



Knowledge, attitudes, and perceptions of COVID-19 vaccine among health-care professionals

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ABSTRACT

Objective: The objective of the study is to understand COVID-19 vaccine perspectives among health-care workers (HCWs) in the early phase of COVID-19 pandemic.

Material and Methods: This cross-sectional study was carried out between February and March 2021, 2 weeks after the Turkish government approved nationwide COVID-19 vaccinations for adults over 18-year-old age. Several online platforms were used to distribute the questionnaires. We followed the snowball sampling technique. An online questionnaire including sociodemographic information, vaccination attitudes, and perceived causes of COVID-19 pandemic was used.

Results: A total of 128 HCWs with a mean age of 30.97±8.07 years were included. The average score of the research-assistant physicians obtained from the “Conspiracy” sub-dimension was significantly lower than that obtained by the nurses, midwives, medical secretaries-laborants, and technicians (all p<0.05). There is a weak negative correlation between considering that the vaccine is safe and the mean scores obtained from all sub-dimensions of the scale (all p<0.05). HCWs had concerns about difference between vaccines obtained significantly higher mean scores from the “Conspiracy” and “Environment” factors subscales than those who were not concerned (all p<0.05).

Conclusion: This study found that over half of HCWs were hesitant about the safety, effectiveness, and brand of vaccines even though they were vaccinated. The higher scores regarding belief and environmental factors indicated decreased the trust and confidence in vaccines among HCWs in the early COVID-19 pandemic.

Keywords: Attitude toward vaccine, conspiracy beliefs, COVID-19, COVID-19 vaccine.

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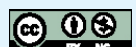
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INTRODUCTION

As of August 10, 2022, approximately 584 million people have been infected, and approximately 6.4 million people have died worldwide due to COVID-19 pandemic. According to the World Health Organization (WHO) reports, around 11 million doses of vaccine have been administered.^[1] The WHO listed the COVID-19 vaccine for emergency use in December 2020. The elderly, health-care workers (HCWs), and immunocompromised people have been prioritized for COVID-19 vaccination. Countries across the world has started vaccination to control the spread of the coronavirus, reduce hospitalizations, and prevent deaths due to the devastating effect of the pandemic.^[2]

The fight against COVID-19 disease relies on taking preventive measures to reduce the risk of COVID-19 transmission. Being vaccinated is a safer and more effective way to achieve herd immunity in the community.^[3] It is emphasized that at least 70% of the population needs to be vaccinated to achieve “herd immunity”.^[4]

Despite the availability of these vaccines, countries are suffering several challenges, such as vaccine hesitancy and anti-vaccination attitudes. The WHO identified vaccine hesitancy and refusal or reluctance as one of the global health concerns.^[5] The causes of vaccine hesitancy are religious reasons, individual factors (knowledge, belief, attitude, and behavior), safety concerns, and lack of information.^[6] Although vaccine acceptance is increasing, vaccine hesitancy still continues due to the significant concerns related to side effects.^[7]

The rapid development in the COVID-19 vaccines may raise vaccine hesitancy in individuals, particularly who are reluctant to take a vaccine.^[8] Vaccine hesitancy may limit the global efforts in the fight against the pandemic.^[9] Empirical evidence suggests that belief in COVID-19 conspiracy theories, concerns about the potential side effects of COVID-19, and mistrust of pharmaceutical companies may contribute to the intention of COVID-19 vaccine uptake.^[10] Although HCWs have a greater risk of exposure to COVID-19 infection, they are still hesitant to get vaccines.^[11] As role models, they play a pivotal role in the behavioral change in society. A successful vaccination program with high participation of HCWs ensures immunization of HCWs as well as reduces loss of workforce, maintenance of essential health services during pandemics, and reduces the costs involving delivery of health care.^[12]

In conclusion, it is of paramount importance for public health agencies and national authorities to be aware of the refusal and hesitancy factors in accepting COVID-19 vaccines among HCWs to formulate effective public health policies. HCWs are among the priority groups that need to be vaccinated to strengthen public trust in the COVID-19 vaccination. Thus, this study aimed to examine the relationships between HCWs' vaccination attitudes and perception on COVID-19 vaccine.

MATERIAL AND METHODS

This cross-sectional study was conducted from February to March 2021 to evaluate the views and perceptions of HCWs toward the COVID-19 vaccine in the context of perceptions of COVID-19 causes. The present study was performed 2 weeks after the COVID-19 vaccines had been approved by the Turkish government for adults over 18 years.

