

Exploring Fears About The Covid-19 Vaccines: The Impact Of Misinformation On Willingness To Accept Vaccination

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Abstract

Many people believe in conspiracy theories related to COVID-19. An example of an unfounded belief is that the pandemic is part of a plan to impose global control over people through vaccinations. This belief increases distrust of vaccines although vaccines are an important tool against life-threatening and debilitating diseases. In this work, the opinions of university educators and students were surveyed to find out participant sources of information about the COVID-19 vaccines and to ascertain the extent this information influences decisions concerning willingness to be vaccinated. Basic information about the currently available vaccines were provided then participants were asked about their readiness to receive the vaccine.

The results revealed that the percentage of people (32.0%) willing to take the vaccine before receiving accurate and reliable information about the safety of the vaccines was not significantly different (33.1%) after receiving information about the safety of the vaccines. This suggests that a statistically significant proportion of people are not willing to receive the vaccine, which may represent a risk of delaying an end to the global pandemic. This study raises the alarm that people's confidence in vaccines that can aid in the fight against the COVID-19 pandemic may be significantly inhibited by unfounded fears about COVID-19 and the vaccines against it.

Keywords: Fear, COVIS-19 vaccine, anti-vaccination, education, university population

Introduction

What is COVID-19?

The novel coronavirus (COVID-19) is a previously unknown pathogen that has become highly contagious for humans. In late 2019, this coronavirus had mutated just enough to start causing disease in humans. It quickly spread around the world causing the current global pandemic. The spread has been rapid, with over 150 countries having reported cases. As of 27 February 2021, there have been over 113,248,645 confirmed cases and over 2,534,880 deaths, worldwide, with a mean death rate of 3.4 (Anderson, Heesterbeek, Klinkenberg, & Hollingsworth, 2020).

To reduce the intensity of the pandemic and to slow down the increase in cases, the focus must remain on preventing the spread of the disease and controlling the death rate. Containment of the

pandemic can be successfully operationalized with the appropriate intervention measures. A risk-based prevention and control approach to strengthened epidemiological investigation, case management, and epidemic prevention on high-risk populations is essential to defeating this pandemic (Gaythorpe, Imai, & Cuomo-Dannenburg). This outbreak can be managed with a response that ensures most infected individuals will recover. As of 27 February 2021 over 88,8204,018 individuals have recovered from the virus (Verity et al., 2020).

This novel SARS-CoV-2 coronavirus (renamed COVID-19) was first identified in Wuhan, China, in December of 2019. The virus is the product of a naturally occurring mutation that has allowed it to use humans as its host. Contrary to internet gossip, analysis of the genome sequence data from this virus and comparing it to other related viruses have found no evidence that the virus was engineered. Rather, it is a product of naturally occurring mutation, like how a “cold virus” mutates from one year to the next (Riou & Althaus, 2020).

At its origin, COVID-19 is a zoonotic virus. Phylogenetic analyses and genome sequencing suggest that bats are the most probable reservoir for COVID-19 (SARS-CoV-2). However, there are no documented cases of direct bat-human transmission. Therefore, this would suggest an intermediate host was involved in the spread from animals to humans. The virus most probably mutated enough to be able to stay alive in an intermediate host that lives in the caves where bats reside. A possible intermediate host is a pangolin. (A mammal that looks like a cross between an armadillo and an anteater.) The chance that a coronavirus that was not pathogenic when it first entered the human population evolved the properties of COVID-19 while a human was serving as the host is highly unlikely (Kucharski et al., 2020).

How is COVID-19 being addressed to minimize the impact of the pandemic?

Two strategies for responding to the pandemic are the standard for pandemic response. The first strategy is mitigation. This approach focuses on slowing down the spread of the epidemic. Mitigation is intended to focus resources on protecting those most at risk of death from the virus. This approach does not attempt to interrupt the transmission of the disease. Its primary focus is on reducing the impact of the disease with medical interventions, such as treating those individuals who have life-threatening symptoms. The second strategy for responding to a pandemic is suppression. Suppression attempts to reverse the progression of an epidemic. The goal of this strategy is to reduce the number of active cases until an effective vaccine is available. Now that vaccines against COVID-19 are available, the hope is that the vaccines will have high levels of efficacy (Bootsma & Ferguson, 2007).

