Research Article
Received: 31.08.2022
Accepted: 13.12.2023
Published: 31.03.2023

Journal of Disaster and Risk
6 (1), 2023, (119-127)
e-ISSN: 2636-8390
DOI: 10.35341/afet.1169103

The Effect of Health Professionals' Attitudes towards COVID-19 Vaccines on Hesitance Situations: The Mediator Role of Vaccine Confidence

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Absract

Purpose of the research is to evaluate the attitudes, hesitancy and confidence of healthcare professionals towards COVID-19 vaccines during the second peak period of the COVID-19 epidemic in Turkey, and to determine the mediating role of vaccine confidence in the effect of their attitudes towards COVID-19 vaccines on hesitancy. A hospital-based cross-sectional research design was used in the study. The population of the research consisted of the health workers of three different training and research hospitals operating in Istanbul. Convenience sampling method was preferred in the study. The data were collected by the researchers themselves using the online survey technique. A total of 440 questionnaires were evaluated. The data were analyzed with SPSS and AMOS package programs. The findings of the study revealed that nearly two-thirds of the participants had a positive attitude towards potential COVID-19 vaccines, partially having higher confidence and less hesitation. In addition, the empirical result of the study revealed that positive attitudes towards potential COVID-19 vaccines reduce vaccine hesitancy. In addition, it has been found that vaccine trust has a significant indirect effect and partially mediates the relationship between attitude towards potential COVID-19 vaccines and hesitancy. This research revealed that positive attitudes towards potential COVID-19 vaccines reduce vaccine hesitations through high vaccine confidence. Thus, increased positive attitudes towards potential COVID-19 vaccines and increased vaccine confidence were significantly associated with decreased vaccine hesitancy.

Keywords: COVID-19, Vaccine Attitude, Vaccine Confidence, Vaccine Hesitancy

1. INTRODUCTION

Vaccines are developed from antigenic constructs of disease-causing viruses, bacteria, or other microorganisms. When these antigens are introduced into our body, our immune system learns to respond quickly and effectively to these threats. Usually, our bodies are given weakened forms of these antigens, so our immune system develops a protective reaction against the antigen and records it in its memory. Thus, when our immune system later encounters this microorganism, they recognize them before they make us sick and immediately begin to fight. Some of the currently developed COVID-19 vaccines are also based on this principle. Arguably one of the greatest public health achievements is vaccination. Vaccines, along with sanitation and clean water, are estimated to have saved more lives than any other health intervention in the past 100 years. Unlike other drugs, vaccines gain functionality at both individual and community levels. However, vaccination is only individual and in most cases community protection against diseases is provided through herd immunity. Vaccination programs rely on achieving and maintaining high

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To cite this article
Karagöz, Y. and Yalman, F. (2023). The Effect of Health Professionals' Attitudes towards COVID-19 Vaccines on Hesitance Situations: The Mediator Role of Vaccine Confidence. *Journal of Disaster and Risk, 6(1*), 119-127.

coverage rates to reduce the risk of vaccine-preventable diseases (The United Nations Children's Fund, 2004).

Over the past decades, there has been some controversy around the world regarding vaccines, and some of the controversial risks have raised concerns about side effects of vaccines while deepening hesitation and trust in vaccines. Research shows that loss of trust in governments and healthcare providers is an important factor in the development of a range of beliefs and behaviors that create vaccine hesitation. The hesitation in individuals about vaccination and even the spread of vaccine rejection behavior is an important problem not only in terms of individual health but also in the control or elimination of vaccine-preventable diseases at the social level. The World Health Organization defines vaccine hesitation as "not hesitating or not accepting vaccines, although vaccination services are accessible". Accordingly, the extent of vaccination hesitation points to situations where "vaccine acceptance is lower than expected in a given setting, given the availability of vaccination services" (Strategic Advisory Group of Experts on Immunization, 2014).

In addition, it has been clearly shown in different studies that the vaccine discussions presented by the traditional media have negative effects on the vaccine acceptance in the societies. Information circulating on the internet and social media regarding vaccines and vaccination programs has also been associated with an increase in vaccine hesitation. In these networks, hearsay information that has not been scientifically tested can spread rapidly and the uncontrolled adoption of most false information either creates hesitations about vaccines or drives those who are hesitant to the point of "vaccine rejection". Many studies have shown that people who delay or refuse their vaccinations are more likely to be exposed to false vaccination information by searching the internet (Domachowske ve Suryadevara, 2013; Dubé, 2017).