This study was approved by the Research Ethics Committee (Approval number: 03.02.2021/28). All respondents provided consent through an electronic form. This study was conducted in accordance with the ethical principles of the 1964 Helsinki Declaration.

Inclusion criteria were individuals who (1) were HCWs currently working at the hospital, (2) able to access the Internet, (3) received a COVID-19 vaccine, (4) voluntarily agreed to participate in this survey.

This study used an anonymous, online questionnaire. The questionnaire had three main parts with mandatory response items: (1) sociodemographic characteristics, (2) questions evaluating participants' attitudes regarding a COVID-19 vaccine, and (3) a 14-items perception of COVID-19 causes scale. Questionnaires were disseminated through online platforms, including Instagram and WhatsApp.

The scale was developed by Çırakoğlu^[13] and Turkish validity and reliability were performed by Geniş et al.^[14] The scale was composed of 14 items, with three sub-dimensions: “Conspiracy Theories,” “Environmental Factors,” and Faith Factors.” It has a five-point Likert-type response format ranging from 1 (strongly disagree) to 5 (strongly agree). Higher scores indicate a higher level of perception in that sub-dimension. “Conspiracy” dimension includes conspiracy beliefs (bioweapons, vaccine sales, and political games). The “Environmental” dimension includes beliefs that unhealthy lifestyles, global planetary warming, and pollution of natural resources were suggested as possible causes of the COVID-19 pandemic. The “Faith” dimension includes beliefs that an epidemic is the punishment of God's wrath due to religion or social degradation.

Statistical Analyses

For statistical analyses, Number Cruncher Statistical System 2007 software (NCSS, Kaysville, Utah, USA) was used. Mean, standard deviation, median, frequency, percentage, minimum, and maximum values were used for descriptive statistics. The conformability of the quantitative data to the normal distribution was determined on the basis of the Shapiro–Wilk test. The independent samples t-test was used to analyze normally distributed data, whereas the Mann–Whitney U-test was for non-normally distributed data. One-way analysis of variance and post hoc Bonferroni tests were used to evaluate statistical differences. Kruskal–Wallis test with the Dunn–Bonferroni post hoc test was used for multiple comparisons. Pearson correlation analysis and Spearman correlation analysis were used as needed. $p < 0.05$ was considered as statistical significance.

RESULTS

A total of 128 HCWs with a mean age of 30.97 ± 8.07 years were included in the study. Of them, 54.7% were single, 64.8% were undergraduate, 38.3% were nurses, 18.0% worked in the delivery room, and 82.8% were not infected with COVID-19. The sociodemographic characteristics are shown in Table 1.

Total scale of Cronbach's alpha value is 0.88. We also calculated Cronbach's alpha as 0.94, 0.92, and around 0.91 for the conspiracy, environmental, and belief sections, respectively (Table 2).

HCWs with bachelor's degrees and below received higher average scores from the “Conspiracy” sub-dimension than those with master's and doctorate degrees (all $p < 0.05$). With respect to the oc-

Table 1: Baseline characteristics of the study participants (n=128)

	n	%
Age (year), Mean±(SD)	30.97±8.07	28 (20–52)
Working year (year), Median (Min–Max.)	8.45±8.97	33 (1–34)
Marital status		
Single	70	54.7
Married	58	45.3
Educational level		
Bachelor's Degree	16	12.5
Master's degree	83	64.8
Doctoral degree	29	22.7
Income		
Less than expense	31	24.2
Equivalent to expense	69	53.9
More than expense	28	21.9
Occupational status		
Midwife	31	24.2
Nurse	49	38.3
Technician	10	7.9
Medical laboratory technique	9	7.1
Research assistant	29	22.7
Department		
Delivery room	23	18.0
Newborn baby room	23	18.0
Pediatry service	14	10.9
Operating room	9	7.0
Pediatric surgery newborn	4	3.1
Pediatric intensive care unit	2	1.6
Pediatric surgery service	3	2.3
Pediatric emergency service	3	2.3
Obs/Gyn emergency department	2	1.6
Obs/Gyn outpatient clinic	12	9.4
Obs/Gyn COVID-19 service	1	0.8
Childbirth education unit	3	2.3
Obstetrics service	14	10.9
Gynecology service	4	3.1
Laboratory	7	5.5
Adult intensive care unit	1	0.8
Neonatal intensive care unit	1	0.8
Management	2	1.6

SD: Standard deviation; Min: Minimum; Max: Maximum.

