

The Relationship between the Severity of the COVID-19 Disease, Temperament and Psychological Factors

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Abstract

Objective: The coronavirus (COVID-19) pandemic negatively affects public mental health around the world. Individuals' reactions to COVID-19 vary depending on their temperament, individual differences, and personality traits. Therefore, the current study is conducted to assess the association of demographical features, Persian temperament, and psychological characteristics with the severity of COVID-19.

Method: An online survey was sent to COVID-19 patients to collect their demographic information, COVID-19 symptoms, and clinical data. The Depression, Anxiety and Stress Scale (DAAS-21) questionnaire, Beck Depression Inventory (BDI-II), Spiel Berger State-Trait Anxiety Inventory (STAI), Pittsburgh Sleep Quality Inventory (PSQI), and Persian general and brain temperament Questionnaire were also completed by 258 participants (127 men and 131 women) 45 days after recovery from COVID-19. Non-parametric analysis was used for statistical analysis.

Results: Results showed the significant relationship of demographic factors such as weight, age and gender with the severity of the COVID-19 ($P < 0.05$). Mean scores of brain temperament (warm/cold) in the severe group were significantly lower than the moderate and mild groups ($P < 0.05$). There was a significant increase in the dry/wet temperament of the brain in the severe and moderate groups compared to the mild group ($P < 0.05$). The results of DASS-21 showed a significantly higher anxiety in patients with severe COVID-19 compared with moderate and mild groups ($P < 0.05$). The severe group was found to be significantly different compared to moderate group in the results of BDI-II ($P < 0.05$). The result of STAI (state and trait) showed a significant difference between the severe group and the mild and moderate groups. The score of PSQI between the moderate and mild groups was significant ($P < 0.05$).

Conclusion: These results indicate the relationship between demographic factors such as weight, age and gender, brain temperament, as well as some psychological factors such as sleep quality and anxiety with the severity of the COVID-19 disease.

Key words: COVID-19; Demographic Factors; Psychological Factors; Severity; Temperament

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In December 2019, the novel coronavirus outbreak (COVID-19) occurred in Wuhan, China (1). Then, the World Health Organization (WHO) on January 30, 2020 declared this new coronavirus outbreak as a Pandemic (2, 3). Controlling this epidemic has become one of the most widespread challenges in the world over the last decade (4). The extent and severity of this epidemic have adversely affected the ability of many health care systems around the world and caused a worldwide health crisis (5). Several studies have been performed to identify demographic factors influencing the risk of acquiring COVID-19 and its severity. Some important factors associated with severity of COVID-19 are age, male gender, poor socioeconomic status, and comorbidity (6). The COVID-19 pandemic results in substantial psychological impacts on the general population. Mass quarantine during the COVID-19, helplessness, and fear of becoming ill and dying can lead to stress, depression, anxiety, frustration, and other mental problems (7). The prevalence of psychological problems is dependent on gender, region, healthcare access, socioeconomic status, and psychiatric history (8-10). A recent meta-analysis study estimated the prevalence of anxiety and depression in COVID-19 as 22% and 28%, respectively (11). Studies have also shown that the psychological impact of the infection is related to COVID-19 severity (12, 13).

A possible factor affecting COVID-19 is temperament, a crucial concept in Greek medicine. It is worth noting that Greek medicine is formed based on an extensive medical system that deals precisely with the individuals' health state. This system provides a kind of promotive, preventive, therapeutic and rehabilitative health care based on a comprehensive perspective. Notably, the concept of temperament is an essential element of the philosophy of medicine which includes a combination of physical, psychological and emotional characteristics of each individual (14). In Iranian traditional medicine, many mental and physical characteristics of human beings and even other creatures and phenomena are evaluated in the form of the four qualities of coldness, warmth, wetness and dryness. Simply put, the basic components of the human body and any other creature are composed of four basic elements: fire (dry and hot quality), air (wet and hot quality), water (wet and cold quality) and soil (dry and cold quality). Each of these elements, as the primary components of creation, is considered as the cause of each of the four qualities including warmth, coldness, wetness and dryness. The first two qualities (warmth and coldness) that are more important in determining the characteristics of each creature are called the active qualities, while the other two qualities (wet and dry) are called passive qualities (15).

