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Factors Affecting Negative Attitudes towards COVID-19 Vaccines

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Abstract: The aim of this study is to examine the factors affecting negative attitudes (vaccine hesitancy and anti-vaccination) towards vaccines. Data of 4004 people were collected online. Although vaccine hesitancy and anti-vaccination attitudes are two different concepts, there is a strong positive relationship between them. In this study, explanatory factor analysis and confirmatory factor analysis are used for vaccine questions. Then, quantile regression models at 10p, 50p and 90p values were calculated separately for these two variables (vaccine hesitancy and anti-vaccination). As a result of the estimation, age, gender, education, household income, belief in conspiracy theories, political views, religious involvement are significant predictors. In addition, trust in science, doctors, the government, vaccine companies, COVID-19 vaccines and herbal treatments are other predictive variables. Negative attitudes towards vaccines are relatively higher among the poor, unemployed and socio-economically disadvantaged groups. To reduce negative attitudes towards vaccines, it is important to inform society based on the results of reliable scientific research, to follow transparent policies that will reduce the doubts in people's minds, and to maintain effective communication policies.

Keywords: Vaccine hesitancy, anti-vaccination, trust, conspiracy theories, politics and religion.

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Öz: Bu çalışmanın amacı, aşılara yönelik olumsuz tutumları (aşı kararsızlığı ve aşı karşıtlığı) etkileyen faktörleri incelemektir. 4004 kişiden oluşan data çevrimiçi olarak toplanmıştır. Aşı kararsızlığı ve aşı karşıtlığı iki farklı kavram olmasına rağmen aralarında güçlü bir pozitif ilişki vardır. Çalışmada öncelikle aşı kararsızlığı ve aşı karşıtlığı ölçekleri için keşfedici faktör analizi ve doğrulayıcı faktör analizleri yapılmıştır Daha sonra 10p, 50p ve 90p değerlerinde kantil regresyon modelleri bu iki değişken (aşı kararsızlığı ve aşı karşıtlığı) için ayrı ayrı hesaplanmıştır. Tahmin edilen regresyonlar sonucunda yaş, cinsiyet, eğitim, hane geliri, komplo teorilerine inanç, politik görüş, dini inanç, bilime, aşılara, bitkisel tedavilere, devlete, aşı firmalarına ve doktorlara güven değişkenleri anlamlı değişkenler olarak elde edilmiştir. Yoksul, işsiz, geçim sıkıntısı yaşayan sosyo-ekonomik bakımdan dezavantajlı gruplar arasında aşıya karşı olumsuz tutumlar görece daha fazladır. Aşılara yönelik olumsuz tutumları azaltmak için güvenilir bilimsel araştırmaların sonuçlarına göre toplumu bilgilendirmek, insanların zihinlerindeki şüpheleri azaltacak şeffaf politikalar izlemek ve etkin iletişim politikalarını sürdürmek önemlidir.

Anahtar Kelimeler: Aşı kararsızlığı, aşı karşıtlığı, güven, komplo teorileri, siyaset ve din.

Introduction

Vaccine hesitancy and anti-vaccination attitudes have become one of the most important problems of countries struggling with the COVID-19 pandemic. COVID-19 vaccines have been produced and made available in an extraordinarily short time. Most countries have conducted extensive campaigns to speed up the vaccination process. However, vaccine hesitancy and anti-vaccination attitudes have risen in many countries, including Turkey. The coming of the global risk society has facilitated not only the spread of goods and viruses, but also ideas and social movements among countries. The content produced by a limited number of anti-vaccine supporters is spread all over the world in a very short time through digital networks. Identifying the factors affecting vaccine hesitancy and anti-vaccination attitudes has become a vital issue for the successful continuation of COVID-19 vaccination policies. This study aims at contributing to the literature and helping the policymaking process by explaining the factors determining the attitudes towards the COVID-19 vaccine in Turkey.

While Andrew Wakefield's article claiming that vaccines cause autism is an important cornerstone for the world's anti-vaccine movement, in fact the roots of anti-vaccination campaigns go back much further (Berman, 2020). In the last 20 years, there is a general opinion that the anti-vaccine movement has gained strength and the support for vaccines has declined (Doustmohammadi & Cherry, 2020). While anti-vaccine supporters are a relatively small group, their harmful effects have become more evident than ever during the COVID-19 pandemic (Wiysonge et al., 2021).

Vaccine hesitancy and anti-vaccination represent different attitudes towards vaccines. However, these two concepts are also used interchangeably from time to time. "Vaccine hesitancy" refers to concerns about the possible side effects of vaccines and to preferences that would like to delay vaccination as much as possible

(Berman, 2020). However, "anti-vaccination" attitudes refers to active opposition against vaccines (Neff et al., 2021). During the COVID-19 pandemic, it is observed that the vaccine hesitant group are more crowded than the anti-vaxxer group. However, like other radical groups, the voices of anti-vaccination supporters have more power compared to their sizes, especially on social media platforms. Anti-vaccination supporters create confusion in the society about the vaccine, and they turn people who are hesitant about vaccines into anti-vaxxers.

A study conducted by the European Commission (European Commission (2021) through Gallup in 27 country 59.5% of the EU citizens think that vaccines are developed too quickly to be safe; 73.8% state that COVID-19 vaccines may have long-term side effects that we do not know yet. As the average age declines, it is seen that the distrust of vaccines increases. Vaccine hesitancy is relatively higher among individuals with secondary education, women, farmers, foresters, fishermen and manual workers. On the other hand, hesitation is decreasing among retired people, senior and middle managers, and professionals. Confidence in vaccines is decreasing in rural areas, and hesitation is increasing (Cascini et al., 2021 ; Paul et al., 2021; (Kricorian et al., 2021; Engin & Vezzoni, 2020).

