the same population before and during the pandemic, we were able to have a more accurate perspective of the issue.

Despite these strengths, several limitations should be considered when interpreting data. First, our study population is not representative of the Iranian general population due to several reasons: This study was publicized and conducted on an online platform, thus, excluding people who did not have access to the Internet. It is noteworthy that this group predominantly includes people from lower socioeconomic levels and those living in rural areas and small cities. Moreover, due to sampling methods and media platforms used for advertising the survey, our participants were mostly from a higher educational level, which is not proportionate to the Iranian general population. Further, we used a single question to measure stress levels instead of a known valid questionnaire to make the survey more convenient for the participants. It should be considered that we cannot discuss concepts such as the clinical relevance of stress levels using this measurement. Finally, we cannot exclude a possible recall bias, which may have led those being more affected by the situation to report their prior state in an unrealistic manner.[23]

Prospect

The COVID-19 pandemic is not the first and will probably not be the last of its kind. In such crises, health systems focus more on immediate harms like mortality. However, psychological harms caused by the situation and policies (such as confinement) have to be considered. In this study, we tried to shed light on the psychological states and probable risk and resilience factors in Iran. Considering that our data were not completely representative of the general population, more and larger studies are still needed to be conducted. Moreover, it should be considered that most studies so far have used an online platform, and therefore, have missed a considerable part of the population with no proper access to the Internet or electronic devices. Future studies should also include this part of the population.

Data availability

The data that support the findings of this study are available on request from the corresponding author (EA).

Disclaimer

A preprint version of the study has been already published and is accessible through https://osf.io/cfgbk/. (Preprint DOI: 10.31219/osf.io/cfgbk).

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflicts of interest

There are no conflicts of interest.

References

1. WHO announces COVID-19 outbreak a pandemic. Available from: https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19 [Last accessed on 2020 Mar 11].
2. Holmes EA, O'Connor RC, Perry VH, Tracey I, Wessely S, Arseneault L, *et al.* Multidisciplinary research priorities for the COVID-19 pandemic: A call for action for mental health science. Lancet Psychiatry 2020;7:547-60.
3. Luo M, Guo L, Yu M, Jiang W, Wang H. The psychological and mental impact of coronavirus disease 2019 (COVID-19) on medical staff and general public-A systematic review and meta-analysis. Psychiatry Res 2020;291:113190.
4. COVID-19 situation report, Islamic Republic of Iran. Available from: https://covid19.who.int/region/emro/country/ir.
5. Xiong J, Lipsitz O, Nasri F, Lui LM, Gill H, Phan L, *et al.* Impact of COVID-19 pandemic on mental health in the general population: A systematic review. Journal of affective disorders. 2020;277:55-64.
6. Lau JT, Yang X, Tsui HY, Pang E, Wing YK. Positive mental health-related impacts of the SARS epidemic on the general public in Hong Kong and their associations with other negative impacts. J Infect 2006;53:114-24.
7. de Quervain D, Aerni A, Amini E, Bentz D, Coynel D, Gerhards C, *et al.* The Swiss Corona Stress Study 2020. doi:10.31219/osf.io/jqw6a.
8. Kroenke K, Spitzer RL. The PHQ-9: A new depression diagnostic and severity measure. Psychiatr Ann 2002;32:509-15.
9. Dadfar M, Kalibatseva Z, Lester D. Reliability and validity of the Farsi version of the Patient Health Questionnaire-9 (PHQ-9) with Iranian psychiatric outpatients. Trends Psychiatry Psychother 2018;40:144-51.
10. Statistical Center of Iran. Findings of the 2016 National Population and Housing Census. (2016). Available from: https://

www.amar.org.ir/english/Population-and-Housing-Censuses.

11. Vindegaard N, Benros ME. COVID-19 pandemic and mental health consequences: Systematic review of the current evidence. Brain Behav Immun 2020;89:531-42.

12. Maarefvand M, Hosseinzadeh S, Farmani O, Safarabadi Farahani A, Khubchandani J. Coronavirus outbreak and stress in Iranians. Int J Environ Res Public Health 2020;17:4441.

