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# The Attitude of Turkish Physicians Toward COVID-19 Vaccination and the Effects of Vaccination on Their Mental Health

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## ABSTRACT

**Background:** The study aims to investigate the willingness of physicians for the coronavirus disease 2019 vaccination, factors contributing to their attitude, and the effects of vaccination on their mental health. It is conducted online with physicians between February 17 and March 17, 2021, corresponding to a period of at least 1 month after the first dosage.

**Methods:** Sociodemographic and professional characteristics are investigated along with coronavirus disease 2019 experiences. The Fear of Coronavirus Disease 2019 Scale, Attitudes Toward the Coronavirus Disease 2019 Vaccine, The Hospital Anxiety and Depression Scale, and Beck Hopelessness Scale are given to evaluate the effects on mental health.

**Results:** Among 578 participants, the total vaccination rate was 91.5% and the main reason for non-vaccination is being already infected by coronavirus disease 2019. Vaccination affected mental health positively in more than half of the participants (59.2% in the vaccinated group). Advanced age (odds ratio = 0.985, $P < .05$), positive attitude toward vaccination (odds ratio = 0.918, $P < .001$), and high fear of coronavirus disease 2019 (odds ratio = 0.937, $P = .001$) were among the predictors of being positively affected by the vaccination. Fear of coronavirus disease 2019 was positively correlated with hopelessness ($r = .239$, $P < .001$), depression ($r = 0.387$, $P < .001$), and anxiety ($r = 0.531$, $P < .001$). The negative thoughts about the vaccination were found to be correlated with hopelessness levels ($r = -0.093$, $P < .05$).

**Conclusions:** Physicians have positive attitudes toward vaccination and vaccination has positive effects on their mental health. As vaccination is a key point during the fight against the coronavirus disease 2019 pandemic, studies on vaccination and its effects on mental health gained importance. The role of physicians in this regard is inevitable.

## ARTICLE HISTORY

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## INTRODUCTION

It is known that the coronavirus disease 2019 (COVID-19) pandemic has a significant impact on people's mental health, as well as their physical health.[1] Along with the effects of the pandemic on the mental health of the society, the effects on groups such as people with pre-existing psychiatric diseases and COVID-19 survivors experiencing mental distress are particularly emphasized.[2] Certainly, healthcare professionals felt the psychological effects of the pandemic intensely as being among the highest risk groups.[3] Factors such as being in close contact with COVID-19 patients, having a high workload, living alone, or being isolated from family were found to be associated with anxiety and depression in healthcare workers.[4] Even though physicians are familiar with a stressful work environment, they have been at a disadvantage in terms of mental disorders due to increased responsibilities, traumatic events, and stigmatization during the pandemic.[5] Studies conducted on physicians reported that being a woman, having children, living with chronic physical and mental illnesses,[6] having high perceived stress and acute fatigue levels,[7] working longer hours, having less personal protective equipment, and exposure to more COVID-19 patients are associated with higher risk for mental illnesses.[5] It is also mentioned that the anxiety, depression, and hopelessness levels of healthcare professionals are higher than the general population.[8] Coronaphobia, defined as a state of intense anxiety about COVID-19, is also common in healthcare workers.[9] Therefore, the importance of

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preventive and curative interventions targeting the mental health of physicians and other healthcare professionals is frequently emphasized.[10]

Less than a year after the novel coronavirus appeared, many vaccines with proven protective effects have been manufactured.[11] While vaccination has started all over the world in a short time, one of the major threats to the effectiveness of vaccination programs is vaccine hesitancy.[12] Among the reasons for vaccine hesitancy are doubts over the effectiveness of the vaccine, concerns about its safety, and thinking that it is unnecessary.[13] A study conducted in Turkey has shown that being old, having no chronic disease, low level of knowledge about the pandemic, believing in conspiracy theories, low level of trust in health authorities, and low compliance with preventive measures are among important predictors of the COVID-19 vaccine refusal.[14] A study on healthcare workers during the influenza A (H1N1) epidemic found that vaccine acceptance was low as much as 17%, mainly due to concerns about side effects.[15] This result can be considered alarming because the positive doctor–patient relationship has been shown to be one of the best strategies to increase positive attitudes toward the H1N1 vaccine.[16] In this respect, it can be considered that physicians' attitudes toward vaccines may also guide the general society. Therefore, many countries including Turkey have started vaccination with healthcare workers, not just because they are in the highest risk group[17] but also it is known that vaccinated healthcare workers are more likely to recommend vaccination to others.[18] This approach helps to increase trust in health authorities and raise awareness about vaccination.