International academic literature generally reveals a negative attitude between anti-vaccine/vaccine hesitant attitudes and education level (Engin and Vezzoni, 2020; Humer et al., 2021; Bono et al., 2021). However, there are few studies that found an opposite relationship (Petravić et al., 2021). On the other hand, there are also studies that could not find a significant relationship between education level and attitude towards vaccination (Martin & Petrie, 2017). In comparative studies, the effect of education level is not the same in all countries. For example, a comparative study found individuals with higher levels of education more likely to say they would accept a vaccine in Ecuador, France, Germany, India, and the United States, whereas it was associated with lower vaccine acceptance in Canada, Spain, and the United Kingdom (Lazarus et al., 2020).

As confidence on the information coming from the government increases, vaccine hesitancy decreases and trust in vaccine increases. As it is known, vaccines are inventions that have eliminated diseases and have improved public health by alleviating the clinical symptoms of many diseases. Despite these advantages, the lack of confidence in vaccines is now considered a threat to the success of vaccination programs (Dubé et al., 2013). The World Health Organization (WHO) has defined vaccine hesitancy as the delay or refusal to accept vaccination despite the availability of vaccination services (MacDonald, 2015). Historically, the biggest obstacle while fighting against epidemics has been access to resources in low-income countries,

while "vaccine hesitation" has become an increasingly important public health problem over the past two decades.

Negative attitude towards vaccines is not only an individual but also a social issue. The most important factors of vaccine hesitancy are: Concerns related with possible side effects of vaccines; the lack of knowledge/awareness; demographic characteristics such as religion, culture, ethnicity and gender (Eguia et al., 2021; Lane et al., 2018; Cascini et al., 2021; McKee & Bohannon, 2016). It is known that people's philosophical or political views and religious beliefs affect their approaches to vaccination as well.

Examining the political views that leads to negative attitudes towards vaccination shows that low tendency of vaccine intake is typically associated with lower trust in the health system and/or government. A relationship is observed between the rise of populist policies and political movements and the increasing hesitations about vaccination (MacDonald, 2015; Boseley, 2018). The higher the level of populist votes in a country, the greater the proportion who believes that vaccines are not important or are not effective (Żuk & Żuk, 2020; Roccato & Russo, 2021; Cremer, 2021; Kennedy, 2019).

Those who feared the side effects of vaccines and had less confidence in drug companies and authorities who are managing the epidemic have more negative attitudes towards getting vaccinated (Vignier et al., 2021). In contrast, individuals with high confidence in the government and the local health system are more likely to accept the vaccine (Mesch & Schwirian, 2015; Cascini et al., 2021).

One of the most important reasons for the vaccine rejection is religious views. Orthodox Protestants in the Netherlands and Amish in the United States are religious communities known for their rejection of vaccination due to religious reasons (Streefland, 2001; Ruijs et al., 2012). While the most common concern expressed by Muslim parents who refuse to have their child receive childhood vaccinations is the presence of pork gelatin in vaccines, most of these parents say that they will vaccinate their children if there is an alternative vaccination option that does not contain pig elements (Paterson et al., 2018).

Another religious reason for vaccine rejection is parents' fear of making the wrong decision. The reason for this fear is that they may be immediately punished by God for vaccinating their children, and they interpret any side effects as a sign to stop vaccination. In addition, distrust of vaccine production companies (Özceylan et al., 2020; Dredze et al., 2016), conspiracy theories, political views and religious beliefs can be related with the rejection of vaccines (Stecula & Pickup, 2021; Perveen et al., 2021; Berman, 2020; Eguia et al., 2021).

Pew's research (Pew Research Center, 2021; Funk & Tyson, 2021; Pew Research Center, 2021) shows that factors such as income, religious affiliation, and political opinion, as well as distrust of science and experts affect attitudes towards vaccination in the United States. Another study finds that more than $150,000 annual income reduces vaccine hesitancy (Shallal et al., 2021). In a longitudinal study of 12,035 people in the UK, vaccine hesitancy is found to be higher among women, youth, black people Pakistani/Bangladeshi people, and people with low education (Robertson et al., 2021). Previous evidence has also shown that vaccination rates are consistently low among minority and disadvantaged groups (Liu & Li, 2021). In addition, highly educated people are found to be less likely to have hesitations about the vaccination (Kricorian et al., 2021; Paul et al., 2021). However, it is difficult to say that the findings of studies conducted in different countries always give a consistent result.

The main research questions of this paper are:

1. What are the effects of demographic factors such as age, gender, education, household income, place of residence on negative attitudes (vaccine hesitancy and anti-vaccination) towards vaccination?
2. What are the effects of belief in conspiracy theories, religious involvement and political opinion on negative attitudes towards vaccination?
3. What are the effects of trust in the government, doctors, vaccine-producing companies and herbal treatments on negative attitudes towards vaccination?

Method

Participants

This research is conducted online by using convenience sampling method among internet users in Turkey. A total of 4515 people responded to the survey. There is no obligation to answer any of the questions. In the data cleaning phase, the questionnaires of those who did not answer more than 10 percent of the questions and those who gave inconsistent answers such as "I am against vaccination" and "Everyone should be vaccinated" are excluded from the analysis. After data cleaning, 511 questionnaires are eliminated and a total of 4004 questionnaires are evaluated.

As seen in Table 1, 93.2 percent of the respondents live in urban areas and 6.8 percent live in rural areas. The majority (73.6%) stated that they have a middle or higher income. The ratio of the lowest income group is 26.4%. In addition, 58 percent are women and 42 percent are men. The rate of those who say they believe

and fulfill their religious obligations is 43.6%, while the rate of those who say they are on the left of the political spectrum is 32.6%. The rest are in the center or right of the political spectrum. The average age of the respondents is 33.89. The research is conducted on social media during the lockdown period. The questionnaire is uploaded to GoogleDrive and shared over social media networks. Convenient sampling method is used in the study. This sampling method does not claim to represent the general population. This data mostly represents the educated population. The reliability coefficients of the scales applied to highly educated populations with relatively higher cognitive capacity are always higher. In this study, both exploratory and confirmatory factor analysis confirm this.