The risk of vaccination hesitation was found to be higher in cases where vaccines were accepted "passively" (i.e. where vaccines were required and/or high social pressure was present). Conversely, where there is a 'high demand for vaccines' (i.e. when individuals and communities demand vaccination and vaccination services, have a positive attitude towards vaccines and vaccination, support and/or advocate vaccines and vaccination), the risk of developing vaccine hesitation is much lower. These two points point to the importance of increasing expectations and demand for vaccines rather than persuading societies by being forced into vaccines in various ways (Domachowske ve Suryadevara, 2013).

Examining the emerging literature on the critical situation of the global pandemic caused by COVID-19, it is clear that more research is needed on possible predictors of vaccine hesitancy. The focus of this study is healthcare workers, a particularly vulnerable group. We designed a survey using structural equation modeling to investigate the relationships between attitudes, confidence and hesitances toward a potential COVID-19 vaccine. Accordingly, this research is based on some of the following objectives:

a. to examine the impact of 'vaccine attitude' on hesitance toward potential COVID-19 vaccines and

b. to find the mediating role of vaccine confidence in the relationship between 'vaccine attitude' on hesitance toward potential COVID-19 vaccines.

Mis and disinformation, including conspiracy theories, about vaccines, especially when spread through social media, are major causes of why many may be hesitant about taking a vaccine. A focus on misinformation overlooks people's real concerns. Rumours often emerge and spread as a way of filling in gaps in knowledge-for which people are desperate-in a time of great uncertainty and anxiety. COVID-19 vaccines could be an important tool in helping to end the pandemic, but evidence suggests millions around the world are wary of accepting them, calling into doubt their

potential public health benefits. This research attempts to understand the direct and indirect relationship between 'vaccine attitude' in hesitancy towards potential COVID-19 vaccines, in which, hypothetically, vaccine trust plays a mediating role. Adopting and applying three different scales on attitude, confidence, and hesitancy towards a potential COVID-19 vaccine, this study examines a structural relationship to test hitherto unique assumptions.

2. MATERIAL AND METHODS

2.1 Ethics approval

This research was approved by Düzce University Scientific Research and Publication Ethics Committee on 25.02.2021 with the decision number 2021/61.

2.2 Participants

There are approximately 7,100 healthcare professionals working in these public hospitals. All participants were informed about the purpose of the study by sending an e-mail and they were invited to participate in the study. To ensure the confidentiality of participant information, no identifying information was included in the online survey. Subjects with intellectual disability or inability to communicate were not included in the survey. Participants were required to have an internet connection, to voluntarily participate in an online survey, and to be able to read, understand and answer the questions provided.

2.3 Research design and procedure

Data collection was carried out in three different training and research hospitals in Istanbul. The hospital-based cross-sectional study design was used at these public hospitals. The study began in the days when the COVID-19 vaccines were first introduced and data were collected from the participants on a weekly basis. This study was a prospective cross-sectional survey conducted online through a structured questionnaire from February 26 to March 26, 2021.

2.4 Measurements of variables

In the study, the attitude scale towards COVID-19 vaccines developed by Genis et al. (Genis vd., 2020) was used. The scale essentially consists of nine statements. The instrument presented high reliability for the study sample (α=0.850). In addition, the confidence scale for the COVID-19 vaccines developed by Lin et al. (Lin vd., 2020) was used to measure the participants' confidence in the COVID-19 vaccines. The scale essentially consists of five statements. The instrument presented high reliability for the study sample (α=0.853). Finally, the hesitation scale for COVID-19 vaccines developed by Barry et al. (Barry vd., 2020) was used to measure participants' hesitancy towards COVID-19 vaccines. The scale essentially consists of six statements. The instrument presented high reliability for the study sample (α=0.818).

