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ORIGINAL ARTICLE

Factors Related to Attitudes Toward the COVID-19 Vaccine and Perception of Control of COVID-19 of Healthcare Workers in Turkey

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Abstract

Objective: This study aims to investigate the sociodemographic, occupational, and psychological factors related to attitudes toward the COVID-19 vaccine and perception of control of COVID-19 among the healthcare workers in Turkey.

Methods: This study has a descriptive and cross-sectional design, and 813 healthcare workers were included using the convenience and snowball sampling methods. The data were collected via online survey. Patient Health Questionnaire (PHQ-4), The Perception of Control of COVID-19 Scale (PCo-COVID-19) which has 3 subscales as macro-control, micro-control, and controllability, and Attitudes Toward the COVID-19 Vaccine (ATV-COVID-19) which has 2 subscales (positive and negative attitude) were used as data collection tools.

Results: The healthcare workers scored 1.93 ± 1.56 and 2.39 ± 1.63, respectively, in the anxiety and depression subscales of PHQ-4. The total scores obtained from PCo-COVID-19 and ATV-COVID-19 Vaccine Scale were 2.70 ± 0.56 and 3.56 ± 0.77, respectively. Our results indicated a very weak negative correlation between the anxiety and depression levels of healthcare workers and ATV-COVID-19 positive attitudes subscale scores. In addition, there was a negative relationship between the macro-control and controllability subscales, and a negative relationship with the micro-control subscale of ATV-COVID-19 and PCo-COVID-19. In multiple linear regression analysis, the variables of age, occupation, macro-control, micro-control, and controllability were found to be related to positive attitude subscale of ATV-COVID-19 scores.

Conclusion: The attitudes toward the vaccine of the healthcare workers were positive, while their beliefs regarding the controllability of COVID-19 pandemic were negative. Increase in anxiety and depression levels was found to be a risk factor for decreased positive attitude toward the COVID-19 vaccine. Finally, the attitude toward the COVID-19 vaccine was better among the healthcare workers who highly believed in the effectiveness of national and global measures, rather than individual ones.

Keywords: COVID-19, healthcare workers, vaccine hesitancy, COVID-19 vaccine, perception

Introduction

The World Health Organization announced a new coronavirus disease pandemic as an International Public Health Emergency and at the end of June 2021, the number of cases reached almost 175 million and the number of deaths reached roughly 3.7 million.[1]

To date, vaccination is considered the most effective method to control the spread of the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2). Therefore, research and development studies on COVID-19 vaccination have been prioritized worldwide.[2] However, negative attitudes toward vaccination have long been a global health concern. Vaccine refusal could not be considered in the individual level and increases the risk of diseases for the whole community. Healthcare workers (HCWs) have been prioritized for the COVID-19 vaccination as they are at higher risk of contracting the virus.[3] Previous studies that focused on the attitudes toward COVID-19 vaccination revealed that HCWs have generally a positive approach,[4,5] while hesitancy and negative attitudes were found to be closely related to the lack of adequate knowledge about the efficacy and safety of the vaccines.[6]

The pandemic has been reported to cause psychological distress and mental disorders in the general population through the impacts of health-related anxiety, preventive measures, and adverse economic consequences.[7,8] Healthcare workers who fight on the frontline against COVID-19 have a greater contraction risk than the general population and also are at high risk for developing mental disorders due to social and professional distress. The fear of contracting SARS-CoV-2 and health-related anxiety were reported to be overwhelming and closely related to mental disorders in HCWs.[9,10] Accordingly, depressive and anxiety disorders, insomnia, and high rates of psychological distress symptoms are well documented in HCWs during the pandemic.[11,12] Uncertainty due to the pandemic may also decrease the perception of control of individuals, thereby resulting in psychological distress and maladaptive psychological reactions and behaviors.[13] Hence, decreased perception of control of COVID-19 and psychological

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distress may influence the health-related behaviors of HCWs negatively and could be associated with the negative attitude toward vaccination.

To date, COVID-19 vaccination rates among HCWs remain unclear in many countries. In a brief report from the United States, researchers reported that as of September 15, 2021, among 3 357 348 HCWs in 2086 hospitals included in their analysis, 70.0% of the HCWs were fully vaccinated.[14]

Understanding the causes of hesitancy and negative attitudes in HCWs toward COVID-19 vaccination is essential as this population have been at higher risk during the pandemic and could help policymakers to develop better strategies to increase vaccination which could result in better outcomes regarding both COVID-19 and psychological distress in this population. In a systematic review searching for COVID-19 vaccination acceptance rates worldwide, it is concluded that only 8 surveys among HCWs (doctors and nurses) were found, with vaccine acceptance rates ranging from 27.7% in the Democratic Republic of the Congo to 78.1% in Israel.[15] However, to date, there are still a limited number of studies on the attitudes of HCWs toward the COVID-19 vaccines and related factors in the Turkish population.[16]

This study was conducted in January 2021, which is the same month when COVID-19 vaccines just became available in Turkey on January 13, 2021. Until April 12, 2022, when Pfizer-BioNTech-mRNA vaccine became available in Turkey, Sinovac-inactivated virus vaccine was the only option. Hence, in this study, we aimed to investigate the attitudes toward COVID-19 vaccines and the perception of control of COVID-19 and the related factors, that is, sociodemographic, occupational, and psychological characteristics in HCWs.