Table 1.

Demographic Characteristics

Variables	Frequency	%
Gender		
Female	2322	58
Male	1682	42
Education		
Postgraduate	1374	34.3
University	2403	60
High school and below	227	5.7
Household income		
Middle income and over	2948	73.6
Lover income	1056	26.4
Place of residence		
Urban	3731	93.2
Rural	273	6.8

Measurement

Questionnaire form is used as the data collection tool in the study. A seven-item scale is created to measure vaccine hesitancy and vaccine opposition. The questions are asked as a 5-point Likert scale. The items in the scale are listed as "1-I strongly disagree" and "5-I strongly agree". The high scores obtained from the scale indicate that vaccine hesitancy and anti-vaccination are high. Other variables in the questionnaire and their definitions are as follows.

Table 2.

Definitions of variables

The name of variable	Definition
Age	Continuous
Gender	0- Female 1-Male
Education	0-University and above 1- High school and below
Household income	0-Middle income and over 1- Lower income
Place of residence	0-Urban 1-Rural
Conspiracy belief	0-No 1-Yes
Political view	0-Other 1-Left
Religious involvement	0-Other 1- I believe and fulfill my religious obligations
Trust in science	0- I do not trust 1- I trust
Trust in vaccines	0- I do not trust 1- I trust
Trust in herbal treatments	0- I do not trust 1- I trust
Trust in government	0- I do not trust 1- I trust
Trust in vaccine companies	0- I do not trust 1- I trust
Trust in doctors	0- I do not trust 1- I trust

Analysis

Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) are used to analyze the validity of the scale, which is prepared to measure vaccine hesitancy and anti-vaccination. At the same time, Cronbach Alpha, CR, AVE, MSV and ASV are calculated to examine the scale structure and reliability.

Factors affecting vaccine hesitancy and anti-vaccination are analyzed with quantile regression method, which does not require the normal distribution condition of ordinary regression. Quantile regression analysis is introduced by Koenker and Bassett (1978). The purpose of this analysis is to estimate the functional relationship between the independent variables and any quantile in the distribution of the dependent variable (Tan & Wang 2017) .

The quantile regression is used in studies where the estimation of the quantiles of the dependent variable is important as well as its mean. In this study, 10p, 50p and 90p quantile points were used to examine the levels of vaccine hesitancy and vaccine opposition. IBM SPSS 26 is used for descriptive statistics and Explanatory Factor Analysis (EFA) to analyze the data. In addition, AMOS 26 is used for Confirmatory Factor Analysis (CFA) and RStudio is used for quantile regression analysis.

Results

58% of the participants are female and 42% are male. The mean age is 34 in the sample. 6% of the respondents received secondary education or below, 60% have university degree and 34% have postgraduate education degree. 73% of respondents state that they belong to middle and upper income groups. This research mainly represents the views of the highly educated middle class. 8% of respondents state that they are against vaccination, 20% state that they are in favor of herd immunity, and 15% responds that they do not plan to get vaccinated. The rate of those who say that they have hesitations about the current COVID-19 vaccines is 43%. On the other hand, 52% of the respondents state that the only way to get rid of the pandemic is vaccination. The rate of those who say that everyone should be vaccinated at the first opportunity is 58%. The samples related to vaccination attitudes are randomly divided into two parts and subjected to EFA and CFA separately and two factors are obtained.

Table 3.

Factor Analysis Results

	EFA		CFA	
	Factor loading N=1994		Factor loading N=2010	
	Vaccine hesitation	Anti-vaccination	Vaccine hesitation	Anti-vaccination
I am worried about the side effects of vaccines	.879		.845	
I have hesitations about current vaccines	.864		.927	
I'm in favor of waiting for the results of the vaccines	.758		.720	
I'm in favor of herd immunity		.770		.512
I am anti-vaccine		.774		.874
I'm not thinking about getting vaccinated		.718		.858
Everyone should be vaccinated (R)		.671		.802
Cronbach Alpha	.85	.82	.86	.83
CR			.87	.85
AVE			.70	.60
MSV			.52	.52
ASV			.52	.52

R: Reverse

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Table 3 shows the results of Exploratory and Confirmatory Factor Analysis. The factors are named as vaccine hesitancy and anti-vaccination. The vaccine hesitation factor consists of 3 variables in total. On the other hand, anti-vaccination factor consists of 4 variables. These two factors explain .71 of the total variance. The

Cronbach Alpha value of the vaccine hesitancy factor is .85 and the Cronbach Alpha value of the anti-vaccination factor is .82. Since these values are greater than .70, it is an indication of the reliability of the scale. In addition, the correlation between the two factors is obtained as .72. For the composite validity of the scale, it is seen that the CR (Composite Reliability) values for both factors are greater than .70 and the AVE (Average Variance Extracted) values are greater than .50 and the CR>AVE condition is met. In the discriminant validity of the scale, it is seen that the MSV (Maximum Shared Squared Variance) and ASV (Average Shared Squared Variance) values are lower than the AVE value and the square root of the AVE values are greater than the correlation value. These results show that the scale has convergent and discriminant validity.

Table 4.