13. Salari N, Hosseinian-Far A, Jalali R, Vaisi-Raygani A, Rasoulpoor S, Mohammadi M, *et al*. Prevalence of stress, anxiety, depression among the general population during the COVID-19 pandemic: A systematic review and meta-analysis. Glob Health 2020;16:57.

14. Nicola Cantore FH, Lavopa A, Haverkamp K, Laplane A, Rodousakis N. 2020. Coronavirus: The economic impact – 10 July 2020. Available from: https://www.unido.org/stories/coronavirus-economic-impact-10-july-2020.

15. Greco V, Roger D. Uncertainty, stress, and health. Pers Individ Differ 2003;34:1057-68.

16. Cao W, Fang Z, Hou G, Han M, Xu X, Dong J, *et al*. The psychological impact of the COVID-19 epidemic on college students in China. Psychiatry Res 2020;287:112934.

17. Burcusa SL, Iacono WG. Risk for recurrence in depression. Clin Psychol Rev 2007;27:959-85.

18. Pfefferbaum B, North CS. Mental health and the Covid-19 pandemic. N Engl J Med 2020;383:510-2.

19. Ozdin S, Bayrak Ozdin S. Levels and predictors of anxiety, depression and health anxiety during COVID-19 pandemic in Turkish society: The importance of gender. Int J Soc Psychiatry 2020;66:504-11.

20. Braam AW, Koenig HG. Religion, spirituality and depression in prospective studies: A systematic review. J Affect Disord 2019;257:428-38.

21. Forouhari S, Hosseini Teshnizi S, Ehrampoush MH, Mazloomy Mahmoodabad SS, Fallahzadeh H, Tabei SZ, *et al*. Relationship between religious orientation, anxiety, and depression among college students: A systematic review and meta-analysis. Iran J Public Health 2019;48:43-52.

22. Rodriguez-Llanes JM, Vos F, Guha-Sapir D. Measuring psychological resilience to disasters: Are evidence-based indicators an achievable goal? Environ Health 2013;12:115.

23. Coughlin SS. Recall bias in epidemiologic studies. J Clin Epidemiol 1990;43:87-91.

Supplementary Table 1: Sociodemographic characteristics of the participants		
Category	***n***	**%**
Age group		
14-24	686	21.4
25-34	1146	35.7
35-44	819	25.5
45-54	407	12.7
55	152	4.8
Gender		
Male	1140	35.5
Female	2049	63.8
No information	21	0.7
Province		
Isfahan	1202	37.4
Tehran	748	23.3
Khoozestan	114	3.6
Fars	110	3.4
Khorasan-Razavi	104	3.2
Alborz	89	2.8
Others	843	26.3
Living condition		
Alone	144	4.5
With partner	431	13.4
With partner and child(ren)	1176	36.6
With parent(s)	1309	40.8
In a shared flat	37	1.2
In a residential institute	35	1.1
Other	26	0.8
Number of child(ren)		
None	1751	54.6
1	538	16.8
2	677	21.1
3	188	5.9
≥4	55	1.7
Religiosity		
Religious	1736	54.1
Not religious	1474	45.9
Highest level of education		
No official education	26	0.8
Primary education	90	2.8
Highschool education/college	700	21.8
Bachelor	1013	31.6
Master	769	24.0
Doctorate	612	19.1
Occupational status		
Highschool/college student	121	3.7
University student	739	23.0
Working	1566	48.8
Housekeeper	401	12.5
Seeking a job	231	7.2
Retired or disabled	152	4.7
Medical conditions history		
None	2606	81.2
Cardiovascular disease	169	5.3

Contd...

Supplementary Table 1: Contd...		
Category	***n***	**%**
Respiratory disease	245	7.6
Hepatorenal disease	158	5.0
Immunodeficiency/immunosuppression	94	3.0
Diabetes	65	2.0
Cancer	27	0.8
Prior psychiatric disorder history		
None	2193	68.3
Depression	646	20.1
Schizophrenia	6	0.2
Post-traumatic stress disorder	154	4.8
Anxiety disorder	523	16.3
Obsessive compulsive disorder	263	8.2
Other	66	2.0
COVID-19 test		
Not tested and healthy	2786	86.8
Not tested with flu-like symptoms	195	6.1
Tested negative	175	5.5
Tested positive	17	0.5
Tested positive and recovered	37	1.2
Quarantine and isolation		
Self-isolation (because of suspicious symptoms or positive test)	312	9.7
Self-quarantine (because of contact with a known/suspicious case of COVID-19 disease)	329	10.2
Staying at home due to confinement		
Voluntarily abstain from going out the of house	2028	63.2
Used to abstain from going out of the house but back to work after lockdown lift	800	24.9
Never stayed at home even during confinement	382	11.9
Encounter with COVID-19		
Know someone with COVID-19 disease	2210	68.8
Know someone who died due to COVID-19	1469	45.8