The optimal mitigation approach combines at-home isolation of suspected individuals, home quarantine of all household members of the individuals suspected of having the disease, and social distancing of the elderly and others most at-risk of severe disease symptoms. With mitigation, the population will eventually evolve a herd immunity leading to a decline in disease transmission (Airey et al., 2017; Jain et al., 2017).

Statistical analysis of the current trajectory of the COVID-19 pandemic is that about 80% of the global population may eventually be infected with the virus through human-to-human transmission. Therefore, implementation of both mitigation and suppression interventions are important until sufficient numbers of individuals have received the vaccine (Ostermann et al., 2014). Using social distancing of the entire population, case isolation, household quarantine, and closure of schools is predicted to have a significant impact on slowing down the pandemic. Studies suggest that social distancing is the one most important step toward suppressing the virus until an adequate percentage of the global population has been vaccinated against the virus (Halloran et al., 2008).

The value of implementing household quarantines during a pandemic is well-established. The WHO China Joint Mission Report (2020) drew the conclusion that 80% of virus transmission occurred from family member to family member. (The importance of school closure is not to protect children, but rather to slow down the transition of the virus from children to older adults who might be living with school-aged children.) School closures support epidemic suppression when combined with population-wide social distancing. The principle of early identification, early isolation, early diagnosis, early treatment and vaccination of the majority of the population are crucial to overcoming this pandemic (Mossong et al., 2008).

A brief history of vaccines

Pre-exposure vaccinations are the cornerstone of a successful community immunization plan against childhood diseases. Yet, according to the International Rescue Committee, ten percent (1 out of 10) of children do not receive the recommended vaccinations during early childhood (Andre et al., 2008). The recommended immunization schedule is intended to protect individuals against specific diseases early in life before they encounter potentially life-threatening diseases. The fourteen diseases of greatest concern are Diphtheria, Hepatitis A & B, two types of Influenza, Measles, Mumps, Pertussis, Pneumococcal pneumonia, Polio, Rotavirus, Rubella, Tetanus, and Varicella (Pediatrics, 2013). When children are vaccinated against these diseases, they are protected from contracting those diseases from others who might be infected. This also results in a significant degree of protection for the entire community. When most children in the community receive their vaccinations, this results in a community immunity (herd immunity) (Rolfes et al., 2016).

What is community immunity?

The germs that can cause potentially life-threatening diseases can move quickly through a community and lead to an outbreak of a disease. However, when enough individuals in the community receive vaccination against a disease, the germ responsible for the disease cannot easily travel from one person to another. This is what makes it less likely for any one individual in the community to get the diseases that vaccinations are designed to prevent (Pebody et al., 2016).

Who is protected by herd immunity?

Community immunity tends to protect individuals who cannot safely receive vaccination against life-threatening diseases. There are some individuals with a suppressed immune system who cannot safely take vaccinations. Individuals with a compromised immune systems, such as those with a medical history of type 1 diabetes, HIV/AIDS, certain types of allergies, cancer, or other not-so-common health conditions receive a significant degree of protection from community immunity (Hakim et al., 2016). In other words, herd immunity is protective of the unvaccinated individuals only if enough other individuals in the community receive vaccinations against the germs that are potentially life-threatening such as COVID-19 (Esposito et al., 2016; Poland & Jacobson, 2012). If a large enough percentage of the population are immunized, it is less likely that these germs will spread person to person. Therefore, with a significant percentage of the population immunized, it is less likely that an outbreak of a potentially life-threatening disease will spread to unvaccinated individuals. This is the goal of “herd” immunity. It tends to protect the members of the community who are not vaccinated (Oberle et al., 2016).

Protection of the unvaccinated population

Vaccines both protect immunized individuals and reduce disease among unimmunized individuals through the indirect effect of herd immunity. Herd immunity provides protection for the unvaccinated only when there is a sufficient proportion of the community immunized against the disease. The resulting decrease in disease incidence is greater when the proportion of individuals immunized through vaccination reduces the spread of the germ that causes the disease reducing the number of germs in the environment that could cause the disease and the duration of time that the germ can survive outside of a host. This results in a short-circuiting of a germs ability to transmit infection (Belongia et al., 2017; Hakim et al., 2016; Vaccines, 2012).