Quantile Regression Results for Vaccine Hesitation

	10p		50p		90p	
Variables	Coefficient	t	Coefficient	t	Coefficient	t
Intercept	2,317**	16,716	4,160**	40,679	5,290**	79,016
Age	-0,010**	-5,798	-0,014**	-8,187	-0,012**	-8,243
Gender	-0,227**	-4,277	-0,207**	-4,953	-0,035	-1,355
Education	0,037	0,457	0,056	0,661	0,009	0,084
Household income	0,067	1,294	0,148**	3,183	0,002	0,062
Place of residence	-0,259	-1,578	0,063	0,504	0,029	0,280
Conspiracy belief	0,478**	8,218	0,384**	8,893	0,246**	9,403
Political view	-0,015	-0,290	0,009	0,174	-0,017	-0,408
Religious involvement	0,186**	3,332	0,050	1,154	-0,012	-0,376
Trust in science	-0,005	-0,072	-0,090	-1,103	-0,070*	-2,015
Trust in vaccines	-0,998**	-9,344	-0,596**	-9,213	-0,655**	-16,143
Trust in herbal treatments	0,542**	10,383	0,339**	7,764	0,194**	5,279
Trust in government	-0,147**	-2,617	-0,072	-1,597	-0,064*	-2,126
Trust in vaccine companies	-0,155	-1,721	-0,382**	-6,437	-0,217**	-5,491
Trust in doctors	0,332**	2,812	-0,049	-0,628	-0,165**	-4,309

**p< .01 ; *p< .05

Results of the quantile regression model, which is created to determine the variables predicting vaccine hesitancy, is given in Table 4. In the model, age, gender, household income, conspiracy theory, religious belief, trust in science, trust in vaccines, trust in herbal treatments, trust in the government, trust in vaccine companies and trust in doctors are found to be significant predictors of vaccine hesitancy. Education, place of residence and political view variables are obtained as nonsignificant variables at all quantile points in vaccine indecision.

In the regression models created for vaccine hesitancy, it is seen that the magnitude of the impact of the conspiracy theories and the herbal treatment variables decreases while passing from 10% quantile (10p) to 90% quantile (90p). It is observed that the effect of the trust in vaccine companies on vaccine hesitancy increases as vaccine hesitancy passes from 50% to 90% quantile. Estimate of trust in doctors is insignificant at middle vaccine hesitancy (50p), statistically significant and negative in high vaccine hesitancy (90p) while it is positive in the low vaccine hesitancy level (10p).

Table 5.

Quantile Regression Results for Anti-Vaccination

	10p		50p		90p	
Variables	Coefficient	t	Coefficient	t	Coefficient	t
Intercept	1,849**	16,384	3,133**	40,490	4,359**	38,198
Age	-0,004**	-3,179	-0,007**	-5,921	-0,007**	-3,494
Gender	0,002	0,097	0,041	1,537	0,033	0,698
Education	0,037	0,822	0,228**	3,562	0,351**	3,016
Household income	0,011	0,396	0,151**	5,106	0,159**	3,194
Place of residence	0,027	0,622	0,061	1,631	0,062	0,683
Conspiracy belief	0,175**	6,468	0,336**	10,961	0,377**	8,208
Political view	-0,036	-1,435	-0,119**	-3,851	-0,141*	-2,533
Religious involvement	0,046	1,648	0,090**	2,812	0,004	0,075
Trust in science	-0,174	-1,826	-0,277**	-3,940	-0,232**	-2,813
Trust in vaccines	-0,507**	-12,638	-0,922**	-18,037	-0,993**	-14,546
Trust in herbal treatments	0,109**	3,317	0,400**	14,680	0,399**	7,305

Trust in government	0,042	1,564	0,045	1,446	0,091	1,824
Trust in vaccine companies	-0,020	-0,667	-0,131**	-2,950	-0,290**	-4,790
Trust in doctors	-0,074	-0,953	-0,253**	-4,555	-0,341**	-4,850

**p< .01 ; *p< .05

As seen in Table 5, age, education, household income, conspiracy theory, political opinion, religious involvement, trust in science, trust in vaccines, trust in herbal treatments, trust in vaccine companies, and trust in doctors are found to be significant predicting variables in the estimation of anti-vaccination. Gender, place of residence and trust in the state variables are found to be insignificant at all quantile points of anti-vaccination .

It is seen that effects of age and confidence in vaccines decreases in magnitude while the dependent variable moves from 10% to 90% quantile. It is seen that effects of the education, household income and trust in science on the vaccine opposition increases as the dependent variable moves from 50% to 90% quantile.

In the regression model created for the vaccine opposition, it is seen that the effects of the conspiracy and the confidence in herbal treatment variables increase while the dependent variable moves from 10% to 90% quantile. The effect of the variables of political opinion, trust in vaccine companies and trust in doctors on anti-vaccination decreases while the dependent variable shifts from 50% to 90% quantile.

The age variable is found to be statistically significant in the regression models established at low (10p), medium (50p) and high (90p) anti-vaccination levels. Looking at Table 4 and Table 5, it is seen that the anti-vaccination attitudes increase at all quantile levels as the age decreases. Therefore, it is possible to say that while the opposition to vaccination is high in the young population, it is lower in the elderly population. In other words, young people's confidence in vaccines is lower than that of the elderly.

Another finding is obtained between gender and vaccine hesitancy attitude. The gender variable is found to be statistically significant in the estimation at 10p and 50p levels. Women show more vaccine hesitancy than men. However, this variable loses its significance at the 90p level, high vaccine hesitancy, and is not significant in all models of anti-vaccination attitudes.

Education and household income variables are found to be statistically significant in the regression models established at medium and high vaccine opposition levels.

There is a higher level of opposition to vaccination among socio-economically disadvantaged (low-educated, poor and unemployed) groups. In other words, those who say that they are struggling to make a living and those with low levels of education have more anti-vaccination sentiment. Accordingly, when the welfare levels and education levels of individuals increase, anti-vaccination decreases.

The variable of believing that COVID-19 is a conspiracy is found to be statistically significant in regression models established at low, moderate, and high levels of vaccine hesitancy and anti-vaccination attitudes. As it is known, the spread of conspiracy theories has increased at an incredible rate with the coronavirus pandemic. In particular, the belief that the virus is intentionally produced in the laboratory as a biological weapon has been expressed very often and continues to be believed. Opponents of the vaccine refer to the current pandemic as a "Plandemic". Therefore, the belief that COVID-19 is a conspiracy is influential factor in anti-vaccination. Similar to the results of previous research, anti-vaccination attitudes are high in those who believe that COVID-19 is a conspiracy in this research.