Temperament is one of the important determinants of personal characteristics, and each organ has its own temperament. Notably, it is associated with personality

traits and helps each individual in a different way (16). It is suggested that individuals with cold and wet temperament are more prone to be infected (15). However, no research has assessed the relation between temperament and severity of COVID-19. Only few studies have assessed the relationship between severity of COVID-19 and psychological indexes after recovery. Identifying the baseline factors that cause the COVID-19 and those that increase the public health can prevent the aggravation of the COVID-19. The current study was intended to evaluate the relationship of demographic variables; temperament; and some psychological factors such as sleep quality, stress, anxiety and depression with the severity of COVID-19 45 days after recovery. The hypothesis of the study was that the severity of COVID-19 was related to demographic, temperament and psychological characteristics.

Materials and Methods

Participants

This cross-sectional research was conducted on patients with COVID-19 who referred to the hospitals affiliated to Iran University of Medical Sciences in a multi-center manner from December 2020 to September 2021. We contacted the patients to invite them to the study. After giving informed consent, the questionnaires were sent by a link. The study was approved by the Baqiyatallah University of Medical Sciences, Tehran, Iran (Ethics Code: IR.BMSU.REC.1399.371).

The survey assessed the quality of life, depression, anxiety, stress, sleep quality, Persian temperament and severity of the disease in 258 patients (127 men and 131 women). The total sample size was computed to be 230 according to a previous relevant research (27): correlation coefficient between temperament and severity of COVID-19 symptoms=0.554, 95% confidence interval and type II error $\beta = 0.2$. However, we included 258 individuals to increase the power of study and to overcome problems such as missing data. Inclusion criteria include: 1- Registration of patients with confirmed COVID-19 through positive PCR test, positive antibody test or lung CT scan reports by an infectious disease specialist or pulmonologist. 2- At least 45 days should be passed since their recovery. Exclusion criteria include: 1-Lack of cooperation in filling out the questionnaires 2- Having neurological diseases since three months before the COVID-19 infection.

Questionnaires

Characteristics of the participants

Google™ forms were used for this purpose with free and online access. The poll link was sent to the participants through WhatsApp or the Telegram application 45 days after recovery from COVID-19. First, the socio-demographic information of the patients was examined, including age, gender, level of education, smoking status, weight, height, job status, income, and underlying diseases. In the second part, the variables related to COVID-19 were evaluated. We asked about COVID-19

symptoms. The severity of COVID-19 disease was determined according to medical records and evaluations by physicians, using the flowchart of diagnosis and treatment of the COVID-19 illness at the level of inpatient and outpatient services provided by the National Scientific Committee of COVID-19 Disease Management, published on February 2020 (17).

Depression, Anxiety and Stress Scale (DASS-21)

The Iranian version of DASS-21 that has been validated by Dr. Samani and colleagues was used to assess anxiety, depression and stress (18). This questionnaire has 21 items, divided into three subscales of anxiety, depression and stress. Every question is measured as a Likert scale (never = 1, low = 2, high = 3, a lot = 4). The total DASS score ranges from 0 to 120; with a larger score showing a higher severity. Brown *et al.* showed that the Cronbach's alpha of each scale of the DASS was acceptable (\cong 0.96, 0.89 and 0.93 for Anxiety, Depression and Stress, respectively) (19).

Beck Depression Inventory

The Iranian version of BDI-II (Beck Depression Inventory-II) was utilized to evaluate depression (20). This inventory includes 21 questions and subjects are instructed to rate the items on a 4-point scale (0-3). The BDI-II global score ranged from 0 to 63. Larger scores indicate more severe depression (21). The Persian version of BDI-II had good internal consistency (Cronbach's alpha = 0.87) and acceptable test-retest reliability ($r = 0.74$) (22).

Spiel Berger State-Trait Anxiety Inventory (STAI)

This questionnaire consists of 40 questions, the first 20 of which measure anxiety state and the second 20 measure anxiety trait. The Anxiety State Scale consists of 20 sentences that assess a subject's feelings at the time of the answer. The Anxiety State Scale also includes another 20 questions that measure a person's general and normal emotions. Every item is based on a four-point Likert scale (too low = 1 to too high = 4) (23). The scale was developed in 1971, by Spielberger *et al.* (24). In the research by Khanipour *et al.* in 2010, the coefficient of similarity was calculated using the Cronbach's alpha method to be 0.66, (23).

Pittsburgh Sleep Quality Index (PSQI)

Pittsburgh Sleep Quality Index (PSQI) subjectively assesses sleep patterns and sleep quality over the past month. This self-reported scale with 18 questions assigns seven scores for general description of sleep quality, delayed sleep, useful sleep duration, sleep adequacy, sleeping pills, sleep disturbance, and morning performance, with each item scoring from 0 to 3 (no problem to severe problem). At the end, the scores are added into a total score (0 to 21). A total score of 6 or higher means that the sleep quality is inadequate (25). The reliability, validity and Cronbach's alpha of this scale were reported to be 0.90-0.93, 0.80, and 0.78-0.82, respectively (26).