Methods

Study Design and Sample

This study has a cross-sectional and descriptive design. Convenience and snowball sampling methods were used to identify the HCWs to participate in the study. The inclusion criteria were (i) being between the ages of 18 and 75, (ii) being a HCW (i.e., physician, nurse, pharmacist, dentist, psychologist, and all other HCWs), and (iii) working in a healthcare setting in Turkey. A total of 813 HCWs who met these criteria and agreed to participate in the study constituted the sample of the study. The purpose of the study was explained to the individuals who wanted to participate in the study and consent was obtained that the information could be used for scientific purposes.

Instruments

Information Form

This form consists of 16 questions about age, gender, level of education, marital status, occupation, type of institution, professional experience, working style, having a physical illness, having a mental illness, working with COVID-19 patients, exposure to discr imination/stigma, the status of being diagnosed with COVID-19, the status of family members being diagnosed with COVID-19, the most reliable source of information about the vaccine, and vaccine preference of the HCWs.

Patient Health Questionnaire-4

The Patient Health Questionnaire-4 (PHQ-4) is a 4-item scale that consists of the Patient Health Questionnaire-2 (PHQ-2) and Generalized Anxiety Disorder-2 Scale (GAD-2). The PHQ-2 is an ultra-brief 2-item scale derived from the original form PHQ and is a valid and practical tool to establish the detection of depressive disorder.[17] A cut-off point of ≥3 (out of a possible score of 6) in PHQ-2 is found to have high sensitivity and specificity to identify clinically significant depression.[18,19] The GAD-2 is an ultra-brief 2-item scale derived from the original form PHQ for detecting anxiety disorder and had acceptable properties for identifying anxiety disorder at a cut-off score of≥3 (out of a possible score of 6).[17] Cronbach's alpha coefficients were 0.83 for PHQ-4 total, 0.76 for GAD-2, and 0.68 for PHQ-2. The original form PHQ from which PHQ-2 and GAD-2 scales were derived was previously adapted into Turkish.[20]

Perception of Control of COVID-19

The Perception of Control of COVID-19 Scale (PCo-COVID-19), which is a 5-point Likert-type scale, evaluates the beliefs about the control of the spread of the pandemic at the individual, institutional, and global levels. The template scale consists of 3 subscales and 13 items. The "macro-control" subscale evaluates the beliefs about the measures taken at the institutional, national, or global levels. The "personal (micro) control" subscale evaluates the beliefs about the personal precautions taken to prevent or catch the disease. The "controllability" subscale evaluates the beliefs about the controllability of the disease with the measures taken for the disease. Some items in the scale are reversely scored. Cronbach's alpha coefficients were 0.88 for the total scale and 0.83, 0.80, and 0.78 for the subscales in a particular order. The scoring of the scale is based on the average score. The increase in the scores obtained from the scale total and its subscales reflects the perception that the epidemic can be controlled by taking precautions. This scale was found to have a valid and reliable structure both in HCWs and non-HCWs.[21]

Attitudes Toward the COVID-19 Vaccine

Attitudes Toward the COVID-19 Vaccine (ATV-COVID-19) scale, which is a 5-point Likert-type scale, has 9 items and 2 subscales (positive and negative attitude). Cronbach's alpha coefficients were 0.96 for positive attitude and 0.78 for negative attitude dimensions. The items in the negative attitude subscale are calculated after reversing. The scoring of the scale is based on the average score. The increase in the scores obtained from the scale total and its subscales indicates that the attitude toward vaccination is positive. The scale was found to have a valid and reliable structure both in HCWs and non-HCWs.[21]

Data Collection

The data of the study were collected with the snowball sampling method via an online survey. The survey was shared via social media platforms to reach the participants. Data were collected between January 7, 2021, and January 14, 2021, immediately before the start of vaccination of HCWs in Turkey.

Statistical Analysis

IBM Statistical Package for the Social Sciences (IBM SPSS Corp., Armonk, NY, USA) 22 package program was used for the statistical analysis of the study. The normality of the data was evaluated via Kolmogorov–Smirnov and Shapiro–Wilk tests. Participants' characteristics and scores on the scales were evaluated using descriptive statistics. The comparison of variables including 2 categories and 3 or more categories was performed via Student's *t*-test and one-way ANOVA, respectively. Post-hoc multiple comparisons were performed using the Games-Howell and Hochberg test. The

relationship between the scale and its subscales was determined by Pearson correlation analysis. Finally, a multivariate logistic regression analysis was performed to assess the factors related to attitude toward the COVID-19 vaccine, with odds ratios (OR) and 95% CIs. A *P*-value <.05 was considered statistically significant for all analyses.

Ethical Considerations

The study was approved by the İstanbul Medeniyet University, Göztepe Prof. Dr. Süleyman Yalçın City Hospital Clinical Research Ethics Committee (January 27, 2021/2021-0057) and the COVID-19 Scientific Review Board of the Ministry of Health of Turkish Republic. This study was conducted in accordance with the Declaration of Helsinki of 1964 and its later amendments. Informed consent was obtained electronically from HCWs who agreed to participate in the study.