Table 2: Descriptive statistics for perception of causes of COVID-19

Scale and subdimensions	Mean±SD	Median (Min–Max)	Cronbach's alpha
Conspiracy theories	16.85±5.08	18 (6–30)	0.943
Environmental factors	14.30±4.68	15 (5–25)	0.924
Faith factors	6.34±3.02	6 (3–15)	0.914
Total	37.49±9.55	40 (14–70)	0.902

SD: Standard deviation; Min: Minimum; Max: Maximum.

cupation status, the mean score of the research-assistant physicians obtained from the “Conspiracy” sub-dimension was significantly lower than that obtained by the nurses, midwives, laborants, and technicians (all $p<0.05$) (Table 3).

There is a weak negative correlation between considering that the vaccine was safe and the mean scores obtained from all sub-dimensions of the scale (all $p<0.05$). HCWs who did not recommend the vaccine to their relatives had significantly higher mean scores on the “Conspiracy” sub-dimension than those who recommended it ($p=0.029$; $p<0.05$). HCWs who did not prefer the mRNA vaccine had significantly higher mean scores on the Belief Theories subscale than those who preferred it ($p=0.016$; $p<0.05$). HCWs who had concerns about the difference between vaccines obtained significantly higher mean scores from the “Conspiracy” and “Environment” factors sub-scales than those who were not concerned (all $p<0.05$) (Table 4).

DISCUSSION

This study found that 51.6% of health-care professionals were hesitant about the safety of the vaccine, and 50.8% were hesitant about its effectiveness against the COVID-19 vaccine. Wang et al.^[15] demonstrated that while the intention to receive the vaccine was 34.8% in the third wave, it was 44.2% in the first wave. It can be assumed that concerns about vaccine safety reduced the willingness to receive the COVID-19 vaccine. Another study concluded that major challenge was safety and awareness of the COVID-19 vaccine.^[16]

The majority of participants recommended the COVID-19 vaccine to their friends and family. A study among HCWs found that the top three reasons for vaccine acceptance were protecting themselves, family, and friends.^[17] Another study covering low-and middle-income countries reported that the main reasons for willingness to receive vaccines were self and family protection.^[18]

Trust in government agencies, scientists, and HCWs may be effective in reducing vaccine hesitancy.^[19] The positive attitude of health professionals toward the vaccine ensures the acceptance of the vaccine and reduces vaccine reluctance or hesitation.^[20] Our research showed that one of the major reasons for vaccine acceptance among HCWs was the approval of the Ministry of Health (63.3%). Similarly, a study in America reported that endorsements from some governments and organizations were associated with more likely vaccine acceptance.^[21] In the same vein, community-based research in Türkiye concluded

Table 3: Distribution of demographic characteristics by perception of causes of COVID-19 sub-dimensions

	Perception of causes of COVID-19 scale			
	Conspiracy theories	Environmental factors	Faith factors	Total
Age (year)				
r	-0.025	-0.148	-0.200	-0.131
p	0.784	0.095	0.024*	0.142
Working year				
r	0.090	-0.018	-0.215	-0.032
p	0.310	0.843	0.015*	0.719
Marital status				
Single (n=70), Mean±SD	16.84±5.29	14.93±4.93	6.64±3.33	38.41±10.04
Married (n=58), Mean±SD	16.88±4.86	13.53±4.28	5.97±2.59	36.38±8.87
p	^c 0.938	^c 0.051	^c 0.338	^a 0.231
Educational level				
Bachelor's degree (n=16), Mean±SD	20.56±4.87	14.38±4.7	7.69±3.98	42.63±11.63
Master's degree (n=83), Mean±SD	16.89±4.52	14.43±4.64	6.06±2.71	37.39±8.4
Doctoral degree (n=29), Mean±SD	14.72±5.64	13.86±4.94	6.38±3.19	34.97±10.62
p	^d 0.002**	^d 0.775	^d 0.308	^b 0.034*
Occupational status				
Midwife (n=31), Mean±SD	17.45±3.62	15.19±5.11	6.29±2.75	38.94±8.67
Nurse (n=49), Mean±SD	17.33±5.52	14.10±4.11	6.00±3.12	37.43±9.51
Technician (n=10), Mean±SD	20.50±3.98	14.80±4.39	6.70±3.92	42.00±9.15
Median (Min–Max)	21.5 (12–24)	14 (8–20)	6 (3–14)	41 (27–58)
Medical laboratory technique (n=9), Mean±SD	19.56±5.81	13.11±5.73	8.22±3.46	40.89±13.87
Research assistant (n=29), Mean±SD	13.34±3.91	13.86±5.03	6.24±2.64	33.45±8.10
P	^d 0.001**	^d 0.489	^d 0.464	^b 0.052
Income				
Less than expense (n=31), Mean±SD	18.68±5.92	15.23±5.57	6.48±3.6	40.39±12.26
Equivalent to expense (n=69), Mean±SD	16.01±4.99	13.75±4.79	6.36±2.83	36.13±9.17
More than expense (n=28), Mean±SD	16.93±3.74	14.61±2.99	6.11±2.88	37.64±5.95
p	^d 0.081	^d 0.346	^d 0.942	^b 0.215