3. RESULTS

3.1. Demographic findings

It can be seen that 52.5% males and 47.5% females were the respondents for this study, 57% were 20 to 29 age. Most participants were married (52.9%) and about half of the participants (50.2%) had college education levels. Most respondents were nursese (39.6%) and other occupations such as doctors, health officer, medical laboratory assistant, patient consultant, technical staffand paramedics accounted for 16.5%, 16.5%, 10.6%, 9.8%, 5.9% and 1.2%, respectively. The majority participants (63.4%) believe that COVID-19 is a virus of artificial origin.

Table 1. Socio-demographic characteristics of healthcare workers

			COVID-19 Vaccine Confidence		COVID-19 Vaccine Hesitancy		COVID-19 Vaccine Attitude	
Variables	**n**	**%**	t Test/ Anova (t/f)	p-value (2tailed)	t Test/ Anova (t/F)	p-value (2tailed)	t Test/ Anova (t/F)	p-value (2tailed)
Sex								
Male	231	52,5	,669[a]	0,504	-,124[a]	0,901	3,063[a]	**0,002**
Famale	209	47,5						
Marital Status								
Married	233	52,9	,221[a]	0,825	-1,266[a]	0,207	2,678[a]	**0,008**
Unmarried	207	47,1						
Age								
20-29	251	57	2,822[b]	**0,025**	5,661[b]	**0**	1,147[b]	0,334
30-39	84	19,1						
40-49	65	14,8						
50-59	36	8,2						
>60	4	0,9						
Experince (Years)								
0-5	197	44,7	2,031[b]	0,062	2,392[b]	**0,029**	2,683[b]	**0,015**
6-10	62	14,1						
11-15	45	10,2						
16-20	41	9,4						
21-25	24	5,5						
26-30	48	11						
>30	22	5,1						
Speciality								
Doctors	73	16,5	2,217[b]	**0,042**	2,701[b]	**0,015**	3,592[b]	**0,002**
Nurses	174	39,6						
Paramedics	5	1,2						
Medical laboratory assistant	47	10,6						
Patient consultant	43	9,8						
Health officer	73	16,5						
Technical staff	26	5,9						
Educational attainment								
Junior college and below	61	13,9	,074[b]	0,929	4,361[b]	**0,013**	,933[b]	0,394
College	221	50,2						
Postgraduate	158	35,9						
Origin of the COVID-19								
An artificial virus	279	63,4	-3,213[a]	**0,001**	-,545[a]	0,586	-,923[a]	0,356
A natural virus	161	36,6						

3.2 The model fit measures

From Table 2, it can be summarized that this study questions/items of the latent variables pass through all the major model fit indicators suggested by Munro (Munro, 2005), Brown (Brown, 2006) and Byrne (Byrne, 2001).

Table 2. Model fit measures

Measure	Estimate	Threshold	Interpretation
CMIN/DF	3.228	Between 1 and 5	Acceptable range
CFI	0.903	≥ 0.90	Within range
GFI	0.880	≥ 0.85	Within range
IFI	0.904	≥ 0.90	Within range
RMSEA	0.071	< 0.08	Within range

3.3 The results of the measurement model

Figure 1 shows the confirmatory factor analysis results and model fit for the variables of confidence, hesitance and attitude toward potential COVID-19 vaccinations.