Results

Participants' Characteristics

The age of the HCWs participating in the study ranged from 20 to 74 (mean = 34.63 ± 9.87). The majority were female (72.8%), nearly half were single (58.6%), and had postgraduate education (52.9%). Among the participants, 41.8% were physicians, 32.5% were nurses, and 20.6% were other HCWs. Most of them (75%) were working in state hospitals and their professional experience ranged from 1 to 50 years. (mean = 10.79 ± 9.39); 87.6% were commuting to work during the pandemic. About 60% were currently or at some time providing direct health care to patients diagnosed with COVID-19, and 43.2% reported that they were exposed to discrimination or stigma by the society. Most of them did not have any medical (68.4%) or mental (88.2%) disease. For the majority of the HCWs, neither they (70.6%) nor any of their family members (66.4%) were diagnosed with COVID-19. Almost half (47%) of HCWs considered the Ministry of Health of Turkish Republic was the most reliable source of information on the vaccine, and the vast majority (72.6%) preferred the Pfizer-Biontech-MRNA vaccine, participants vaccine preferable and reliable source of information choices were as shown at Figures 1 and 2.

The PHQ-4, PCo-COVID-19, and ATV-COVID-19 Scores of HCWs

The mean PHQ-4 scores were 4.32 ± 2.64, being 1.93 ± 1.56 in the anxiety subscale and 2.39 ± 1.63 points in the depression subscale. In addition, 29.6% of HCWs had anxiety and 38.4% had depression. The mean scores obtained from PCo-COVID-19 were 2.70 ± 0.56 in the total scale, 2.34 ± 0.83 in the macro-control subscale, 2.67 ± 0.88 in the micro (personal) control subscale, and 3.10 ± 0.89 in the controllability subscale. Finally, the mean scores for ATV-COVID-19 were 3.56 ± 0.77 in the total scale, 3.53 ± 1.05 from the positive attitude subscale, and 3.58 ± 0.81 from the negative attitude subscale.

The Comparison of the PHQ-4, PCo-COVID-19, and ATV-COVID-19 Scores Regarding the Characteristics of HCWs

The results revealed that male HCWs compared to female HCWs and those who were married had higher ATV-COVID-19 compared to those who were single. Among the participants, physicians had the highest ATV-COVID-19 scores, while nurses had the lowest ATV-COVID-19 scores. Finally, ATV-COVID-19 scores were higher in those with a higher level of education and monthly household income. The comparison of the PHQ-4, PCo-COVID-19, and ATV-COVID-19 scores regarding the characteristics of HCWs is provided in Table 1.

When the HCWs' most reliable source of information about the vaccine is examined, macro-control perception was found to be significantly higher in those who accept the Ministry of Health of Turkish Republic as the most reliable source than in those who see professional societies, foundations, and online resources as the most reliable source ($P < .001$), and no significant difference was observed between any scales in any group besides that ($P > .05$). Except for this finding on macro-control, and controllability, no significant difference was found between any group in any variable ($P > .05$). Although marital status in the macro-control scale and occupation in the micro-control scale were found to be $P < .05$, it was determined that there was no significant difference between the groups as a result of post hoc analyses.

Correlations Between ATV-COVID-19, PHQ-4, and PCo-COVID-19 Scores

In this study, a weak and negative association was found between the ATV-COVID-19 and PHQ-4 ($r = -123$, $P < .001$), anxiety subscale ($r = -0.132$, $P < .001$), and depression subscale ($r = -0.095$ $P = .007$) scores. In addition, the macro-control and controllability subscales of PCo-COVID-19 had a weak positive correlation with ATV-COVID-19 scores, while the micro-control subscale scores had a weak negative correlation ($r = -0.099$, $P < .01$; $r = 0.115$, $P < .01$; $r = -0.085$, $P < .05$, respectively) (Table 2).

Factors Related to Positive Attitude Subscale of ATV-COVID-19 Scores

In this study, the relation between ATV-COVID-19 scores and the factors such as age, gender, marital status, income, cohabitating person(s), occupation, unit where he/she works, anxiety, depression, macro-control, micro-control, and controllability was analyzed by multiple linear regression analysis. The regression model was statistically significant ($P < .001$) and the variables explained 24% of the HCWs' attitudes toward the COVID-19 vaccine. Finally, the variables of age, occupation, macro-control, micro-control, and controllability were found to be related to the positive attitude subscale of ATV-COVID-19 scores (Table 3).

Discussion

This study aimed to investigate the attitudes of HCWs toward the COVID-19 vaccine, their perception of COVID-19 control, and the related factors. Our results indicated that the attitudes of HCWs toward the COVID-19 vaccine were generally positive. In addition, the attitudes of HCWs toward the COVID-19 vaccine differed according to their perception of COVID-19 control, anxiety, and depression levels, as well as their sociodemographic characteristics such as gender, age, level of education, occupational group, and income level. The variables of age, occupation, macro-control, micro-control, and controllability were found to predict the attitudes of HCWs toward the COVID-19 vaccine.