SD: Standard deviation; a: Student t-test; b: One-way ANOVA test; c: Mann–Whitney U-test; d: Kruskal–Wallis test; *: P<0.05; **: P<0.01.

that the approval of the Coronavirus Scientific Committee of the Ministry of Health and the WHO has a key role in vaccine acceptance.^[22]

This study found that HCWs were hesitant about the brand of vaccines even though they were vaccinated. More than half of HCWs stated they would prefer to receive a domestic vaccine and one-third an mRNA vaccine if there were another vaccine option available. In Türkiye, the first administered vaccine was Sinovac-CoronaVac, produced by a Chinese pharmaceutical company. The Philippines was among the countries that used the same vaccine for the 1st time. A study in the Philippines, where reasons for COVID-19 vaccine brand hesitancy were evaluated, cited doubts about the provenance of the vaccine, and concerns about the safety and effectiveness of mRNA

vaccines, and the Sinovac-CoronaVac brand was not recognized by other countries as the major reasons for vaccine hesitancy.^[23] While our study showed that 51.6% of the HCWs had no idea about the long-term consequences of the vaccine, in a study conducted in the USA, the participants stated that the COVID-19 vaccine would change human DNA or lead to infertility.^[24]

The present study found that 60.2% of HCWs were concerned about the possible adverse effects of the vaccine. Similarly, in the study by Paul et al.,^[25] 16.3% expressed strong concerns, while 52.9% expressed moderate concerns about unforeseen effects. Previous studies reported that the most common reasons for vaccine refusal were concerns about side effects.^[18]

Table 4: Distribution of views and perceptions of participants by perception of causes of COVID-19 sub-dimensions

	Perception of causes of COVID-19 scale			
	Conspiracy theories	Environmental factors	Faith factors	Total
Vaccine is safe				
r	-0.230	-0.326	-0.309	-0.407
p	0.009**	0.001**	0.001**	0.001**
Vaccine will put an end to pandemic				
r	-0.162	-0.010	-0.052	-0.107
p	0.068	0.915	0.556	0.230
Recommends relatives vaccination				
Yes, Mean±SD	16.61±4.92	14.20±4.65	6.30±2.95	37.12±9.20
No, Mean±SD	21.83±6.15	16.17±5.49	7.00±4.52	45.00±13.97
p	°0.029*	°0.508	°0.908	°0.048*
If you have a choice other than the Sinovac vaccine, which vaccine would you get?				
mRNA vaccines				
Yes, Mean±SD	16.42±5.37	14.81±4.19	5.42±2.75	36.65±8.35
No, Mean±SD	17.08±4.94	14.04±4.92	6.80±3.06	37.92±10.12
p	°0.632	°0.358	°0.016*	°0.481
Domestic vaccines				
Yes, Mean±SD	16.14±4.70	13.80±4.70	6.74±3.07	36.68±9.01
No, Mean±SD	17.60±5.38	14.81±4.64	5.92±2.94	38.33±10.08
p	°0.067	°0.225	°0.129	°0.328
Vector vaccines				
Yes, Mean±SD	15.54±4.58	14.92±5.11	6.15±3.08	36.62±8.71
No, Mean±SD	17.01±5.13	14.23±4.65	6.36±3.03	37.59±9.67
p	°0.324	°0.861	°0.852	°0.728
Protein subunit vaccines				
Yes, Mean±SD	14.52±4.04	13.72±4.41	6.12±2.65	34.36±8.01
No, Mean±SD	17.43±5.16	14.44±4.76	6.39±3.12	38.25±9.77
p	°0.004**	°0.398	°0.812	°0.067
Concern about differences between vaccines?				
Yes, Mean±SD	17.69±4.87	15.14±4.50	6.45±3.17	39.27±8.97
No, Mean±SD	14.38±4.97	11.78±4.38	6.00±2.57	32.16±9.35
p	°0.001**	°0.001**	°0.512	°0.001**
Any regrets after getting vaccinated?				
Yes, Mean±SD	20.64±4.03	17.77±3.39	7.32±3.48	45.73±8.42
No, Mean±SD	16.08±4.94	13.58±4.60	6.13±2.90	35.78±8.88
p	°0.001**	°0.001**	°0.125	°0.001**
Concerned about vaccine side effects?				
Yes, Mean±SD	17.87±5.04	15.03±4.72	6.21±3.23	39.10±9.47
No, Mean±SD	15.33±4.79	13.20±4.45	6.53±2.70	35.06±9.23
p	°0.006**	°0.027	°0.387	°0.018*

SD: Standard deviation; a: Student t-test; c: Mann–Whitney U-test; *: P<0.05; **: P<0.01.