Current studies on COVID-19 vaccination show that the positive attitude toward COVID-19 vaccine among healthcare workers is in a wide range from 27.7% to 81.5%.[19,20] The vaccination program in Turkey has started with healthcare workers in January 2021.[21] In a study conducted in Turkey months before the vaccination program, it has been found that vaccine acceptance in healthcare workers is 52.8%, while it is 48.5% in the general community. In the same study, it was observed that more than a quarter of both groups (healthcare workers and the general population) had vaccine hesitancy.[14] This study examines the attitudes of physicians toward the COVID-19 vaccine with the initiation of the vaccination program and the psychological effects of vaccination. Therefore, it is aimed to investigate the following hypotheses:

1. The majority of physicians are willing to get vaccinated and support the vaccination program.
2. Vaccination has positively affected the psychological health of physicians.
3. Levels of anxiety, depression, hopelessness, and coronaphobia affect physicians' attitudes toward vaccination.

**MAIN POINTS**

- The current study examines the psychological effect of the coronavirus disease 2019 vaccination on physicians.
- The vaccination rate of physicians in Turkey is 91.5%.
- The vaccination positively affected physicians who were mentally affected by the pandemic.
- Physicians with a high level of hopelessness have more negative thoughts about vaccination.
- The possibility of infecting others may increase the positive attitude toward the vaccine.

## METHODS

### Study Sample

The universe of the study comprises physicians who are actively working in Turkey. In the study, it was tried to reach the participants with both convenience and snowball sampling. The study form was delivered to the participants via mailing to groups of physicians from all branches. In addition, the participants were asked to share this study form with other physicians who are actively working. According to the Ministry of Health, it is known that there are approximately 165 000 physicians actively working in Turkey.[22] Minimum sample calculation found that at least 384 participants should participate in the study for 5% margin of error, 95% CI ($n = N \times X/(X+N-1)$). A total of 589 people participated in the study within the specified period. Eleven participants were excluded from the study because of the incomplete questionnaire form. As a result of the comparison of the obtained data, no repeating form was found and 578 physicians who filled the questionnaire completely were included in the study.

### Data Collection Process

The vaccination program started with healthcare workers on January 16, 2021, and second doses were scheduled 1 month after the administration of the first doses. To prevent confounding effects of the vaccination in the first days (potential side effects), it has been planned to collect the data between February 17 and March 17, 2021, corresponding to a period of at least 1 month after the first dosage. The data form of the study was prepared by researchers on Google Forms and was delivered to the participants via mailing to groups of physicians from all branches and different institutions and regions around the country. Participants were informed in the introduction of the data form with a section containing the purpose, content, and ethics committee approval of the study. The participants who gave their informed consent and filled the form completely were included in the study.

### Measurement Tools

**Sociodemographic Form:** Data form started with sociodemographic variables including age, gender, marital status, household members, having children, physical and

psychiatric illnesses, chronic illness in family members, and length of medical practice. There were also questions related to the pandemic such as knowledge on COVID-19, history of COVID-19 infection, history of COVID-19 infection in family members and/or close friends, frequency of contact with COVID-19 patients, and being mentally affected by COVID-19 pandemic. Finally, the vaccination status, the reason if not being vaccinated, and the psychological effect of vaccination have been questioned.

**The Fear of COVID-19 Scale:** The scale was developed by Ahorsu et al[23] to measure COVID-19-related fear levels of adults. Its validity and reliability study in the Turkish language was conducted by Kaya et al.[24] It is a 5-item Likert-type self-report scale comprising 7 questions. A higher scale score indicates that the person has a higher COVID-19 fear level.

**Attitudes Toward the COVID-19 Vaccine:** The scale was developed in Turkish by Genis et al[25] and was found to be a reliable and valid tool to measure attitudes toward vaccination. This 5-item Likert-type self-report scale has 9 questions and positive/negative attitude sub-dimensions. The first 4 questions (positive sub-dimension) evaluate positive attitudes toward vaccination (e.g., "I would like to be vaccinated as soon as I can" and "I trust the reports about the vaccine developed"). The following 5 questions (negative sub-dimension) focus on negative thoughts about vaccination (e.g., "COVID-19 vaccine is dangerous" and "I think the efficacy of COVID-19 vaccine has not been adequately tested"). An increase in the scores of both sub-dimensions means a positive attitude toward vaccination (negative sub-dimension is scored reversely). The total score is measured by the addition of the scores of the 2 sub-dimensions. Higher scores are evaluated in favor of a more positive attitude toward vaccination.