Supplementary Table 2: Stress levels change in relation to other factors during the pandemic (|r| ≥0.1)

Rank	Variable	n	r	P
Fear of COVID-19 disease				
1	Fear of contracting COVID-19 disease	3210	0.16	1.86E-20
2	Fear of death due to COVID-19 disease	3210	0.15	2.81E-18
3	Fear of losing someone close due to COVID-19 disease	3210	0.15	7.05E-18
4	Fear that someone close contract COVID-19 disease	3210	0.12	4.52E-12
Burdens due to confinement				
1	Burden of childcare	339	0.21	6.86E-05
2	Burden due to thinking about future	3210	0.20	5.47E-30
3	Burden due to living alone in confinement situation	144	0.19	2.01E-02
4	Burden due to restrictions in personal freedom	3210	0.17	3.96E-23
5	Burden due to the changes in working situation	3210	0.15	2.28E-18
6	Burden due to limitations in private life	3210	0.14	2.86E-16
7	Increase in conflicts at home	3066	0.12	7.15E-12
8	Burden due to restrictions in cultural activities	3210	0.12	5.70E-11
9	Burden due to financial consequences of confinement	3210	0.11	1.53E-09
10	Burden due to limitations in spending time with colleagues in professional life	3210	0.11	1.85E-09
11	Burden to changes in education system	3210	0.10	3.54E-09
Relief and confidence				
1	Feeling relieved in the actual situation	3210	-0.24	5.05E-43
2	Confidence of surviving the pandemic without problem	3210	-0.16	1.39E-19
3	Enjoying more family time due to confinement	3210	-0.11	7.04E-10
Changeable behaviors during the pandemic				
1	Frequency of checking information about COVID-19	3210	0.10	1.18E-08
2	Change in regularity of meals	3210	0.10	1.61E-08
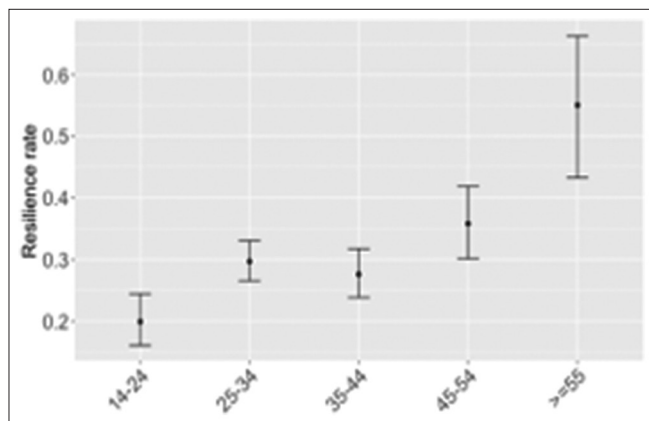
Supplementary Figure 1: Resilience rates by age group. Plot of marginal effects estimated from the Logit regression model on 'resilience'. The error bars represent 95% confidence intervals

Supplementary Table 3: Depression score change in relation to other factors during the pandemic (|r| ≥0.1)