Persian Temperament Questionnaire

To assess temperament, a scale proposed by Mojahedi *et al.* was utilized in this study and it has acceptable reliability for detecting different types of temperament. The weighted kappa coefficients and the Cronbach's alpha coefficient of this questionnaire were within an acceptable range (15). The general temperament Questionnaire includes 10 questions on a 3-point Likert scale, and the brain temperament Questionnaire includes 14 questions on a five-point Likert scale.

Statistical analysis

Non-parametric analysis was used for analyzing most of the variables of the study that were qualitative and without normal distribution. Then, the Kuroskal-Wallis tests were used to draw a comparison between the baseline and clinical characteristics of the study groups. Furthermore, the Mann-Whitney test was utilized to compare the two groups. Chi-squared test was also used to compare the frequency of the variables in the groups. Quantitative variables such as age, height and weight were analyzed by applying the ANOVA and Tukey tests. The significance level was set at less than 0.05.

Results

Totally, 258 COVID-19 patients entered the study. The total sample size was computed to be 230 according to a previous relevant research (27): correlation coefficient between temperament and severity of COVID-19 symptoms = 0.554, 95% confidence interval and type II error $\beta = 0.2$. However, we included 258 individuals to increase the power of study and to overcome problems such as missing data. The demographic and clinical characteristics of the subjects are presented in Table 1. The numbers of patients with mild, moderate and severe infection were 112 (44 males, 68 females), 67 (37 males, 30 females) and 79 (46 males, 33 females), respectively. We observed significant differences in age, gender, weight, and educational levels.

As can be seen in Table 2, the mean scores of the general temperament questionnaire were not significantly different in the three groups. No significant relationship was found between general temperament and disease severity. A significant relationship between the type of brain temperament and the severity of the disease was observed. Mean scores of warmth of the brain in the severe group were significantly lower than the moderate ($P < 0.0005$) and mild ($P < 0.001$) groups. In terms of dryness and wetness, the patients in the moderate group were the wettest, followed by the severe group and then the mild group. There was a significant increase in the wet temperament of the brain in the severe ($P < 0.05$) and moderate ($P < 0.005$) groups compared to the mild group.

The mean \pm SD of the scores of psychological questionnaires responded by patients of the mild, moderate and severe groups were compared by Mann-Whitney test. The results of DASS-21 are shown in

Table 2. A significantly higher anxiety score was found in patients with severe COVID-19 compared to those with moderate ($P < 0.005$, Eta-squared = 0.065) and mild ($P < 0.0005$, Eta-squared = 0.082) infection. The severe group was found to be significantly different to the other two groups in the results of Beck Depression Inventory ($P < 0.05$, Eta-squared = 0.018). The result of Spielberger Anxiety Inventory (state and trait) showed a

significant difference between the severe group and the mild and moderate groups ($P < 0.01$, Eta-squared > 0.04). The score of Pittsburgh Sleep Quality Index showed that the moderate and severe groups had more sleep disorders than the mild group and the comparison between the moderate and mild groups was significant ($P < 0.05$, Eta-squared = 0.024).

Table 1. The Socio-Demographic Characteristics (Mean ± SD) and P-Value of Statistics Analysis of the Three Groups of Patients with COVID-19 (Mild, Moderate and Severe)

Variable	Mild	Moderate	Severe	P-Value
Number	112	67	79	
Age (year)	37.8 ± 5.8	42.2 ± 8.9	46.4 ± 9.9	0.0002*
height (mean ± SD)	165.93 ± 18.4	167.8 ± 15	169.3 ± 9.4	0.27
Weight (mean ± SD)	72.77 ± 13.3	77.2 ± 12	81.7 ± 17	0.0002*
Gender (% men-% Women)	39.3-60.7	55.2-44.8	58.2-41.8	0.01§
Marital status (% married)	83	59	68	0.10
Education level (% under Diploma, High school diploma, Graduate)	2.8, 24.1, 73.1	0, 21.2, 78.8	21.9, 24.7, 53.4	0.000002#
Income (% 0, < 5MT, 5-10MT, 10 < MT)	16.8, 40.6, 28.7, 13.9	12.5, 28.1, 39.1, 20.3	26.8, 29.6, 29.6, 14.1	0.17
Employee of the healthcare system(%yes)	40	45.5	31.2	0.20
Cigarette and tobacco use (% yes)	9	5.5	7	0.79
Type of COVID-19 diagnostic test (% clinical symptoms, blood test (IG), PCR, CT scan)	41.6, 8, 34.5, 15.9	16.1, 5.4, 33.9, 46.6	8.3, 4.2, 12.5, 75	0.000§#
Use of Oxygen mask (% yes)	1	7.3	55.1	0.000#
Hospitalization (% yes)	8.6	7.1	72.7	0.000#
ICU (%yes)	0	0	6	0.027#
Nursing at home (% yes)	48.8	89.4	81.1	0.000§
Family support (% yes)	63.5	86.4	81.1	0.0003¥
Completed the treatment period (% yes)	85.9	93.9	98.6	0.011§
Oxygen saturation percentage (> 95, 90-95, 85-90, < 85)	100, 0, 0, 0	0, 92.4, 7.6, 0	8.5, 23.9, 54.9, 12.7	0.000§#