Statistically significant results are found in the regression models established at moderate and high anti-vaccination levels for the variable of political opinion. The academic literature reveals that those on the right of the political spectrum and religious people are relatively more negative about vaccination than others. In this research people are asked about their subjective opinions on their position in the political spectrum. Results show that as people move from the left to the right of the political spectrum, the opposition to the vaccine increases. In other words, those who are on the right of the political spectrum are leading the opposition to vaccination.

Religiosity is another factor that affects attitudes towards vaccination. To measure religious devotion, a question is asked how you define yourself religiously. It is found that those who say that "I believe and practice my faith" are more hesitant and more opposed to the vaccine compared to other groups.

The variables of trust in science, trust in vaccine companies and trust in doctors are found to be statistically significant in the regression models established at medium and high anti-vaccination levels. In the models created for vaccine hesitancy, the variables of trust in science, trust in vaccine companies and trust in doctors are found to be statistically significant. As confidence in science increases, anti-vaccination attitudes regress. The same is true for trust in vaccine companies and doctors. In addition, it has been found that as trust in government increases, vaccine hesitancy decreases.

On the other hand, one of the most important reasons for vaccine hesitancy and opposition to vaccines is distrust of existing vaccines. The variable of confidence in

vaccines is found to be statistically significant in the regression models established at low, medium and high vaccine hesitancy and vaccine opposition levels. As confidence in vaccines increases, vaccine hesitancy and anti-vaccination decrease. It is observed that the rapid invention of vaccines and disinformation about the contents of vaccines are important in the emergence of this result.

Finally, the variable of confidence in herbal treatments is found to be statistically significant in the regression models established at low, medium and high vaccine hesitancy and anti-vaccination levels. As confidence in the alternative medicine and herbal treatments increases, confidence in the vaccine decreases, that is, vaccine hesitancy and anti-vaccination attitudes increase.

Conclusion and Discussion

The academic literature distinguishes between vaccine opposition and vaccine hesitancy. Vaccine opponents are seen as hard-to-convince fanatics, while those who are hesitant to vaccinate are seen as easier to persuade. In this study, although those who are hesitant about the vaccine are separated from those who are against the vaccine, there is a strong correlation between them. Recently, the campaign carried out by fanatical anti-vaccine supporters, especially on the social media, has the potential to turn people who are undecided about the vaccine into anti-vaxxers. Although the anti-vaccine aggressors constitute a smaller group than the vaccine hesitant, it is possible that they will attract the undecided people to their side by influencing them (Burki, 2020). On the other hand, the aggressive rhetoric used by anti-vaccine supporter group to exploit the fears of the masses unsettled by the pandemic has begun to suppress the voices of supporters of the vaccine. The academic literature emphasizes that if anti-vaccine advocates maintain their current stance, the consequences will extend beyond COVID-19 (Johnson et al., 2020).

Those who are anti-vaccine supporter tend to promote herbal treatments (Nhamo & Sibanda, 2021). The most important antidote to both vaccine opposition and vaccine hesitancy is trust in science and specialist doctors. In addition, transparency and regularly informing the public on the contents and possible side effects of vaccines can reduce vaccine hesitancy. Another online survey conducted in 17 countries reveals that vaccine acceptance increases as trust in science and doctors increases (Rozek et al., 2021; Cascini et al., 2021). In this research, as trust in science and doctors increases, trust in vaccines also increases. Confidence in physicians is not as expected only in those with very low vaccine hesitancy (10% quantile). This may be due to some degree of low vaccine hesitancy in almost every group.

Academic literature emphasizes that trust in government increases the likelihood of vaccine acceptance (Mesch & Schwirian, 2015). In Turkey, the government is decisively carrying out policies for the vaccination of society. The findings of this study show that vaccine hesitancy decreases as trust in government increases.

Some authors (Keyes, 2004) call this age as the post-truth age. In the post-truth era, as confidence in science weakens, interest in non-scientific practices such as alternative medicine and herbal therapies is increasing. Although nearly three-quarters of the people in Turkey state that they trust in science (75%) and doctors (73%), those who say that they believe in herbal treatments are approximately one-third (33%) of the respondents. The rate of those who believe that COVID-19 is a conspiracy of great powers is 38%. Consistent with the academic literature (Eguia et al., 2021; Germani & Biller-Andorno, 2021) people who say that they believe in conspiracy theories and alternative medicine are more anti-vaccine supporter and hesitant about vaccines.

Anti-vaccine campaigners use an emotional language and they express ideas such as not harming body integrity and disrupting the game of great powers. Scientists have an obligation to speak responsibly to the extent that the data they have is representative. Conversely, conspiracy theorists speak in very certain terms that leave no room for doubt, without having reliable or validated data. The discourses of conspiracy theorists can be much more attractive to people on the street who do not have developed critical/analytical thinking skills, seek easy solutions and are afraid of uncertainty (Sayın & Bozkurt, 2021).

Young people consider their own immune system stronger than the elderly, which leads them to think that if they are infected with the virus, they can easily overcome it. In addition, the propaganda of vaccine opponents regarding future health problems, especially infertility, has made some young people skeptical of vaccines. Young people are more in favor of herd immunity than adults. Among the young, those who say that they are in favor of herd immunity are more common than the elderly. Positive attitudes towards vaccination increase with age (Truong et al., 2021; Cascini et al., 2021).

The data shows no difference between men and women in anti-vaccination attitudes. However, a statistically significant difference is found in vaccine hesitancy between gender, and the scores of women are higher than men. In particular, pregnancy, concerns about the side effects of vaccines, and women's tendency to take less risk than men may have contributed to this result (Flanagan et al., 2017).