**The Hospital Anxiety and Depression Scale:** This scale was developed by Zigmond and Snaith[26] to evaluate an individual's anxiety and depression symptoms concurrently. It was adapted for the Turkish population in a validity and reliability study by Aydemir et al.[27] This 14-item self-report scale has been validated in various populations, including healthcare workers.[28] Higher scores of anxiety and depression subscales indicate higher anxiety and depression levels.

**Beck Hopelessness Scale:** It was developed by Beck et al[29] to assess negative expectations about the future. Its validity and reliability study in the Turkish language was done by Şeber et al.[30] Later, it has been validated again in a larger and different patient sample by Durak et al.[31] This scale consists of 20 yes or no (1 or 0) questions. Higher scores indicate higher hopelessness levels in an individual.

### Statistical Analysis

The data were analyzed using Statistical Package for the Social Sciences (SPSS) version 25.0 (IBM SPSS Corp.; Armonk, NY, USA). The Kolmogorov–Smirnov test, histogram, skewness, and kurtosis values are examined for testing normality distribution. Descriptive statistics were used to determine the participants' characteristics. Pearson chi-square test was used to evaluate the relationship between categorical variables. In the evaluation of continuous variables in groups who said that the vaccine had a positive effect on their mental health or not, the independent *t*-test was used when the data showed normal distribution, and the Mann–Whitney *U* test was used when it did not show normal distribution. Correlation analyses were used to test our hypothesis that anxiety, depression, and coronaphobia affect attitudes toward the vaccine. Among the scale scores, attitudes toward the COVID-19 vaccine (ATV-COVID-19) positive sub-dimension scores that did not show a normal distribution in terms of skewness and kurtosis values (±1) were evaluated with Spearman correlation coefficients, while other scale data were evaluated with Pearson correlation coefficients because they showed normal distribution. Logistic regression analysis was used to create a model showing the predictive effect of the data we obtained in the study on the psychological effect of the vaccine. The backward binary logistic regression (backward likelihood ratio) analysis was used to examine the predictive effect of vaccination's psychological effect that differs significantly ($P < .05$). Hosmer–Lemeshow fit test was used for model fit. Finally, the independent *t*-test was applied to determine the parameters affecting the positive attitude toward the vaccine. The significance level was established as $\alpha = 0.05$.

### Ethical Approval

The Ethics approval for the study was obtained from the Acıbadem Mehmet Ali Aydınlar University Ethics Committee with the number 2021/03 on February 11, 2021. Furthermore, a permit was obtained from the Ministry of Health Scientific Research Platform Directorate for the study.

## RESULTS

### Sample Characteristics

Descriptive statistics were used to determine the characteristics of the sample. The average age of the participants was 47.53 years (between 24 and 72 years, standard deviation (SD): 12.19) and 64.5% (n = 373) of the participants were female and 35.5% (n = 205) were male. Of the participants, 91 (15.7%) were single, 421 (72.8%) were married, 66 (11.4%) were divorced/separated, 419 (72.5%) participants stated that they have children, and 89 (15.4%) of the participants had a previous history of COVID-19. The sociodemographic and professional characteristics of the participants are given in Table 1.

When the scale results of the study group were examined, the Fear of COVID-19 Scale (FCV-19S) mean score was 17.475 (between 7 and 33, SD: 5.204, skewness

**Table 1.** Sociodemographic and Professional Characteristics of the Sample

| | | | |
|---|---|---|---|
| Gender | Female | 373 | 64.5% |
| | Male | 205 | 35.5% |
| Marital status | Single | 91 | 15.7% |
| | Married | 421 | 72.8% |
| | Divorced/separated | 66 | 11.4% |
| Having children | No | 159 | 27.5% |
| | Yes | 419 | 72.5% |
| Household members | Single | 97 | 16.8% |
| | Nuclear family | 431 | 74.6% |
| | Extended family | 33 | 5.7% |
| | Other | 17 | 2.9% |
| | **No** | | **Yes** |
| History of chronic illness | 457 (79.1%) | | 121 (20.9%) |
| History of psychiatric illnness | 523 (90.5%) | | 55 (9.5%) |
| History of chronic illness in amily | 330 (57.1%) | | 248 (42.9%) |
| History of COVID-19 | 489 (84.6%) | | 89 (15.4%) |
| History of COVID-19 in family | 196 (33.9%) | | 382 (66.1%) |
| History of severe COVID-19 in family | 354 (61.2%) | | 224 (38.8%) |
| Death in the family due to COVID-19 | 426 (90.5%) | | 152 (73.7%) |