Among the HCWs, a considerable amount of the participants had higher scores above the cut-off value for anxiety and depression (29.6% and 38.4%, respectively). In a meta-analysis evaluating the prevalence of anxiety and depression among HCWs during the COVID-19, the rates of anxiety and depression were 23.2% and 22.8%, respectively.[22] While the stress levels of HCWs are expected to be high during the COVID-19 pandemic,[23] the rates we found were slightly higher than those reported in the literature. We suggest that these results could be related to the decline in

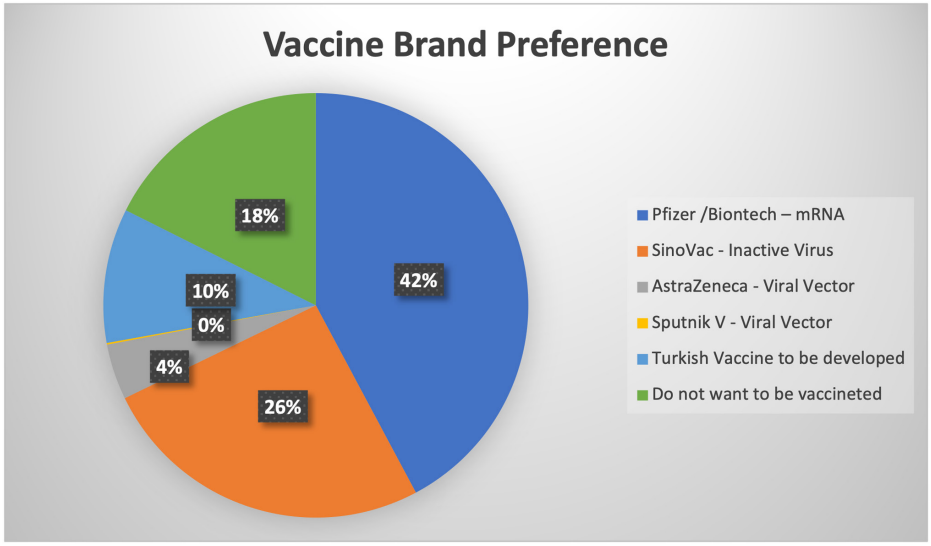

Figure 1. Vaccine Brand Preferences of the Participants.

mental health of HCWs who worked in hard conditions for a long period since our study was conducted in the later stages of the pandemic in 2021.

The perception of control is a psychosocial structure that defines the general beliefs about the person's ability to affect desired results and avoid undesirable consequences, which is higher in individuals who think that they can easily affect their own conditions or environment and lower in those who think that their lives are significantly directed outside themselves.[24] Perception of control has implications for performance, physical health, and mental health behavior[25] that could influence attitudes toward the COVID-19 vaccination. While HCWs' beliefs about the controllability of COVID-19 at the individual, national, or global levels were negative, their attitudes toward the COVID-19 vaccine were positive. Protecting the health of HCWs is essential as they are in the high-risk group in terms of transmission,[3] as well as they are an important source to positively influence the society's attitude toward vaccination. In our study, the rate of the HCWs who reported that they did not want to be vaccinated was 17.3%. A study conducted in the UK and Turkey in May 2020 reported that 31% of the participants in Turkey were unsure about getting themselves vaccinated for a COVID-19 vaccine and this rate was more than double when compared with UK (14%), also in both countries 3% of the participants rejected to be vaccinated.[16] In our study, we asked the participants to choose the vaccine they preferred in multiple choice question and the answers included "I am not willing to get vaccinated" but answers did not include option of being unsure, so keeping that information in mind our results can be interpreted as founded similar vaccine hesitancy rates in Turkish population with the literature.[16]

A study conducted in the United States reported that one-third of HCWs were willing to get vaccinated, and more than half willing to review data on vaccines, with a reluctance rate of just 8%.[26] In another study conducted in Israel, the acceptance rate of vaccination among physicians and nurses was 78% and 61%, respectively.[27] In a recent review of 35 recent studies they conducted, Biswas et al[28] reported that worldwide vaccine rejection among HCWs ranged from 4.3% to 72%, with an average vaccine rejection rate of 22.51% in studies involving approximately 76 000 HCWs. In these studies, the concerns of HCWs about

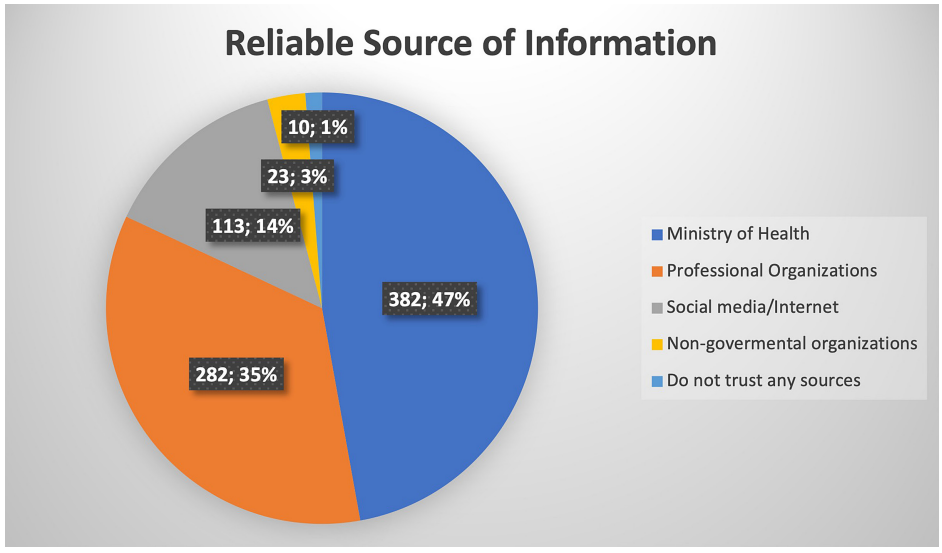

Figure 2. Reliable Source of Information Choices of the Participants.