In our study, only 18% of the participants reported that the production time of the vaccine was sufficient. This result seems to be consistent with other research, which found that 72% of Infection Control and Epidemiology Professionals hesitated about the speedy development of vaccines.^[26] Similarly, in Russia, the release of the vaccine before the completion of phase III trials has caused public outrage over safety.^[27]

Conspiracy theories are defined as secret plans hatched by powerful groups or individuals. There are beliefs that COVID-19 is a biological weapon and that pharmaceutical companies support the spread of COVID-19 for profit.^[28] Barriers to vaccine acceptance included insufficient knowledge of the COVID-19 vaccine, concerns about long-term side effects, thoughts about the disease-causing virus, and doubts about efficacy. Karabela et al.^[29] reported a positive relationship between people's attitudes to the COVID-19 vaccine and the conspiracy theories and belief factors. Consistent with the literature, the results of our study found that COVID-19 conspiracy beliefs pose challenges to vaccine safety.

The pandemic and environmental health issues are interlinked. It is claimed that sustainable solutions and policies are needed to protect the human race and ecosystems.^[30] Latkin et al.^[31] found that the individual who was more concerned about climate change was more likely to receive the COVID-19 vaccine. In line with previous studies, our research found that higher subscale scores regarding environmental factors decrease the attitudes toward vaccination.

The COVID-19 pandemic is interpreted by many religious groups.^[32] Religious-related convictions were probably the most common underlying reasons for vaccine hesitancy or refusal.^[33] An Ethiopian Orthodox interpreted the COVID-19 pandemic as the punishment of God for sins.^[34] It is suggested that there is a belief in divine destiny or destiny among Muslims and that the disease is by the will of God and that no vaccine should go against it.^[35] Our research found that higher subscale scores regarding belief factors decrease the trust and confidence in vaccines.

Previous studies found that participants with higher education levels were less likely to believe in conspiracy theories and had higher vaccine acceptance rates,^[36] which is in line with the findings of the present study.

Conspiracy scores of the research-assistant physicians were lower than other groups. This result is along the lines of earlier literature that found the willingness to get the vaccine was higher in doctors than that of other health-care professionals.^[37]

There was a close relationship between pandemic conspiracy beliefs, vaccine attitudes, and vaccination intentions.^[38] Bertin et al.^[39] concluded that the COVID-19 conspiracy beliefs were negatively associated with a positive attitude toward the vaccination, which is in good agreement with the results of the present study.^[39]

The present study has some limitations to be acknowledged. First, this was a single-center study with a small sample size. As anticipated, the study was conducted in the early phase of vaccination, making it difficult to achieve a larger sample size. Second, the retrospective nature of the study does not allow for inferences about causality. Notwithstanding these limitations, our study has several strengths worth noting. Most studies investigating the tendencies of HCWs concerning vaccination intention have been conducted be-

fore the vaccination rollout. However, our research was performed 2 weeks after the vaccination program began and was conducted in one of the largest hospitals in the country and could be considered one of the strengths of the study. In addition, the vaccination status of the HCWs who did not receive the vaccine at the time of the study was followed over time.

CONCLUSION

The present study indicated that there was a considerable level of hesitancy among HCWs in the early phase of the COVID-19 pandemic. We found a close relationship between COVID-19 conspiracy beliefs and vaccine attitudes. Research assistants, participants who had higher education attainments, and those with a longer duration of working life were less likely to believe in conspiracy theories. Our findings may guide health authorities and stakeholders in formulating new strategies to control the pandemic and better understanding the opportunities and constraints in distributing vaccines among HCWs. Further research is needed to address the factors affecting vaccine uptake among HCWs to improve attitudes, knowledge, and perceptions toward the COVID-19 vaccine.

Statement

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Ethics Committee Approval: The Zeynep Kamil Maternity and Children's Training and Research Hospital Clinical Research Ethics Committee granted approval for this study (date: 03.02.2021, number: 28).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

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