COVID-19, coronavirus disease 2019.

value: 0.198, kurtosis value: −.150, D(578) = 0.045, $P$ = .012), Beck Hopelessness Scale (BHS) mean score was 5.837 (between 0 and 20, SD: 5.305, skewness value: 0.954, kurtosis value: −0.100, D(578) = 0.167, $P$ < .001), Hospital Anxiety and Depression Scale (HADS) anxiety mean score was 6.403 (between 0 and 20, SD: 3.838, skewness value: 0.483, kurtosis value: 0.220, D(578) = 0.09, $P$ < .001), HADS depression mean score was 6.382 (between 0 and 18, SD: 3.885, skewness value: 0.159, kurtosis value: −0.766, D(578) = 0.092, $P$ < .001), ATV-COVID-19 positive sub-dimension median score was 18 (between 4 and 20, skewness value: −1.874, kurtosis value: 4.776, D(578) = 0.215, $P$ < .001), ATV-COVID-19 negative sub-dimension mean score of 19.313 (between 9 and 25, SD: 2.753, skewness value: −0.237, kurtosis value: −0.136, D(578) = 0.081, $P$ < .001), and ATV-COVID-19 total mean score was 36.692 (between 19 and 25, SD: 4.616, skewness value: −0.865, kurtosis value: 0.931, D(578) = 0.113, $P$ < .001).

## Comparison of Vaccinated and Non-Vaccinated Groups

Totally 91.5% of the physicians (n = 529) stated that they were vaccinated, and 8.5% (n = 49) of them stated that they were not vaccinated. The reasons and frequencies of the non-vaccination are given as follows: 59.2% (n = 29) of the non-vaccinated group stated "I have had COVID-19 and I think I am immune," 18.3% (n = 9) stated "The vaccine may be harmful," 6.1% (n = 3) stated "I do not think the vaccine is effective," 4.1% (n = 2) stated "The vaccine did not reach me," 2% (n = 1) stated "I think I will overcome the disease without the vaccine," and 10.2% (n = 5) stated other reasons.

In order to understand whether the variables differentiate between vaccinated and non-vaccinated groups, a chi-square test was applied. In the comparison of vaccinated and non-vaccinated groups, a statistically significant result was not obtained in any parameter other than the history of severe COVID-19 in the family which is less likely to get vaccinated, ($X^2$ (1) = 11.389, $P$ < .001).

## Comparison of Groups Who Stated that the Vaccine Positively Affected Their Mental Health and Those Who Did Not

Of those who were vaccinated, 59.5% (n = 344) stated that being vaccinated positively affected their mental health, 3.1% (n = 18) stated negatively affected, and 37.4% (n = 216) stated no mental effect. Due to the small size of the negative effect group, 2 groups are combined as a "no positive effect" group. To compare the positive effect and no-positive effect groups, the chi-square test was used to compare the categorical variables, the independent $t$-test to compare the normally distributed continuous variables, and the Mann-Whitney $U$ test to compare the non-normally distributed ATV-COVID-19 positive sub-dimension scores. The comparison of the groups that are positively affected by the vaccination and those that are not is shown in Table 2.

The mean age of the group that said they were positively affected by the vaccine was found to be higher ($P$ < .016). In addition, FCV-19S score ($P$ < .001), HADS anxiety ($P$ = .01), and HADS depression ($P$ = .03) scores were higher in positively affected group. It was found that there was no statistically significant relationship between being positively affected by the vaccination and the family history of COVID-19, the history of severe COVID-19 in the family, and the death in the family due to COVID-19 ($P$ > .05).

To understand the predictive effects of the data obtained in our study on the psychological effect of the vaccine, we applied logistic regression analysis. Backward stepwise: conditional ratio analysis was used to examine the predictability of features that differed in previous analyses ($P$ < .05). Psychological positive and no-positive effects of the vaccination were taken as the dependent variable. As independent variables, categoric variables such as being mentally affected by COVID-19, history of COVID-19 infection, COVID-19 vaccination status, and continuous variables such as age, FCV-19S, HADS anxiety, HADS depression, ATV-COVID-19 total scores were selected. Hosmer-Lemeshow test analysis was performed to examine the model fit. Relative risk values, 95% CIs, and $P$-values of the model are shown in Table 3.