Table 1. The Comparison of the PHQ-4, PCo-COVID-19, and ATV-COVID-19 Scores Regarding the Characteristics of HCWs

		Patient Health Questionnaire-4		Perception of Control			Attitude Toward Vaccination Scale	
		Anxiety	Depression	Macro	Micro	Controllability	Positive	Negative
Variables	**n**	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**
Gender								
Female	592	2.13 ± 1.55	2.58 ± 1.65	2.34 ± 0.78	2.70 ± 0.84	3.11 ± 0.85	3.42 ± 1.03	2.53 ± 0.78
Male	221	1.38 ± 1.46	1.89 ± 1.49	2.36 ± 0.94	2.56 ± 0.93	3.06 ± 0.98	3.83 ± 1.06	2.70 ± 0.89
		t = 6.180 *P* < .001	*t* = 5.685 *P* < .001	*t* = –.377/*f* = 0.314 *P* = .707/*P** = .575	*t* = 2.033/*f* = 4.717 *P* = .042/*P** = .030	*t* = 646/*f* =0.801 *P* = .519/*P** = .371	*t* = 5.085/*f* = 19.157 *P* = .000/*P** < .001	*t* = 2.383/*f* = 14.725 *P* = .018/*P** < .001
Age								
18-24	319	2.30 ± 1.65	2.80 ± 1.57	2.25 ± 0.85	2.70 ± 0.88	3.08 ± 0.88	3.11 ± 1.02	2.39 ± 0.78
30-44	371	1.74 ± 1.45	2.15 ± 1.64	2.40 ± 0.80	2.64 ± 0.84	3.10 ± 0.90	3.75 ± 0.98	2.65 ± 0.80
45-59	107	1.50 ± 1.46	2.08 ± 1.56	2.44 ± 0.83	2.59 ± 0.91	3.14 ± 0.89	3.98 ± 1.01	2.87 ± 0.81
60+	16	1.50 ± 1.37	1.81 ± 1.60	2.26 ± 0.80	2.91 ± 1.02	2.80 ± 0.87	3.86 ± 0.87	2.73 ± 0.95
		f = 11.453 *P* < .001	*f* = 11.728 *P* < .001	*f* = 2.461/*f** = 0.736 *P* = 061/*P** = .530	*f* = 0.948/*f** = 0.443 *P* = .417/*P** = .722	*f* = 0.715/*f** = 2.023 *P* = .543/*P** = .109	*f* = 32.643/*f** = 18.800 *P* < .001/*P** < .001	*f* = 12.278/*f** = 4.958 *P* < .001/*P** = .002
Education levels								
Elementary/high school	42	1.64 ± 1.71	1.98 ± 1.88*	2.35 ± .1.01	2.61 ± .0.99	3.08 ± .0.96	2.77 ± 1.12*	2.53 ± 0.89
Associate – undergraduate degree	341	2.20 ± 1.65*	2.73 ± 1.70*	2.35 ± .0.86	2.75 ± .0.89*	3.05 ± .0.87	3.29 ± 1.05*	2.43 ± 0.83*
Postgraduate degree	430	1.74 ± 1.44*	2.16 ± 1.50*	2.34 ± 0.77	2.66 ± 0.87*	3.13 ± 0.89	3.80 ± 0.96*	2.70 ± 0.77*
		f = 9.049 *P* < .001	*f* = 13.421 *P* < .001	*f* = 0.030/*f** = 1.198 *P* = .970/p*:.302	*f* = 3.201/*f** = 3.506 *P* = .041/*P** = .030	*f* = 0.945/*f** = 6.483 *P* = .389/*P** = .002	*f* = 37.261/*f** = 26.595 *P* < .001/*P** < .001	*f* = 11.544/*f** = 6.886 *P* < .001/*P** < .001
Marital status								
Married		1.79 ± 1.55*	2.18 ± 1.58*	2.38 ± 0.78	2.61 ± 0.85*	3.13 ± 0.91	3.66 ± 1.01*	2.65 ± 0.83*
Single		2.08 ± 1.56*	2.64 ± 1.65*	2.26 ± 0.84	2.68 ± 0.88	3.02 ± 0.86	3.31 ± 1.07*	2.50 ± 0.76*
Divorced/widow		2.09 ± 1.55	2.53 ± 1.72	2.61 ± 1.05	3.03 ± 0.79*	3.30 ± 0.68	3.89 ± 0.94*	2.65 ± 0.89
		f = 3.587 *P* = .028	*f* = 7.839 *P* < .001	*f* = 3.794/*f** = 1.697 *P* = .023/*P** = .184	*f* = 3.690/*f** = 1.653 *P* = .025/*P** = .192	*f* = 2.416/*f** = 3.443 *P* = .090/*P** = .032	*f* = 13.046/*f** = 9.487 *P* < .001/*P** < .001	*f* = 3.077/*f** = 1.511 *P* = .047/*P** = .221
Cohabitating person(s)								
Alone	181	2.03 ± 1.55	2.70 ± 1.62	2.21 ± 0.79	2.64 ± 0.89	3.11 ± 0.85	3.42 ± 1.04	2.42 ± 0.75
Partner – Partner and/or children	448	1.78 ± 1.53	2.20 ± 1.59	2.38 ± 0.78	2.61 ± 0.84	3.13 ± 0.91	3.68 ± 1.01	2.35 ± 0.84