Vaccine safety

Arguments about vaccine safety draw more public attention than the well-documented studies of vaccine effectiveness. World Health Organization studies demonstrate the safety and efficacy of most vaccines. The fears about the safety of vaccines stem from a time when vaccines were less safe because of how they were formulated. However, the safety of the current vaccines has been well-documented in the literature. For example, despite continued accusations that vaccinations are a cause of autism, there is no reliable evidence that current vaccines can possibly do so (Smith & Woods, 2010; Tapia et al., 2016; Zerbo et al., 2017).

Fear of vaccines

Fear of vaccines is not a new problem. It is a problem with historical roots that go back to when vaccines came with significant risks of causing debilitating side effects or death. A lack of understanding about the measures medical researchers have taken to ensure the safety of current vaccines is poorly understood. Therefore, there are active anti-vaccination groups on social media that provoke fear of vaccines. These “anti-vaxxer” groups have provoked considerable controversy about the issue (Zinka, Rauch, Buettner, Ruëff, & Penning, 2006). Anti-vaxxers and “vaccine hesitant” individuals have existed for decades. One anti-vaxxer established an anti-vaccination association that publishes warnings about vaccines, including the vaccines against COVID-19. Anti-vaccine groups pose a challenge to battling the COVID-19 global pandemic by distributing misleading information on social media. The call to not take vaccinations has triggered considerable fear based on unfounded accusations (News, 2020a). The researcher, Renée DiResta, at Stanford University monitors anti-vaccination movements on the Internet, saying that anti-vaxxer groups have significantly increased their activity since the beginning of the COVID-19 pandemic. She added that these groups even question public health instructions, such as wearing masks and social distancing (DiResta, 2020).

Roozenbeek et al. (2020), suggested a significant percentage of the population believe in conspiracy theories related to the Corona virus epidemic. These beliefs have increased mistrust of anti-virus vaccines (Roozenbeek et al., 2020). The World Health Organization (WHO) has placed neglect of vaccinations among 10 issues threatening global health. The WHO said that “the hesitation in taking vaccines” or refusing them despite their availability “threatens to lead to reversing the progress made in tackling diseases that can be prevented by vaccines” (WHO, 2019). The WHO stressed that vaccines are among the most effective means of preventing disease, noting that they prevent 2.3 million deaths annually, and can prevent 1.5 million more if the health coverage of vaccines expands worldwide. The WHO stated that measles has returned to countries that were on the verge of eliminating it due to neglected vaccine campaigns (Facciola et al., 2019). Facciola, et al. (2019) suggested that among the

reasons some people are hesitant to take vaccines or give them to their children is typically related to difficulty in obtaining them or lack of confidence in the safety of vaccines due to social media influence (Facciola et al., 2019). They suggest health workers provide more reliable information on the safety of vaccinations. They concluded that health education of parents is the cornerstone on which public health agencies should build the fight against vaccine hesitancy and improve vaccination coverage.

The spread of false and misleading information about vaccinations impedes the efforts of health officials to encourage people to receive the COVID-19 vaccine. Misleading information about vaccines is spread easily on social media. For example, misleading claims circulating on Facebook and Instagram suggest receiving a flu vaccine increases the risk of catching COVID-19 by 36 percent. Another published Instagram scare suggests the influenza vaccine produced by the 'Sanofi' company and called 'Fluzone' is 2.4 times more deadly than Covid-19 (News, 2020b).

A study conducted by the University of Michigan found that one in three parents decided to not give their children the flu vaccine this year due to misleading information on social media. There is a lot of misinformation about the flu vaccine, but it is the best defense for children against serious health consequences of influenza and the risk of spreading it to others, said Sarah Clark, a specialist at the Michigan Medical Center for Research and Child Health Assessment, who added, Children should get the flu vaccine not only to protect themselves but to prevent the spread of influenza to family members and those who are at higher risk of serious complications. With the number of cases of Covid-19 worldwide disinformation is a barrier to vaccinating people (Mostafavi, 2020).