**Table 2.** Comparison of the Groups That Are Positively Affected by the Vaccine and Those Who Are Not

| Mentally Affected by the Vaccine | Positively Affected (n %) | No Positive Effect (n %) | *P** | |
|---|---|---|---|---|
| **Gender** | | | .287 | |
| Female | 228 (39.4%) | 145 (25.1%) | | |
| Male | 116 (20.1%) | 89 (15.4%) | | |
| **Marital status** | | | .102 | |
| Single | 45 (7.8%) | 46 (8%) | | |
| Divorced/seperated | 40 (6.9%) | 26 (4.5%) | | |
| Married | 259 (44.8%) | 162(28%) | | |
| **Having children** | | | .208 | |
| Yes | 256 (44.3%) | 163 (28.2%) | | |
| No | 88 (15.2%) | 71 (12.3%) | | |
| **Household members** | | | .379 | |
| Single | 53 (9.2%) | 44 (7.6%) | | |
| Nuclear family | 265 (45.8%) | 166 (28.7%) | | |
| Extended family | 18 (3.1%) | 15 (2.6%) | | |
| Other | 8 (1.4%) | 9 (1.6%) | | |
| **History of chronic illlness** | | | .675 | |
| Yes | 70 (12.1%) | 51(8.8%) | | |
| No | 274 (47.4%) | 183 (31.7%) | | |
| **History of psychiatric illness** | | | .617 | |
| Yes | 31 (5.4%) | 24 (4.2%) | | |
| No | 313 (54.2%) | 210 (36.3%) | | |
| **Chronic illlness in family** | | | .205 | |
| Yes | 155 (26.8%) | 93 (16.1%) | | |
| No | 189 (32.7%) | 141 (24.4%) | | |
| **Mentally affected by COVID-19** | | | **<.001** | |
| Yes | 282 (48.8%) | 155 (26.8%) | | |
| No | 62 (10.7%) | 79 (13.7%) | | |
| **History of COVID-19** | | | **<.001** | |
| Yes | 37 (6.4%) | 52 (9%) | | |
| No | 307 (53.1%) | 182 (31.5%) | | |
| **COVID-19 vaccination** | | | **<.001** | |
| Yes | 334 (57.8%) | 195 (33.7%) | | |
| No | 10 (1.7%) | 39 (6.7%) | | |
| | **Mean ± SD** | **Mean ± SD** | ***P*** | Effect Size[a] (95% CI) |
| **Age**[+] | 48.54±12.10 | 46.05±12.19 | **.016** | 0.205 (0.038 to 0.371) |
| **FCV-19S**[+] | 18.38 ± 5.17 | 16.13 ± 4.95 | **<.001** | 0.442 (0.274 to 0.610) |
| **BHS**[+] | 5.88 ± 5.44 | 5.76 ± 5.11 | .799 | 0.022 (−0.143 to 0.188) |
| **HADS anxiety**[+] | 6.82 ± 3.69 | 5.78 ± 3.96 | **.01** | 0.273 (0.106 to 0.440) |
| **HADS depression**[+] | 6.77 ± 3.78 | 5.80 ± 3.97 | **.03** | 0.251 (0.084 to 0.418) |
| **ATV-COVID-19 positive sub-dimension**[++] | 19 (4-20)[b] | 17 (6-20)[b] | **<.001** | 0.229 |
| **ATV-COVID-19 negative sub-dimension**[+] | 19.68 ± 2.49 | 18.77 ± 3.02 | **<.001** | 0.334 (0.167 to 0.502) |
| **ATV-COVID-19 total**[+] | 37.53 ± 3.83 | 35.45 ± 5.33 | **<.001** | 0.462 (0.294 to 0.630) |

*Chi-square; [+]Indepent samples *t* test; [++]Mann–Whitney *U*-test; [a]Effect size is given as Hedges' g for T tests, [b]Median score (minimum–maximum values).

FCV-19S, The Fear of COVID-19 Scale; BHS, Beck Hopelessess Scale; HADS, Hospital Anxiety and Depression scale; ATV-COVID-19, Attitudes Toward the COVID-19 Vaccine; SD, standard deviation; COVID-19, coronavirus disease 2019.