Continued

Table 1. The Comparison of the PHQ-4, PCo-COVID-19, and ATV-COVID-19 Scores Regarding the Characteristics of HCWs (*continued*)

		Patient Health Questionnaire-4		Perception of Control			Attitude Toward Vaccination Scale	
		Anxiety	Depression	Macro	Micro	Controllability	Positive	Negative
Variables	**n**	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**
Parents and/or siblings	132	2.14 ± 1.61	2.55 ± 1.70	2.32 ± 0.87	2.75 ± 0.84	2.89 ± 0.84	3.23 ± 1.05	2.55 ± 0.75
Other	52	2.23 ± 1.57	2.53 ± 1.61	2.50 ± 1.05	2.87 ± 0.99	3.15 ± 0.86	3.31 ± 1.16	2.62 ± 0.88
Occupation								
Physician	340	1.76 ± 1.46*	2.13 ± 1.52*	2.36 ± 0.79	2.56 ± 0.82	3.15 ± 0.90	4.01 ± 0.87*	2.84 ± 0.75*
Nurse	264	2.40 ± 1.72*	2.89 ± 1.63*	2.35 ± 0.85	2.76 ± 0.91	3.07 ± 0.87	3.09 ± 1.00*	2.27 ± 0.79*
Dentist	52	1.80 ± 1.41	2.65 ± 1.41	2.34 ± 0.76	2.54 ± 0.81	3.03 ± 0.74	3.35 ± 1.00*	2.54 ± 0.79
Pharmacist	42	1.48 ± 0.94*	2.05 ± 1.72*	2.43 ± 0.86	2.67 ± 0.73	2.90 ± 0.84	3.62 ± 0.93*	2.63 ± 0.72
Psychologist/social worker	42	1.57 ± 1.12*	2.30 ± 1.64	2.02 ± 0.57	2.60 ± 0.77	3.09 ± 0.74	3.42 ± 0.92*	2.50 ± 0.67
Other healthcare worker	73	1.47 ± 1.59*	1.86 ± 1.75*	2.36 ± 0.93	2.82 ± 1.00	3.02 ± 1.02	3.00 ± 1.17*	2.54 ± 0.89*
		f = 8.544 P < .001/	f = 9.266 P < .001/	f = 1.407/f^* = 2.397 P = .219/P^* = .036	f = 2.331/f^* = 2.153 P = .041/P^* = .057	f = .875/f^* = 1.323 P = .497/P^* = .252	f = 32.613/f^* = 23.457 P = .000/P^* < .001	f = 16.179/f^* = 7.682 P = .000/P^* < .001
Monthly household income								
≤ TL 5999	201	2.19 ± 1.68*	2.67 ± 1.72*	2.24 ± 0.87	2.72 ± 0.96	3.08 ± 0.93	3.07 ± 1.06*	2.30 ± 0.80*
TL 6000-TL 9999	167	2.23 ± 1.71*	2.67 ± 1.69*	2.43 ± 0.81	2.78 ± 0.87*	3.05 ± 0.83	3.29 ± 1.05*	2.57 ± 0.80*
TL 10 000-TL 14 999	186	1.80 ± 1.38	2.34 ± 1.57	2.32 ± 0.77	2.68 ± 0.75	3.14 ± 0.81	3.73 ± 0.93*	2.62 ± 0.75*
TL 15 000 – TL 24,999	151	1.74 ± 1.54	2.10 ± 1.57*	2.36 ± 0.86	2.54 ± 0.87	3.18 ± 0.94	3.88 ± 0.94*	2.71 ± 0.81*
≥ TL 25 000	108	1.39 ± 1.13*	1.90 ± 1.34*	2.39 ± 0.75	2.46 ± 0.84*	2.93 ± 0.91	3.89 ± 0.98*	2.89 ± 0.79*
		f = 7.312 P < .001/	f = 6.472 P < .001/	f = 1.414/f^* = 2.723 P = .227/P^* = .029	f = 3.266/f^* = 2.802 P = .011/P^* = .025	f = 1.472/f^* = 4.599 P = .209/P^* < .001	f = 23.038/f^* = 20.070 P < .001/P^* < .001	f = 11.216/f^* = 6.295 P < .001/P^* < .001
Contact COVID-19 patients								
Currently contacting	335	2.16 ± 1.63*	2.59 ± 1.73*	2.35 ± 0.85	2.67 ± 0.84	3.12 ± 0.93	3.62 ± 1.05	2.57 ± 0.84
Previously contacted	154	2.12 ± 1.56*	2.47 ± 1.53	2.38 ± 0.90	2.73 ± 0.96	3.08 ± 0.90	3.38 ± 1.09	2.57 ± 0.78
Had never contacted	324	1.58 ± 1.41*	2.14 ± 1.54*	2.30 ± 0.75	2.61 ± 0.84	3.06 ± 0.82	3.50 ± 1.02	2.60 ± 0.80
		f = 13.174 P < .001/	f = 6.371 P = .002	f = 0.573/f^* = 3.312 P = .564/P^* = .037	f = 1.18/f^* = 3.530 P = .308/P^* = .030	f = .284/f^* = 0.173 P = .753/P^* = .841	f = 3.000/f^* = 4.851 P = .052/P^* = .008	f = 0.178/f^* = 0.299 P = .837/P^* = .741

SD, standard deviation.