*: Significant difference between mild and severe groups. #: Significant difference between severe and the other two groups. §: Significant difference between the mild group and the other two groups. ¥: Significant difference between mild and moderate groups

Table 2. Evaluation of Psychological and Temperament Factors as Associated with the Severity of the COVID-19 Disease

Variables	Mild (N = 112)	Moderate (N = 67)	Severe (N = 79)
DASS-Depression	4.81 ± 4.3	4.11 ± 3.9	5.03 ± 4.9
DASS-Anxiety	3.06 ± 2.9	3.56 ± 3.6	5.58 ± 4.4*¥
DASS-Stress	6.89 ± 4.3	6.33 ± 4.8	6.97 ± 6
Beck depression index II	9.19 ± 7.7	7.75 ± 7.8	11.49 ± 10.9¥
Spiel Berger State Anxiety Inventory	29.22 ± 11.1	30.1 ± 11.9	36.34 ± 13.7*¥
Spiel Berger Trait Anxiety Inventory	29.01 ± 12.2	28.7 ± 11.2	34.05 ± 12.8*¥
Pittsburgh Sleep Quality Index	9.1 ± 3	9.8 ± 2.7#	9.69 ± 4
Temperament (Warm/cold)	16.25 ± 3.8	15.13 ± 5.1	16.4 ± 2.8
Temperament (Dry/wet)	3.84 ± 1.1	3.76 ± 1.4	3.89 ± 1.1
Brain temperament (Warm /cold)	1.8 ± 2.9	1.81 ± 2.7	-0.74 ± 4¥*
Brain temperament (Dry /wet)	11.25 ± 3.8	8.7 ± 5.2#	10.26 ± 3.6*

#: significant difference between mild and moderate groups. *: significant difference between mild and severe groups. ¥: significant difference between severe and moderate groups.

Discussion

In this work, we examined the mental and physical health of patients with COVID-19 at least 45 days after recovery. In the first step, the relationship between socio-demographic and clinical factors and disease severity was investigated. Our results revealed that the variables of age, gender, weight and level of education were significantly related to the severity of the disease. However, other factors such as height, marital status, income and job status did not have any significant relationship with the severity of the disease.

Notably, a few studies in Iran have been done on the associations between severity of the COVID-19 disease and the mentioned factors. A recent research in China on the association between disease severity and weight shows that the weight factor is one of the most important factors which affects the severity of the COVID-19 disease (28). Another research demonstrated that there is also a positive relationship between the weight factor and the rate of ICU admission (29). Research on the severity of the disease, mortality rate and age started since the middle of the epidemic. According to the outcomes of many studies performed in this regard, the severity of the disease and the probability of death or long-term hospitalization is directly and significantly related to the age of the patients, which supports the findings of the present study (30, 31).

In 2021, a review article was published on the rate of COVID-19 infection and gender. The results of this study and other several related studies demonstrated that there is no association between gender and COVID-19 infection. However, there is a significant association between disease severity, mortality rate and gender. Results of this study show that the mechanism of this disease depends on the entry of SARS-Cov-2 into the body and binding to the angiotensin-converting enzyme 2 (ACE2) and trans-membrane serine protease 2 (TMPRSS2) receptors. In fact, gender differences in the expression of the enzymes of these two receptors elucidate the differences in the COVID-19 severity and the mortality rate based on gender. It should be noted that these differences in the expression of these two enzymes are directly influenced by different hormones in men and women. In addition, men tend to smoke more, which in turn leads to the severity of the disease (32). Considering the effect of age, weight, gender and clinical characteristics on the severity of the disease, we demonstrated that the significant differences were seen between the groups in the factors of age, weight, gender, treatment duration, family support, home nursing, hospital or ICU length of stay, arterial blood oxygen saturation and using oxygen masks, which is clearly in agreement with results of the studies done in this field (33).