**Table 3.** Binary Logistic Regression Analysis Model for the Psychological Effect of Vaccination

| | 95% CI | | | *P* |
|---|---|---|---|---|
| | OR | Lower | Upper | |
| **Being affected by COVID**[a] | 0.510 | 0.328 | 0.792 | .003 |
| **Vaccination status**[b] | 0.202 | 0.095 | 0.432 | <.001 |
| **ATV-COVID-19 total score** | 0.918 | 0.881 | 0.957 | <.001 |
| **FCV-19S total score** | 0.937 | 0.902 | 0.974 | .001 |
| **Age** | 0.985 | 0.971 | 1.000 | .048 |

[a]Not being affected by the COVID-19 pandemic is a reference value; [b]Not being vaccinated is a reference value.
ATV-COVID-19, Attitudes Toward the COVID-19 Vaccine; FCV-19S, The Fear of COVID-19 Scale; OR, odds ratio
Correct predictions = 66.3%, $P < .001$.

Logistic regression analysis was concluded in the fifth step. Model fit tests for this step were found to be sufficient (Hosmer–Lemeshow fit test: $X^2$= 8.569, $P$=.380). Being mentally affected by COVID-19, vaccination status, ATV-COVID-19, FCV-19S, and age were included in the model. All of these were statistically significant (Cox and Snell, $R^2$: 0.146; Nagelkerke, $R^2$: 0.197; $P < .001$). In the logistic regression analysis, it was observed that being positively affected by the vaccination was 4.95 times more common in the vaccinated group compared to the not vaccinated group. In addition, it was found that being positively affected by the vaccination was 1.96 times more common in the group who said they were mentally affected by the COVID-19 pandemic, compared to the group who were not.

## Correlation Analysis of the Psychological Measurement Tools and Their Relationship with Other Parameters

In order to evaluate the effect of depression, anxiety, and hopelessness on attitudes toward the vaccine, correlation analyses were applied and the results were reported in Table 4. Pearson correlation analysis was performed, except for correlations with ATV-COVID-19 positive attitude scores, which did not show a normal distribution, and Spearman Correlation analysis was used.

In correlation analysis between scales, FCV-19S score was found to be positively correlated with BHS score ($r$ = 0.239, $P < .001$, n = 578), HADS anxiety score ($r$ = 0.531, $P < .001$, n = 578), HADS depression score ($r$ = 0.387, $P < .001$, n = 578). BHS score was found to be positively correlated with HADS anxiety score ($r$ = 0.474, $P < .001$, n = 578) and HADS depression score ($r$ = 0.562, $P < .001$, n = 578), and negatively correlated with ATV-COVID-19 negative attitude score ($r$ = −0.093, $P$ = .025, n = 578). Correlations between scales are shown in detail in Table 4.

Finally, to determine the parameters affecting the positive attitude toward the vaccination, an independent $t$-test was applied. It was observed that there was a statistically significant increase in ATV-COVID-19 scores with being married ($P$ = .001) and having children ($P$ = .006). When we used the same analysis with the ATV-COVID-19 sub-dimension scores, it was found that there was a significant decrease in the ATV-COVID-19 negative sub-dimension levels in the female gender ($P$ = .047). No significant result was found for other parameters. However, when we investigated whether there is a difference in other scale scores between the genders, it was observed that there was a significant increase in all parameters in the female gender. We applied the independent $t$-test for normally distributed FCV-19S ($P < .001$), HADS anxiety ($P < .001$), HADS depression ($P < .001$), and BHS scores ($P$ = .028) to test for differences in scale scores between the genders.

In the post hoc power analysis, the effect size was found to be 0.462 and the power analysis of the study was found to be 0.999 in terms of the results of ATV-COVID-19 scores between the groups positively affected and not affected

**Table 4.** Correlation Analysis of FCV-19S, ATV-COVID-19, HADS, and BPS

| | FCV-19S | BHS | HADS Anxiety | HADS Depression | ATV-COVID-19 Positive[+] | ATV-COVID-19 Negative |
|---|---|---|---|---|---|---|
| **BHS** | 0.239 | | | | | |
| ***P*** | <.001 | | | | | |
| **HADS anxiety** | 0.531 | 0.474 | | | | |
| ***P*** | <.001 | <.001 | | | | |
| **HADS depression** | 0.387 | 0.562 | 0.682 | | | |
| ***P*** | <.001 | <.001 | <.001 | | | |
| **ATV-COVID-19 positive[+]** | 0.062 | −0.055 | −0.021 | −0.030 | | |
| ***P*** | .138 | .19 | .614 | .467 | | |
| **ATV-COVID-19 negative** | −0.031 | −0.093 | −0.061 | −0.026 | 0.542 | |
| ***P*** | .452 | .025 | .141 | .616 | <.001 | |
| **ATV-COVID-19 total** | 0.28 | −0.057 | −0.039 | −0.038 | 0.822 | 0.884 |
| ***P*** | .504 | .172 | .355 | .561 | <.001 | <.001 |