In the academic literature, there is also a partial increase in the tendency to get vaccinated as education increases (Paul et al., 2021). In this study, especially among

those with a master's degree or higher, the tendency to be vaccinated increases and the opposition against vaccination decreases. However, no significant effect of education on vaccine hesitancy is found.

In addition, among economically disadvantaged groups, trust in social institutions is lower and these groups are more likely to reject the vaccine (van Bavel et al., 2020; Cascini et al., 2021; Paul et al., 2021; Kricorian et al., 2021). As a matter of fact, in this study, low-income, poor and unemployed people have more negative attitudes towards vaccines. The general distrust tendencies of socio-economically disadvantaged groups with low income and low education towards the ruling elite may have been the main reason of these results.

Studies conducted in different countries have shown that political and religious views affect attitudes towards vaccination (Streefland, 2001; Ruijs et al., 2012). The findings of this study also show that those with high religious affiliation and those who position themselves on the right of the political spectrum have higher anti-vaccination attitudes.

The regression models revealed that one of the important factors in vaccine hesitancy and anti-vaccination is the distrust of existing vaccines and their ingredients. Concerns about the rapid development of vaccines and their long-term negative effects lead to negative attitudes towards vaccines in European Union countries. In addition, distrust in science, trust in herbal treatments, belief in conspiracy theories, being on the right of the political spectrum, age and gender variables are other significant factors.

It is seen that the effect of trust in vaccine companies on vaccine hesitancy increases as we move from 50% quantile to 90% quantile. On the other hand, in the regression models created for the anti-vaccination, both the effect of conspiracy and the effect of confidence in herbal treatments increase from 10% to 90% quantile. In addition, it is seen that the effects of education, household income and trust in science on anti-vaccination attitudes increases as switching from 50% quantile to 90% quantile.

Specialist doctors and scientists have an important role to play in providing up-to-date evidence-based information on COVID-19 vaccines and correcting previously disseminated misinformation (Aloweidi et al., 2021). However, nowadays anti-vaccine attitudes tend to gradually turn into an identity or a belief in the world. Those who adopt the anti-vaccination views as an identity may, after a certain stage, perceive the presentation of the results of scientific research that promotes vaccines as an attack on their own identity and values (Berman, 2020). As a matter of fact, the most

important proof of this is the attacks frequently seen on the social media against doctors who inform the society about vaccines.

Increasing inequalities (Stiglitz, 2013) and precariousness (Standing, 2014) as a result of the neo-liberal globalization process have shaken the trust in the ruling elite and the system paved the way for populist policies and vaccine hesitancy (Matos et al., 2021). In addition, the ontological sense of security (Sayın & Bozkurt, 2021) shaken by the pandemic, social paranoia, biological warfare discourse and conspiracy theories which is largely fed by fear and anxiety may further strengthen the opposition to vaccines in the coming period.

As this research reveals, anti-vaccination is supported more by right-wing, religious and socio-economically disadvantaged groups who are more distrustful of the global system in general. Pandemic and anti-vaccination campaigns are a global problem. Not only viruses emerging in different countries of the world, but also ideas continue to spread at the speed of light in this digital world.

It is not enough to fight against anti-vaxxers by ignoring them or simply sharing scientific research results with the public. For this, first of all, it is important to eliminate the psycho-social factors that feed irrational scenarios, to emphasize the understanding of transparency that encourages a sense of trust, and to share all information openly with the society, including its possible side effects of vaccines. In addition, effective communication campaigns that appeal not only to people's minds but also to their emotions, in order to reduce anti-vaccine attitudes and vaccine hesitancy, will facilitate coping with the current problem.

References | Kaynakça

Aloweidi, A., Bsisu, I., Suleiman, A., Abu-Halaweh, S., Almustafa, M., Aqel, M. et al. (2021). Hesitancy towards COVID-19 vaccines: An analytical cross-sectional study. *International Journal of Environmental Research and Public Health,* 18 (10). https://doi.org/10.3390/ijerph18105111.

Berman, J. M. (2020). *Anti-vaxxers. How to challenge a misinformed movement*. The MIT Press.

Bono, S. A., Faria de Moura Villela, E., Siau, C. S, Chen, W. S., Pengpid, S., Hasan, M. T. et al. (2021). Factors affecting Covid-19 vaccine acceptance: An international survey among low- and middle-income countries. *Vaccines,* 9 (5). https://doi.org/10.3390/vaccines9050515.

Burki, Talha (2020). The online anti-vaccine movement in the age of COVID-19. *The Lancet Digital Health,* 2 (10), e504 –e505. https://doi.org/10.1016/S2589-7500(20)30227-2.

Cascini, F., Pantovic, A., Al-Ajlouni, Y., Failla, G., & Ricciardi, W. (2021). Attitudes, acceptance and hesitancy among the general population worldwide to receive the COVID-19 vaccines and their contributing factors: A systematic review. *EClinical Medicine,* 40, 101 –113. https://doi.org/10.1016/j.eclinm.2021.101113.

Cremer, T. (2021). A religious vaccination? How Christian communities react to right-wing populism in Germany, France and the US. *Gov. & Oppos.*, 1–21. https://doi.org/10.1017/gov.2021.18

Doustmohammadi, S., & Cherry, J. D. (2020). The sociology of the antivaccine movement. *Emerging Topics in Life Sciences,* 4 (2), 241–245. https://doi.org/10.1042/ETLS20190198.

Dredze, M., Broniatowski, D. A., Smith, M. C., & Hilyard, K. M. (2016). Understanding vaccine refusal: Why we need social media now. *American Journal of Preventive Medicine* 50 (4), pp. 550–552. https://doi.org/10.1016/j.amepre.2015.10.002.

Dubé, E., Laberge, C., Guay, M., Bramadat, P., Roy, R., & Bettinger, J. (2013). Vaccine hesitancy: An overview. *Human Vaccines & Immunotherapeutics,* 9 (8), 1763–1773. https://doi.org/10.4161/hv.24657.