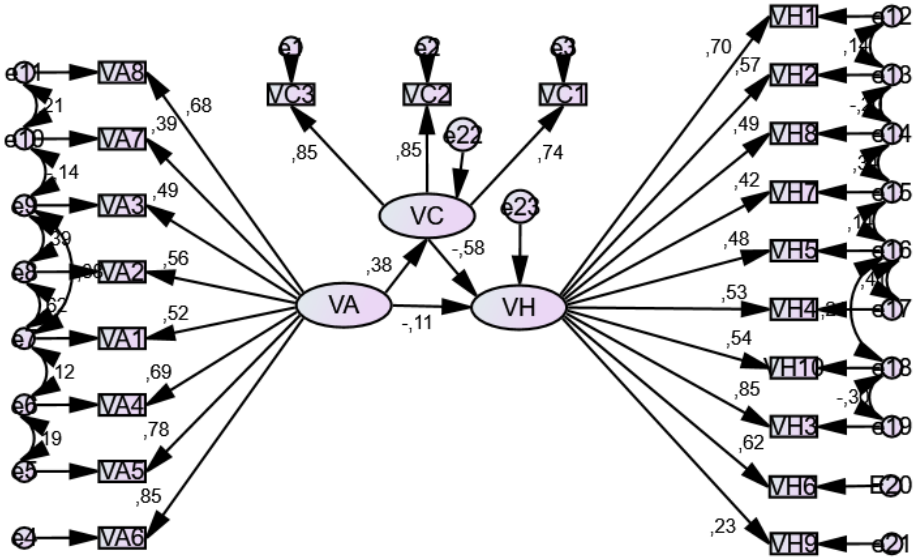

Figure 1. The results of the full model

Since the CR vavues are greater than 0.7, the factors have high construct reliability.

Table 3. The items' estimate and the constructs' Cronbach's α, AVEs and CRs.

Constructs	Items	Estimate	Crpnbach's α	Mean (±SD)	AVE	CR
Vaccine Confidence (VC)	VC1	0,849	0.853	3,2788 (±,86470)	0,66	0,86
	VC2	0,853				
	VC1	0,738				
Vaccine Hesitancy (VH)	VH1	0,703	0.818	2,4607 (±,67701)	0,41	0,86
	VH2	0,57				
	VH8	0,487				
	VH7	0,421				
	VH5	0,48				
	VH4	0,528				
	VH10	0,544				
	VH3	0,855				
	VH9	0,23				

	VH6	0,616				
Vaccine Attitude (VA)	VA6	0,852	.850	3,7264 (±,63479)	0,32	0,77
	VA5	0,784				
	VA4	0,693				
	VA1	0,524				
	VA2	0,564				
	VA3	0,49				
	VA7	0,394				
	VA8	0,684				

Table 4 shows the results of the structural model.

Table 4. The result of the structural model

Hypothesis	Paths	Estimate	S.E.	C.R.	P	Result
Effect of COVID-19 Vaccine Attitude on COVID-19 Vaccine Hesitancy (Before Mediation)						
H_1	VH <--- VA	-0,33	0,051	-5,767	***	H_1 supported
Effect of COVID-19 Vaccine Attitude on COVID-19 Vaccine Hesitancy (After Mediation)						
H_2	VC <----- VA	0,38	0,061	6,904	***	H_2 supported with a partial mediation
	VH <--- VC	-0,58	0,051	-9,405	***	
	VH <--- VA	-0,11	0,047	-2,095	0,036	

When the mediator variable (vaccine confidence) is included in the model with the independent variable (vaccine attitude) are included in the model, the direct effect of the independent variable (vaccine attitude) on the dependent variable (vaccine hesitancy) becomes insignificant and creates a partial mediation relationship.

Table 5. Indirect effect of the model

Indirect Path	Unstandardized Estimate	Standardized Estimate	p value
VA --> VC --> VH	-0,2	-0,21	0,036

4. DISCUSSION

There was a statistically significant difference in COVID-19 vaccine confidence score according to age (ANOVA test = 2.822; P < .05), according to speciality (ANOVA test = 2.217; P < .05) and according to origin of the COVID-19 (t test = -3.213; P < .05). However, there was no significant relationship among the sex of the participants, marital status of the participants, the educational level of the participants and the experience of the participants. Furthermore there was a statistically significant difference in COVID-19 vaccine hesitancy score according to age (ANOVA test = 5.661; P < .05), according to experience (ANOVA test = 2.392; P < .05), according to educational attainment (ANOVA test = 4.361; P < .05) and according to speciality (ANOVA test = 2.701; P < .05). However, there was no significant relationship among the age of the participants, marital status of the participants and origin of the COVID-19. Moreover there was a statistically significant difference in COVID-19 vaccine attitude score according to sex (t test = 3.063; P < .05), according to marital status (t test = 2.678; P < .05), according to experience (ANOVA test = 2.683; P < .05) and according to speciality (ANOVA test = 3.592; P < .05). However, there was no

significant relationship among the sex of the participants, educational attainment of the participants and origin of the COVID-19.