In the second step of the current work, we explored the role of temperament on the COVID-19 severity. In this regard, traditional Iranian medicine, having roots in the ancient civilization of Iran and being developed by

Persian scientists in different historical periods, is a school that puts the focus of disease diagnosis, health care recommendations and treatment instructions, in most cases, on the individual differences in each community. In this regard, a large number of physical and mental differences of members of human societies are categorized based on temperament (34). One research showed that clients with diabetes mellitus have a higher frequency of hot and dry temperament than healthy controls (35). Another study demonstrated that temperament assessment using a questionnaire can provide important information for predicting the risk of hypertension in primary care (36).

However, since the beginning of the COVID-19 epidemic, a few studies have been done on temperament, especially brain temperament, and its relationship with the COVID-19 severity (37). There is a bidirectional relation between mizaj and COVID-19 infection. Some studies showed that the COVID-19, by affecting the cells of the upper and then the lower respiratory tracts of the lungs, can change one's mizaj to a hot and dry type. On the other hand, disturbance of mizaj initiates many dysfunctions in different organs of the body, particularly the brain, heart and liver, which is more due to its consequences and less due to the multiplication and presence of the virus in these organs (38). According to the results of Akhtar's study, some temperaments predispose people to diseases or worsening of the diseases (34). The interesting results of our study also indicate that coldness and wetness of the brain are associated with the severity of the COVID-19 illness and can be considered as a factor to prevent the disease or predict the course of the disease.

In the final step of the study, the mental health of the participants, at least 45 days after recovery, was investigated. Results of the DASS21 questionnaire regarding the anxiety subscale and the Spiel Berger questionnaire in both subscales of state anxiety and trait anxiety showed that patients in the severe group had higher scores than other groups at least 45 days after their recovery. The results of Beck Depression Inventory also revealed that the incidence of depression after recovery is substantially higher in the severe group than the moderate group.

In accordance with our results, a study by Zandifar *et al.* in 2020 on the prevalence and severity of depression, anxiety and stress among hospitalized patients revealed that the significance of correlation coefficients between anxiety and perceived stress in the subjects was quite extensive, so that 97.2% of the hospitalized individuals exhibited some degree of depression (39).

The results of another study on patients who recovered from severe COVID-19 showed that a significant proportion of the participants experienced psychological trauma: about 20% anxiety and 40% insomnia (40).

In this regard, the mental health of the patients who recovered from the COVID-19 disease declared that 5.8%, 5.0%, 5.3% of the recovered patient show

symptoms of depression, anxiety and post-traumatic stress disorder, respectively. Another finding of this study indicated that most under 50 and female patients reported anxiety and depression (39).

The results of the Petersburg Sleep Quality Questionnaire showed that sleep disorders increased after recovery in the severe and moderate groups. Confirming this finding, a study on 572 severe patients with COVID-19 showed that 0.19% of these patients had apnea and 11% had insomnia (41).

Limitation

The present research has some restrictions. First of all is the limited sample size of the study. Nonetheless, one strength of this work is the dispersion of the participating population, which was from different cities of Iran in terms of geography and climate. It should be noted that these differences make our results more generalizable to a wider population. Online data gathering has been utilized to reduce any potential risk that may decrease the generalizability of the findings. Given the cross sectional nature of the research, it is difficult to draw conclusions about the long-term effects of COVID-19.

Conclusion

Our results revealed that a number of individual characteristics, including temperament, play a role in the severity of the disease. Therefore, it is recommended to reduce the risk of infection in the epidemic and pandemic cases by getting help from traditional medicine specialists and to prepare plans, based on individual considerations, for people who are more at risk.

In addition to the above-mentioned issues, it is suggested to get help from traditional medicine specialists to diagnose people's temperament instead of using a questionnaire; although it was not possible at the time of this study due to the peaks of the COVID-19 pandemic. Besides that, it is highly recommended to take appropriate measures regarding the mental health of the improved patients because of the prevalence of psychological problems in the patients of the severe group after recovery. Therefore, it is suggested that more comprehensive research be conducted on anxiety, depression, sleep disorders and brain temperament in order to ultimately reduce the incidence of severe COVID-19 disease and future costs of health care.

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Conflict of Interest

None.

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