Pearson Correlation analysis was used, except for ATV-COVID-19 positive marked as [+] which Spearman Correlation analysis was used.
FCV-19S, The Fear of COVID-19 Scale; BHS, Beck Hopelessess Scale; HADS, Hospital Anxiety and Depression scale; ATV-COVID-19, Attitudes Toward the COVID-19 Vaccine; SD, standard deviation.

by the vaccine. For FCV-19S, the effect size was found to be 0.442, and the power analysis of the study was found to be 0.999.

## DISCUSSION

The main findings of this cross-sectional study are:

(a) The rate of vaccination among physicians is as high as 91.5%; 61% of those who chose not to be vaccinated stated that they were immune because they had the COVID-19 in the last few months.
(b) More than half of the physicians stated that the COVID-19 vaccination positively affected their psychology. Being vaccinated, being mentally affected by COVID-19, advanced age, positive attitude toward vaccination, and high fear of COVID-19 were found to be predictors of being positively affected by the vaccination.
(c) Fear of COVID-19 was positively correlated with hopelessness, depression, and anxiety levels. The negative thoughts about the vaccination (ATV-COVID-19 negative sub-dimension) were found to be correlated with hopelessness levels.

The current study reached one of the highest rates of COVID-19 vaccine acceptance in the literature. The first study on vaccine hesitancy in Turkey has found that only 52.8% of healthcare workers will accept a COVID-19 vaccine when available.[14] The difference between these results can be explained by the following reasons: (1) while the other study was conducted when there was no vaccine available, this study was conducted 1 month after the start of the vaccination program. (2) This study comprises a population of physicians, who are known to have a higher vaccination rate than other healthcare workers. (3) Recent literature on COVID-19 vaccines has provided positive evidence about protection and safety.[32] (4) Health policies to support vaccination have increased recently. Literature on vaccine acceptance among physicians shows that the lowest rate is in the Democratic Republic of Congo with 37.7%,[19] and the highest rate is in France with 92.1%.[33] However, since most studies are designed as cross-sectional, they are heavily influenced by factors such as the current severity of the pandemic, current results about protection rates of vaccines, the status of health policies, and sociocultural factors. To the best of our knowledge, the current study is the first post-vaccination study on this topic. For this reason, it is recognized that the vaccination rate is as high as it should be because of the effect of many factors. It can be argued that the relationship between COVID-19 vaccination and the mental state of physicians might also be among these factors.

Studies have shown that male gender, older age, high education level,[34] presence of chronic disease,[14] and high anxiety level[35] increase vaccine acceptance. Also, a study on vaccine hesitancy in the Turkish population showed that women who are married with children, are highly educated, and have high income are more likely to be vaccine-hesitant in recent years.[36] In the current study, no significant relationship was found between the vaccination acceptance and any data other than the family history of severe COVID-19. This result can be explained by the increase in the frequency of COVID-19 rates in individuals with severe COVID-19 infection in their families. Thus, the majority of those who choose not to be vaccinated stated that they have recently had the COVID-19 and assumed that they are immune. Considering that approximately 70% of the population should be vaccinated to ensure herd immunity,[37] this result can be considered very positive. Physicians should set an example to society by choosing to be vaccinated, regardless of any factor. This result, also can be viewed as vaccine hesitancy among physicians, may have decreased after the vaccination program in the light of current scientific data.

In the current study, factors such as age, fear of COVID-19 levels, anxiety and depression levels, and positive attitude toward vaccination were found to be higher in the group who said vaccination had positive effects on their mental health. It is also found that those who stated that the pandemic negatively affected their mental health and those who choose to be vaccinated were affected more positively as a result of the vaccination program. Based on these results, it can be considered that those who were positively affected by the vaccination were already having high levels of anxiety, depression, and fear of COVID-19. On the other hand, it has been reported that the people who refused the vaccine were less concerned about the pandemic and had lower anxiety and fear levels.[14] Age is also known as an important parameter in terms of vaccination acceptance.[38] In the current study, a positive relationship was found between the vaccination's positive mental effect and age, consistent with the literature. This result can be interpreted as older individuals are riskier in terms of COVID-19 infection mortality; therefore, they are more positively affected by the vaccination.