Table 2. Correlations Between ATV-COVID-19, PHQ-4, and PCo-COVID-19 Scores

Scales		PHQ-4			PCo-COVID-19			
		Anxiety	**Depression**	**Total**	**Macro**	**Micro**	**Controllability**	**Total**
ATV	Positive	**−0.137**** **0.000**	**−0.095**** **0.007**	**0.126**** **0.000**	**0.169*** **0.000**	**−0**.020 0.578	0.021 0.542	**0.079*** **0.024**
	Negative	**−0.084*** **0.017**	**−0**.064 0.069	**−0.080*** **0.022**	**−0**.004 0.919	**−0.126**** **0.000**	**0.175**** **0.000**	0.026 0.454
	Total	**−0.132**** **0.000**	**−0.095**** **0.007**	**−0.123**** **0.000**	**0.099**** **0.005**	**−0.085*** **0.015**	**0.115**** **0.001**	0.063 0.072

PHQ-4, Patient Health Questionnaire-4; PCo-COVID-19, Perception of Control of COVID-19; ATV-COVID-19, Attitudes Toward the COVID-19 Vaccine; ATV, attitudes toward vaccination. Bold print indicates statistical significance at $P < .05$.

vaccination appeared to have resulted from the lack of adequate knowledge on the safety profile, potential or unknown long-term side effects, and also emergency use authorizations of the vaccines that arise concerns due to the lack of regulatory approval and licenses. On the other hand, in another study conducted, in the United States, the authors emphasized the propensity of HCWs for being vaccinated was constantly increasing.[29] These results indicated that HCWs consider the vaccine as an important method to control the COVID-19 pandemic. In addition, the development of the positive perspective of HCWs toward the COVID-19 vaccine probably resulted from the increase in scientific data on the efficacy and safety of the vaccine over time, as well as the continuing strong activity of the pandemic worldwide although more than 1 year has passed since its beginning.

With respect to the factors associated to the prevention and control of COVID-19 transmission, in our study, no significant difference was found between any of the groups in terms of controllability and except for a reliable source of information on macro-control ($P > .05$). Since the PCo-COVID-19 scale that we used in our study does not have a cut-off score for the subscales and the total score, we could not calculate the general perception of the HCWs about the controllability of the pandemic; however, while the score was 2.34 ± .83 out of 5 (median: 2.25) in the macro-control subscale, a relatively higher score of 3.10 ± .89 out of 5 (median: 3) was obtained in the controllability subscale. These results show that HCWs probably assume that COVID-19 disease is actually a controllable condition, but they have lower belief in the adequacy and appropriateness of the macro-level actions at the country and global level. These results also could be resulted from the lack of confidence in the healthcare policies as a result of factors such as the fact that many countries in the world cannot generate vaccines due to the patent issues, developing and lower income countries cannot reach enough vaccines, the planned targets of vaccine supply and vaccination rates could not be achieved in Turkey, and finally, the preventive measures were not sufficient to mitigate the spread of the pandemic. Regarding the studies conducted in other countries, in a study conducted in the early periods of the pandemic, the authors reported that the belief of HCWs that the pandemic can be controlled was positive.[30] It is thought that this perception may be due to the limited awareness

Table 3. Factors Related to Positive Attitude Subscale of ATV-COVID-19 Vaccine

Independent Variable	Beta	SE	*β*	*t*	*P*	95% CI Lower Bound	95% CI Upper Bound
Age	0.013	0.003	0.165	4.164	**<.001**	0.007	0.019
Gender	0.110	0.058	0.063	1.897	.058	−0.004	0.223
Marital status	0.008	0.080	0.006	0.094	.925	−0.149	0.164
Income	0.085	0.074	0.047	1.144	.253	−0.061	0.231
Cohabitating person(s)	−0.055	0.107	−0.036	−0.520	.603	−0.265	0.154
Occupation	−0.511	0.073	−0.309	−7.000	**<.001**	−0.654	-0.367
Unit where he/she works	0.145	0.118	0.040	1.225	.221	−0.087	0.377
Anxiety	−0.115	0.064	−0.068	−1.792	0.074	−0.242	0.011
Depression	0.099	0.059	0.062	1.673	.095	−0.017	0.215
Macro-control	0.126	0.033	0.134	3.824	**<.001**	0.061	0.191
Micro-control	−0.087	0.031	−0.098	−2.824	**.005**	−0.147	−0.027
Controllability	0.108	0.028	0.123	3.908	**<.001**	0.054	0.162

n = 813.
SE, standardized error, *β*, standardized coefficients, $F_{Model1} = 13.646$, $P < .001$, $R_{Model1} = 486$, $R^2_{model1} = 0.236$, Adjusted $R^2_{Model1} = 0.219$. Bold print indicates statistical significance at $P < .05$

and current scientific knowledge about the COVID-19 pandemic, both at the national and global level at that time. It has been reported that the perception of COVID-19 control deteriorated during the pandemic period, which is claimed to be a result of the increasing volume of patients.[31]