Despite evidence to the contrary, opposition to vaccines have been relatively persistent since Edward Jenner introduced the concept of vaccination in 1798. It has been rumored on social media that you may turn into a crocodile if you take the Coronavirus vaccine. History repeats itself because Jenner was accused that his vaccine would turn people into cows. Despite the success of Jenner's experiments in protecting people from smallpox, a campaign was raised against his innovation (Riedel, 2005). In anti-vaccination propaganda, a Dr. Rowley of Oxford, opposed to Jenner's experiments, alleged that a child began to take on the appearance of a cow after receiving the vaccine (Fara, 2021).

Scholars have described vaccination as one of the ten most prestigious public health achievements of the twentieth century (CDC, 1999). Nevertheless, opposition to vaccinations have continued since Jenner's first vaccine against small pox (Wolfe & Sharp, 2002). Vaccination critics have focused on controversies surrounding the safety and efficacy of immunizations against diphtheria, tetanus, pertussis (DTP) and the measles, mumps and rubella (MMR) vaccine because of the use of a preservative that contains mercury called Thimerosal (CDC, 2020). However, as of 2001, thimerosal is no longer used in most standard vaccines.

Methodology

Research Context

In this study, the opinions of instructors and students at universities in Turkey were surveyed through a questionnaire distributed to them via e-mail in both Turkish and English languages. The questionnaire sought to find out sources of information about the COVID-19 vaccine and to what extent this information influenced a participant's decision about whether to receive the vaccine. Participants were provided with information about vaccines in the questionnaire and then asked about their readiness to receive the vaccine. The effect of social media, on an individual's acceptance of vaccination appeared to be a significant factor influencing attitudes about the vaccines. The questionnaire consisted of 26 questions. The questions queried the source of each participant's information about

COVID-19, the proposed vaccines, their participation in rumors about the virus, and willingness to accept the vaccine. At the end of the questionnaire, an overview of the currently available vaccines was given. After the clarification about the safety of the vaccines was read, participants were asked a second time about their willingness to take the COVID-19 vaccine.

Population and Sample

The questionnaire was prepared in two versions: Turkish and English using the Google Form website, and the link was sent to the participants via email, leaving participants free to select the language of the questionnaire that suits them. This study targeted Turkish university professors and students, as this questionnaire was distributed to professors and students at Turkish universities in Konya, Ankara, and Istanbul. To maintain the confidentiality of the participants, no personal identifying information was gathered.

Data analysis

After collecting the responses, the questions were sorted by type and the options were given a numerical value for easy analysis. These responses were analyzed using SPSS Version 25 software. For the sake of eliciting valid inferences, frequency analysis, percentage analysis and descriptive statistics were used.

Results and Discussion

Rumors can play a significant role in influencing the attitude and conduct of people. During times of increased stress such as with the current global pandemic; the mandatory wearing of masks, forced social distancing, curfews, and closure of restaurants seem to intensify the spread of rumors. Especially with the availability of social media, people can easily fabricate information and transmit “fake news” around the world with the speed of a mouse click. This research explores the impact of rumors about the Coronavirus and the vaccines that are now available to combat it on the willingness of individuals to accept the vaccine.

The study was conducted at Turkish universities using a questionnaire which consists of 26 questions as shown in Table 1.

Table 1. Mean and standard deviation of participants’ responses on the questionnaire (n=338).

	Question	Mean	SD
Q1	Are you a university Faculty or Student?		
Q2	Gender		
Q3	Have you been infected with the Coronavirus (COVID-19)?	0.12	0.32
Q4	Has anyone in your family been infected with the Coronavirus (COVID-19)?	0.65	0.92
Q5	Are you afraid of getting infected by Coronavirus (COVID-19)?	0.61	0.49
Q6	Do you track the number of coronavirus (COVID-19) cases, recoveries, and deaths?	3.59	1.00