Rank	Variable	n	r	P
Sociodemographic factors				
1	Previous psychiatric disorder/disease	3210	0.13	2.03E-14
2	Age	3210	-0.10	5.80E-08
Fear of COVID-19 disease				
1	Fear of death due to COVID-19 disease	3210	0.21	1.21E-32
2	Fear of contracting COVID-19 disease	3210	0.21	6.45E-32
3	Fear that someone close contract COVID-19 disease	3210	0.19	1.01E-26
4	Fear of losing someone close due to COVID-19 disease	3210	0.18	1.49E-25
Burdens due to confinement				
1	Burden due to living alone in confinement situation	144	0.31	1.49E-04
2	Burden of childcare	339	0.30	1.57E-08
3	Burden due to thinking about future	3210	0.28	3.38E-58
4	Burden due to limitations in private life	3210	0.25	3.85E-45
5	Burden due to restrictions in personal freedom	3210	0.23	8.27E-41
6	Burden due to limitations in spending time with colleagues in professional life	3210	0.21	4.81E-34
7	Increase in conflicts at home	3066	0.21	8.02E-32
8	Burden due to changes in education system	3210	0.21	6.83E-33
9	Burden due to the changes in working situation	3210	0.20	2.57E-31
10	Burden due to restrictions in cultural activities	3210	0.19	2.64E-27
11	Being overwhelmed by the switch to digital media/classes/teaching	3210	0.16	4.66E-20
12	Increase in domestic violence exposure	3210	0.14	1.59E-15
13	Burden due to financial consequences of confinement	3210	0.13	8.43E-14
14	Burden of paying attention to 2-m safety distance	3210	0.12	2.85E-11
15	Fear of famine	3210	0.11	9.11E-10
Relief and confidence				
1	Feeling relieved in the actual situation	3210	-0.35	8.08E-95
2	Confidence of surviving the pandemic without problem	3210	-0.19	5.46E-27
3	Enjoying more family time due to confinement	3210	-0.20	7.02E-30
Changeable behaviors during the pandemic				
1	Change in regularity of meals	3210	0.27	8.93E-56
2	Change in sleep schedule	3210	0.23	1.87E-38
3	Consumption of tranquilizers/sleeping pills	500	0.22	1.22E-06
4	Food consumption	3174	0.19	1.98E-44
5	Frequency of checking information about COVID-19	3210	0.14	1.56E-16
6	Increase in mobile phone/computer/telephone usage to maintain social contact	3210	0.14	9.56E-16

Supplementary Table 4: Logistic regression for vulnerable categories

Variable	Reference category	OR [CI][1]
Occupational status (Working-Affected[2])	Working-Not affected[3]	1.4 [0.9;2.1]
Occupational status (Job seeking)	Working- Not affected	2.6 [1.8;3.9] *
Occupational status (Student)	Working- Not affected	2.1 [1.6;2.7] *
Occupational status (Retired/Disabled)	Working- Not affected	0.9 [0.4;1.6]
Occupational status (House keeper)	Working- Not affected	1.7[1.2;2.4] *
Prior psychiatric disorders history (Yes)	No	3.2 [2.6;4] *

[1]Odds ratio and 95% confidence intervals obtained from logit regression model comparing 'resilient' participants to others. [2]Participants who worked in a sector affected by shorter working time or closure due to limitations. [3]Participants whose work was not affected by limitations. *Effect size Cohen's d (log [OR] *$\sqrt{3}/\pi$) >0.2

Supplementary Table 5: Logistic regression for resilient category		
Variable	**Reference category**	**OR [CI][1]**
Gender (Male)	Female	1.4 [1.1;1.6]
Age (14-24)	35-44	0.7 [0.5;0.9]*
Age (25-34)	35-44	1.1 [0.8;1.3]
Age (45-54)	35-44	1.5 [1.1;1.9]
Age (≥55)	35-44	2.9 [1.8;4.6]*
Religiosity (religious)	Not religious	1.5 [1.3;1.8]*
Have child (ren) (Yes)	No child (ren)	1.1 [0.9;1.4]
Occupational status (Working-Affected[2])	Working-Not affected[3]	0.9 [0.7;1.2]
Occupational status (Job seeking)	Working-Not affected	0.5 [0.3;0.7]*
Occupational status (Student)	Working-Not affected	0.9 [0.7;1.2]
Occupational status (Retired/Disabled)	Working-Not affected	0.9 [0.7;1.2]
Occupational status (House keeper)	Working-Not affected	1.7[1.2;2.4]*
Psychiatric disorder history (Yes)	No	0.3 [0.2;0.3]*

[1]Odds ratio and 95% confidence intervals obtained from logit regression model comparing 'resilient' participants to others. [2]Participants who worked in a sector affected by shorter working time or closure due to limitations. [3]Participants whose work was not affected by limitations. *Effect size Cohen's d (log [OR] *√3⁄π) >0.2