The attitudes of HCWs toward the COVID-19 vaccine differed regarding the sociodemographic and occupational characteristics. Among HCWs, males and married ones had higher positive attitudes toward the COVID-19 vaccine. Other studies also showed lower vaccine acceptance rates of female HCWs, similar to our findings.[26,32] We also found that HCWs with higher age, education, and income levels showed more positive attitudes toward the COVID-19 vaccine. These findings were also consistent with the results of the recent research by Shekhar et al.[26] It is suggested that this difference in the trend toward vaccines may be due to the increased risk of being adversely affected by COVID-19 at older age and the increase in accessibility to both vaccines and information with increasing levels of income and education. Finally, attitudes toward the COVID-19 vaccine appeared to differ by occupation and healthcare role. Among the HCWs, doctors had the most positive attitude while nurses had the most negative attitude toward vaccination. Although this result is compatible with the results of other studies,[26,32] it may create a significant problem in the increase of contamination in the health sector since nursing is the profession with the highest contact with the patient. In addition, the attitudes of the HCWs who directly give care for COVID-19 patients toward the vaccine were more positive. In other words, the rates of vaccine rejection were higher among HCWs not giving care for COVID-19 patients.[26,29] We suggest that this result is associated with being at serious risk of being exposed to the virus by direct contact with COVID-19 patients,[34] and it can be thought that witnessing the negative outcomes of the disease also affects such decision.

The results of the study revealed that as the anxiety and depression levels of HCWs increase, their attitudes toward the vaccine are negatively affected. In this respect, in a study conducted on medical students, the authors emphasized that the desire to be vaccinated increases with stress and decreases with depressive symptoms.[35] In another study conducted on HCWs, it was reported that anxiety and fear influence the individual and social practices for infection control.[9] The refusal or reluctance of HCWs who are in a high-risk group and who also have a leading advisory role to be vaccinated against COVID-19 may negatively affect both their colleagues' and the general public's confidence in the vaccination and may result in a community health issue.[26] For this reason, it is crucial to determine and mitigate the factors that ruin the mental health and work motivation of HCWs through regular meetings with the treatment teams in order to improve the rate of vaccination in this population as well as their physical and mental health.

Regarding the factors related to positive attitude toward COVID-19 vaccination, our results indicated that among HCWs, being younger and being nurse are risk factors for decreased positive attitude toward the COVID-19 vaccine. The uncertain attributes such as effectiveness, side effects, and effective duration of the COVID-19 vaccine were probably the reason for this discrepancy.[6] Heath authorities should take into consideration the negative attitude of nurses when tailoring and executing the vaccination campaign. When it comes to the perception of control of COVID-19, while increase in the controllability and believing in the effectiveness of the measures taken against the COVID-19 pandemic at the national and global level (macro-control) predicted a positive attitude toward the COVID-19 vaccine, the increase in the perception of the effectiveness of the individual measures was found to be a risk factor for decrease in positive attitude toward COVID-19 vaccination. In other words, these results show that policymakers should regularly advise and promote the effects of institutional and global measures, and promoting them rather than individual measures could improve the rates of vaccination among HCWs. However, unlike the results of this study, Kwok et al[6] emphasized that if institutional measures are inadequate during the COVID-19 pandemic, the level of work stress of the employees increases and this indirectly increases the intention to get the COVID-19 vaccine. This may be due to the differences between countries in the perspective of HCWs regarding health policies and protective measures. Therefore, it is thought that further research is needed to resolve the current contradiction in the literature.

Study Limitations

This study has some limitations. The data were collected through online survey and the rate of participation is unknown. Although the participants were included voluntarily in the study, this survey may have caused bias as it included questions about the view on the health policies. In addition, this study was conducted at the beginning of the vaccination process, and the results of efficacy and safety studies on vaccination may continue to influence the attitudes of HCWs. The present study did not use any theory-based instrument to assess vaccine acceptance and female dominance of participants should be taken into consideration. Finally, the inability to use a robust sampling method in this study may have affected the generalizability of the findings, as well as the sample size was not calculated in relation to the estimated total number of HCWs in Turkey. The results of this study should be evaluated with these limitations in mind.

This study reveals that HCWs' attitudes toward the COVID-19 vaccine are positive. HCWs believe more in the effectiveness of institutional and global measures. Our results showed that in order to improve the positive attitudes of HCWs toward vaccination and to protect and improve their mental health, it is crucial to improve the perception of COVID-19 in this population. To prevent vaccine rejection, which is known to be closely related to negative attitudes, it is important for healthcare policymakers to provide regular support by addressing the social and mental conditions of HCWs and to focus on the groups shown to be associated with negative attitudes such as nurses and younger HCWs. Thus, increasing the positive attitude toward the vaccine and the rate of vaccine acceptance may contribute to the decrease in morbidity and mortality rates by reducing the rates of transmission and absenteeism among HCWs who are role models for society.

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