The fear of getting infected with COVID-19 and infecting family members are among the major factors that mentally affect healthcare workers.[39] In a study conducted in Turkey, COVID-19-related anxiety levels are found to be higher in women, those who are married, those who have children, and those who live with a vulnerable individual.[8] Another study conducted in the Turkish physician sample supports that female gender, having children, living in large families, and living with someone who has a chronic illness increase anxiety and depression levels.[6] Studies on physicians and other healthcare professionals from different countries have also obtained results supporting that the fear of infecting someone else is an important stress factor.[40,41] Although the effect of vaccination on viral

transmission is not yet known, many scientists believe it reduces infection and transmission rates.[42] One of the reasons physicians are relieved after vaccination might be that they felt less likely to be contagious. However, in the current study, factors such as being married, living with a family, having children, and living with someone with a chronic disease were not found to be associated with the positive mental effects of vaccination. But when the attitudes toward vaccination have been evaluated, it appeared that being married, having children, and living with a large family increased positive attitudes. Regardless of the psychological effects of the vaccination, it can be said that the fear of infecting others may increase the positive attitude toward the vaccine.

When the relationship between positive attitude toward vaccination and psychological parameters has been evaluated, it was seen that there was no significant correlation except for hopelessness levels. Although no correlation has been found between anxiety and depression levels and attitude toward vaccination in this study, results reveal that physicians with a high level of hopelessness have lower positive attitudes toward vaccination. A recent study has shown that individuals with greater vaccine hesitancy have higher post-vaccination anxiety, depression, and peritraumatic stress levels.[43] This result may suggest that the attitude toward vaccination and psychological factors mutually affect each other. In addition, the finding that women have lower scores in the ATV-COVID-19 negative sub-dimension (means less positive attitude toward vaccination) may indicate that gender is an important variable in this respect. It is known that women in the healthcare sector are more worried about vaccines and the main reason for this is the fear of side effects which is typically more common in women.[44-46] It is suggested that psychological factors such as depression, anxiety, stress, and insomnia may reduce the efficacy of the vaccine by weakening the immune system.[47] In the current study, it has been found that women are more at risk than men in terms of all psychological factors (anxiety, depression, hopelessness, and fear of COVID-19). In this respect, it can be postulated that the approaches aiming to protect the mental health of female physicians during vaccination may also increase their physical health.

Since the current study is designed as cross-sectional, it is not possible to show a temporal relationship. However, it has been thought that it is possible to compare it with 2 studies conducted during the initial period of the pandemic. The first one is conducted with the same population (physicians in Turkey) and used HADS as an anxiety and depression measurement tool. In that study, the total HADS scores were an average of 7.342 points (±4.756) for the anxiety sub-scale and 5.64 points (± 4.236) for the depression sub-scale.[6] In our study, it has been found that the HADS anxiety subscale score was 6.4 (±3.83) and the depression subscale score was 6.38 (± 3.88). In the HADS scale, less than 7 points can be considered as normal limits for both subscales. In this respect, it can be argued that anxiety levels decrease to more normal limits after vaccination. In another study on healthcare professionals in Turkey, hopelessness levels measured by BHS showed an average score of 7.15 (±5.42).[8] The current study showed a much lower hopelessness score of 5.83 (±5.3) in doctors. Certainly, there might be many independent variables that may be affecting these results. It can be thought that there is an improvement in physicians' psychological parameters in comparison with previous studies.

Among the main limitations of the current study are its cross-sectional design, the use of self-report scales, and the fact that the data were obtained online, not face-to-face. However, using an online and self-report questionnaire has been beneficial to maintain social distance and reach a wider and more comprehensive sample. The fact that the participants who chose to participate in our study were probably more interested in vaccination may have affected our results.

Results of this study indicate that physicians have positive attitudes toward vaccination and that vaccination has positive mental effects on physicians. In further studies, a longitudinal design is needed to better demonstrate the effects of vaccination on mental health in physicians. As vaccination has become one of the most crucial points in the fight against the pandemic, studies on the mental health and immunity of physicians will gain even more importance.

**Availability of Data:** The data are available upon request from the corresponding author.

**Ethics Committee Approval:** The Ethics approval for the study was obtained from the Acıbadem Mehmet Ali Aydınlar University Ethics Committee with the number 2021/03 on February 11, 2021. Furthermore, a permit was obtained from the Ministry of Health Scientific Research Platform Directorate for the study.

**Informed Consent:** Written informed consent was obtained from all participants who participated in this study.

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