Eguia, H., Vinciarelli, F., Bosque-Prous, M., Kristensen, T., & Saigí-Rubió, F. (2021). Spain's hesitation at the gates of a COVID-19 vaccine. *Vaccines,* 9 (2). https://doi.org/10.3390/vaccines9020170.

Engin, C., & Vezzoni, C. (2020). Who's Skeptical of Vaccines? Prevalence and determinants of anti-vaccination attitudes in Italy. *Population Review,* 59 (2). https://doi.org/10.1353/prv.2020.0007.

Flanagan, K. L., Fink, A. L., Plebanski, M., & Klein, S. L. (2017) Sex and gender differences in the outcomes of vaccination over the life course. *Annual Review of Cell and Developmental Biology,* 33, 577–599. https://doi.org/10.1146/annurev-cellbio-100616-060718.

Funk, C., & Tyson, A. (2021). Growing share of Americans say they plan to get a COVID-19 vaccine – or already have. *Pew Research Center Science & Society*, 5/3/2021. Available online at https://www.pewresearch.org/science/2021/03/05/growing-share-of-americans-say-they-plan-to-get-a-covid-19-vaccine-or-already-have/, checked on 11/15/2021.

Germani, F., & Biller-Andorno, N. (2021). The anti-vaccination infodemic on social media: A behavioral analysis. *PloS One,* 16 (3), e0247642. https://doi.org/10.1371/journal.pone.0247642.

Humer, E., Jesser, A., Plener, P. L., Probst, T. & Pieh, C. (2021). Education level and COVID-19 vaccination willingness in adolescents. *European Child & Adolescent Psychiatry*. Https://doi.org/10.1007/s00787-021-01878-4.

Johnson, N. F., Velásquez, N., Restrepo, N. J., Leahy, R., Gabriel, N., El Oud, S. et al. (2020). The online competition between pro- and anti-vaccination views. *Nature,* 582 (7811), 230–233. https://doi.org/10.1038/s41586-020-2281-1.

Kennedy, J. (2019). Populist politics and vaccine hesitancy in Western Europe: An analysis of national-level data. *European Journal of Public Health* 29 (3), 512–516. https://doi.org/10.1093/eurpub/ckz004.

Keyes, R. (2004). *The post-truth era. Dishonesty and deception in contemporary life*. St. Martin's Press.

Kricorian, K., Civen, R., & Equils, O. (2021). COVID-19 vaccine hesitancy: Misinformation and perceptions of vaccine safety. *Human Vaccines & Immunotherapeutics*, 1–8. https://doi.org/10.1080/21645515.2021.1950504.

Lane, S., MacDonald, N. E., Marti, M., & Dumolard, L. (2018). Vaccine hesitancy around the globe: Analysis of three years of WHO/UNICEF joint reporting form data-2015-2017. *Vaccine,* 36 (26), 3861–3867. https://doi.org/10.1016/j.vaccine.2018.03.063.

Lazarus, J. V., Wyka, K., Rauh, L., Rabin, K., Ratzan, S., Gostin, L. O. et al. (2020). Hesitant or not? The association of age, gender, and education with potential acceptance of a COVID-19 vaccine: A country-level analysis. *Journal of Health Communication,* 25 (10), 799–807. https://doi.org/10.1080/10810730.2020.1868630.

Liu, R., & Li, G. M. (2021). Hesitancy in the time of coronavirus: Temporal, spatial, and sociodemographic variations in COVID-19 vaccine hesitancy. *SSM - Population Health,* 15. https://doi.org/10.1016/j.ssmph.2021.100896.

MacDonald, N. E. (2015). Vaccine hesitancy: Definition, scope and determinants. *Vaccine,* 33 (34), 4161–4164. https://doi.org/10.1016/j.vaccine.2015.04.036.

Martin, L. R., & Petrie., K. J. (2017). Understanding the dimensions of anti-vaccination attitudes: The vaccination attitudes examination (VAX) scale. *Annals of Behavioral Medicine :A Publication of the Society of Behavioral Medicine,* 51 (5), 652–660. https://doi.org/10.1007/s12160-017-9888-y.

Matos, C. C. de S. A., Gonçalves, B. A., & Couto, M. T. (2021). Vaccine hesitancy in the global south: Towards a critical perspective on global health. *Global Public Health*, 1–12. https://doi.org/10.1080/17441692.2021.1912138.

McKee, C., & Bohannon, K. (2016). Exploring the reasons behind parental refusal of vaccines. *The Journal of Pediatric Pharmacology and Therapeutics : JPPT : The Official Journal of PPAG,* 21(2), 104–109. https://doi.org/10.5863/1551-6776-21.2.104.

Mesch, G. S., & Schwirian, K. P. (2015). Social and political determinants of vaccine hesitancy: Lessons learned from the H1N1 pandemic of 2009-2010. *American Journal of Infection Control,* 43 (11), 1161–1165. https://doi.org/10.1016/j.ajic.2015.06.031.

Neff, T., Kaiser, J., Pasquetto, I., Jemielniak, D., Dimitrakopoulou, D., Grayson, S. et al. (2021). Vaccine hesitancy in online spaces: A scoping review of the research literature, 2000-2020. *HKS Misinfo Review*. https://doi.org/10.37016/mr-2020-82.

Nhamo, G., & Sibanda, M. (2021). Forty days of regulatory emergency use authorisation of COVID-19 vaccines: Interfacing efficacy, hesitancy and SDG target 3.8. In *Global Public Health* 16 (10), 1537–1558. https://doi.org/10.1080/17441692.2021.1938170.

Özceylan, G., Toprak, D., & Esen, E. S. (2020). Vaccine rejection and hesitation in Turkey. *Human Vaccines & Immunotherapeutics* 16 (5), pp. 1034–1039. https://doi.org/10.1080/21645515.2020.1717182.