The empirical result has shown that positive attitude towards COVID-19 vaccines increases vaccine confidence and, as a result, vaccine hesitancy decreases. It also revealed the importance of the general attitude towards the vaccine in order to determine the main causes of hesitation against the COVID-19 vaccines in order to ensure community immunity and to eliminate the vaccine hesitation. On the other hand, with the emergence of vaccine confidence as a mediator, the indirect relationship between vaccine attitude and hesitancy towards potential COVID-19 vaccines becomes less important and constitutes a partial mediation relationship. As the spread of COVID-19 continues, hesitancy towards COVID-19 vaccines will decrease or disappear if positive attitude and confidence in potential COVID-19 vaccines increases.

One of the main reasons for hesitation about vaccination is the risk/benefit dilemma. The success of immunization studies depends on the trust in the applied vaccination programs (Turkish Medical Association, 2020). Despite all the known benefits of vaccines, people may exhibit negative attitudes and behavior towards vaccination due to reasons such as doubting the safety and efficacy of vaccines, and distrust of governments and healthcare workers (Salmon vd., 2005). Parents, who are the main audience targeted by anti-vaccine movements, have insufficient knowledge, leaving this group vulnerable and open to manipulation (Ropeik, 2013; Sadaf vd., 2013). At the same time, individuals' lack of knowledge about vaccines and insufficient knowledge about vaccine-preventable diseases feed the hesitations of individuals about vaccination (Republic of Turkey Ministry of Health 2nd National Vaccine Workshop, 2016).

Lack of information about vaccines, lack of trust in vaccines, difficulty in accessing vaccines, fear of the side effects of vaccines, anti-vaccine news in the media, and not having enough information about vaccine-preventable diseases feed the “vaccine hesitation” in the society. Scientific studies; It shows that good communication and trust by healthcare professionals with the individuals to be vaccinated and/or their parents is one of the most effective ways to overcome hesitations about vaccination (Republic of Turkey Ministry of Health 2nd National Vaccine Workshop, 2016; Larson vd., 2011).

From this point of view, this study hypothesizes that vaccine attitude has a direct impact on hesitation against potential COVID-19 vaccines. It has also been postulated that vaccine confidence mediates the direct relationship between vaccine attitude and hesitancy towards potential COVID-19 vaccines. In addition, confirmatory factor analysis was performed and it was observed that the relations between attitude, confidence and hesitation towards COVID-19 vaccines had an acceptable fit index. Ensuring validity and reliability demonstrated the existence of a structural relationship between attitude, confidence, and hesitation towards COVID-19 vaccines.

In line with emerging viral infections and pandemics, attitude, trust and hesitation towards newly developed vaccines are key factors in evaluating vaccine acceptance (Magadmi ve Kamel, 2020). In a systematic review of 145 studies published in the European Union, it was found that the biggest concern in the society about vaccination was about vaccine trust and often led to the opinion that the risks of vaccines outweigh the benefits (Karafillakis ve Larson, 2017). In another study, the decision of parents whether to vaccinate or not; factors such as lifestyle, beliefs about childhood diseases, perceptions about health and disease risks, vaccine efficacy and attitudes towards vaccine components, and trust in vaccines and institutions (Harmsen vd., 2012). In a randomized controlled study conducted in 2013, in which the change of vaccination hesitations of parents was investigated; Thanks to the information given to the mother, it has been observed that increasing the mother's confidence in the safety and efficacy of vaccines reduces vaccine hesitation (Henrikson vd., 2013). As the reasons for vaccine hesitation in a study conducted in

Australia in 2017; fear of vaccine side effects (35.9%), suspicion of vaccine efficacy (35.9%), and distrust in the pharmaceutical industry (23.1%) (Sandhofer vd., 2017).

5. CONCLUSION

As a result, hesitant individuals have been shown to make more positive decisions about vaccination when healthcare providers, especially physicians, communicate effectively with strong statements about the "need for vaccines", "the value of the vaccine" and "vaccine safety". Therefore, one of the most important steps is to create effective strategies to eliminate vaccine hesitation among healthcare providers. Understanding the dynamics of the determinants underlying vaccine hesitation is critical to designing effective interventions for both the community and healthcare providers. For in-depth studies to be planned in this field, with the participation of people from different disciplines such as physicians and healthcare team members, scientists from a wide spectrum, community opinion leaders, communication experts, artists and designers, journalists and social media experts, There is a need for collective wisdom projects that take into account the opinions and evaluations of the segments.

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