Paterson, P., Chantler, T., & Larson, H. J. (2018). Reasons for non-vaccination: Parental vaccine hesitancy and the childhood influenza vaccination school pilot programme in England. *Vaccine,* 36 (36), 5397–5401. https://doi.org/10.1016/j.vaccine.2017.08.016.

Paul, E., Steptoe, A., & Fancourt, D. (2021). Attitudes towards vaccines and intention to vaccinate against COVID-19: Implications for public health communications. In *The Lancet Regional Health - Europe* 1, 100012. https://doi.org/10.1016/j.lanepe.2020.100012.

Perveen, S., Akram, M., Nasar, A., Arshad-Ayaz, A., & Naseem, A. (2021). Vaccination-hesitancy and vaccination-inequality as challenges in Pakistan's COVID-19 response. *Journal of Community Psychology*. https://doi.org/10.1002/jcop.22652.

Petravić, L., Arh, R., Gabrovec, T., Jazbec, L., Rupčić, N., Starešinič, N. et al. (2021): Factors affecting attitudes towards COVID-19 Vaccination: An online survey in Slovenia. *Vaccines,* 9 (3). https://doi.org/10.3390/vaccines9030247.

Pew Research Center (2021). "Growing share of Americans say they plan to get a COVID-19 vaccine – or already have", March 2021. Available online at https://www.pewresearch.org/science/2021/03/05/growing-share-of-americans-say-they-plan-to-get-a-covid-19-vaccine-or-already-have/, checked on 11/15/2021.

Robertson, E., Reeve, K. S., Niedzwiedz, C. L., Moore, J., Blake, M., Green, M. et al. (2021). Predictors of COVID-19 vaccine hesitancy in the UK household longitudinal study. *Brain Behav. Immun.,* 94, 41-40

Roccato, M., & Russo, S. (2021). A new look on politicized reticence to vaccination: Populism and COVID-19 vaccine refusal. *Psychol. Med.*, 1–2. https://doi.org/10.1017/s0033291721004736.

Rozek, L. S., Jones, P., Menon, A., Hicken, A., Apsley, S, & King, E. J. (2021). Understanding vaccine hesitancy in the context of COVID-19: The role of trust and confidence in a seventeen-country survey. *International Journal of Public Health,* 66. https://doi.org/10.3389/ijph.2021.636255.

Ruijs, W. L. M., Hautvast, J. L. A., van Ijzendoorn, G.; van Ansem, W. J. C., van der Velden, K., & Hulscher, M. E. J. L. (2012). How orthodox protestant parents decide on the vaccination of their children: A qualitative study. *BMC Public Health,* 12, 408. https://doi.org/10.1186/1471-2458-12-408.

Sayın, Ö., & Bozkurt, V. (2021). Sociology of coronavirus conspiracies in Turkey: Who believes and why? In Veysel Bozkurt, Glenn Dawes, Hakan Gülerce, Patricia Westenbroek (Eds.): *The societal impacts of Covid-19: A transnational perspective*: Istanbul University Press, 79–91.

Shallal, A., Abada, E., Musallam, R., Fehmi, O., Kaljee, L., Fehmi, Z. et al. (2021). Evaluation of COVID-19 vaccine attitudes among Arab American healthcare professionals living in the United States. *Vaccines,* 9 (9). https://doi.org/10.3390/vaccines9090942.

Standing, G. (2014). *The precariat. The new dangerous class.* Revised edition. (ProQuest Ebook Central). Available online at https://ebookcentral.proquest.com/lib/kxp/detail.action?docID=6160267.

Stecula, D. A., & Pickup, M. (2021). How populism and conservative media fuel conspiracy beliefs about COVID-19 and what it means for COVID-19 behaviors. *Research & Politics,* 8 (1), 205316802199397. https://doi.org/10.1177/2053168021993979.

Stiglitz, J. E. (2013). *The price of inequality*. W.W. Norton & Company.

Streefland, P. H. (2001). Public doubts about vaccination safety and resistance against vaccination. *Health Policy,* 55 (3), 159–172. https://doi.org/10.1016/S0168-8510(00)00132-9.

Tan, X.P., & Wang, X.Y. (2017). Dependence changes between the carbon price and its fundamentals: A quantile regression approach. *Applied Energy,* 190, 306–325. https://doi.org/10.1016/j.apenergy.2016.12.116.

Truong, J., Bakshi, S., Wasim, A., Ahmad, M., & Majid, U. (2021). What factors promote vaccine hesitancy or acceptance during pandemics? A systematic review and thematic analysis. *Health Promotion International*. https://doi.org/10.1093/heapro/daab105.

van Bavel, J. J., Baicker, K., Boggio, P. S., Capraro, V., Cichocka, A., Cikara, M. et al. (2020). Using social and behavioural science to support COVID-19 pandemic response. *Nature Human Behaviour,* 4 (5), 460–471. https://doi.org/10.1038/s41562-020-0884-z.

Vignier, N., Brureau, K., Granier, S., Breton, J., Michaud, C., Gaillet, M. et al. (2021). Attitudes towards the COVID-19 vaccine and willingness to get vaccinated among healthcare workers in French Guiana: The influence of geographical origin. *Vaccines,* 9 (6). https://doi.org/10.3390/vaccines9060682.

Wiysonge, C. S., Ndwandwe, D., Ryan, J., Jaca, A., Batouré, O., Anya, B. P. M., & Cooper, S. (2021). Vaccine hesitancy in the era of COVID-19:Could lessons from the past help in divining the future? *Human Vaccines & Immunotherapeutics*. https://doi.org/10.1080/21645515.2021.1893062.

Żuk, P., & Żuk, P. (2020). Right-wing populism in Poland and anti-vaccine myths on YouTube: Political and cultural threats to public health. *Global Public Health,* 15 (6), 790–804. https://doi.org/10.1080/17441692.2020.1718733.