Q7	What are your sources of news?		
Q8	I follow the news about COVID-19 vaccines.	3.72	0.99
Q9	I always make sure a news source is trustworthy and a news story is reliable?	3.28	1.23
Q10	I participate in spreading news about Coronavirus (COVID-19) and vaccines via social media	3.27	1.13
Q11	I believe the conspiracy theories that COVID-19 is human-made.	3.04	1.19
Q12	I have attempted to convince my family and acquaintances that the virus is a conspiracy	2.18	1.15
Q13	I follow the news about the vaccines, the different types, and how they work.	3.59	1.00
Q14	Some people believe that some vaccines contain microchips and can control your behavior. Do you believe this is true?	2.15	1.03
Q15	Some people spread rumors that the vaccine contains DNA that will change a person's genetic characteristics. Do you believe this news?	2.43	1.04
Q16	Some people spread rumors about alleged dangerous side effects of the vaccine on human health. Do you believe this news?	2.88	1.01
Q17	Pharmaceutical companies have declared the vaccines are effective and safe. Do you believe those companies?	3.05	0.85
Q18	I agree to be vaccinated	1.07	0.75
Q19	If you disagree with being vaccinated, what are your reasons?		
Q20	I think information published by health authorities is sufficient to refute the rumors about vaccines.	3.04	0.94
Q21	The Chinese and Russian vaccines use Ad5-based adenovirus substrates to stimulate an immune system response that does not cause disease but stimulates the immune system to produce antibodies against Covid-19. Do you agree to be vaccinated with either of these vaccines?	2.92	0.97
Q22	The Pfizer/BioNTech and Moderna vaccines both contain messenger RNA that allow the immune system to make a non-infectious spike protein of the SARS-CoV2. This stimulates the immune system to mobilize a response against the spike proteins in COVID-19. Do you agree to be vaccinated with either of these vaccines?	3.02	0.98
Q23	The Oxford-AstraZeneca vaccine uses an adenovirus substrate combined with a non-infectious SARS-	2.94	0.94

	CoV-2 spike protein to stimulate the production of antibodies against COVID-19. Do you agree to be vaccinated with this vaccine?		
Q24	The Janssen vaccine combines a SARS-Co2 spike protein with an adenovirus substrate using DNA that cannot replicate to stimulate an immune system response to COVID-19. Do you agree to be vaccinated with this vaccine?	2.83	0.90
Q25	Novavax protein subunit vaccine uses a laboratory produced version of a SARS-Co2 spike protein that is not infectious to precipitate the immune system producing an anti-body to COVD-19. Do you agree to be vaccinated with this vaccine?	2.88	0.90
Q26	After learning information about vaccines through this questionnaire, will you agree to take the vaccine?	1.15	0.70

Response scale: 1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree and 5 = Strongly Agree.

Response scale: 0 = No; 1 = Maybe; 2 = Yes.

Response scale: 0 = No; 1 = I don't know; 2 = Yes.

The participants consist of 18.7% professors (52.4% males and 47.6% females) and 81.4% students (31.3% males and 68.7% females), as shown in Figure 1.

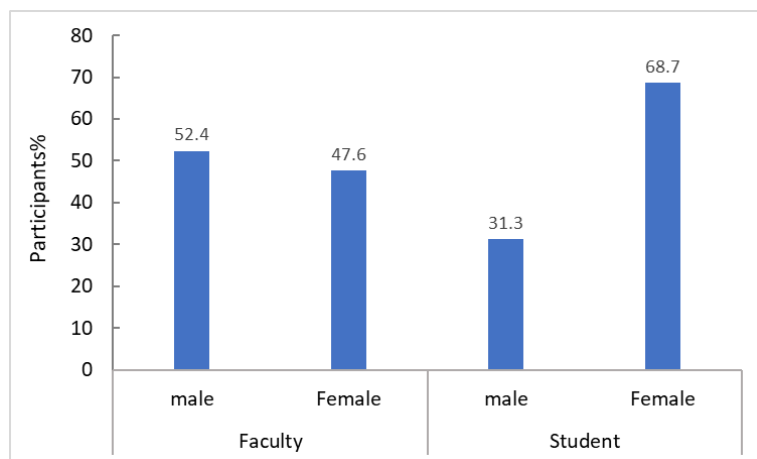


Figure 1. Distribution of the participant Faculty and students by gender.

The study identified 11.8% of participants as individuals who had been infected with the Coronavirus. It was also identified that 30.7% of participants had a member of their family who caught the virus. Additionally, 3.25% are unsure whether a family member has been infected. These numbers are relatively large, as they constitute almost a third of the study participants (Tables 1 and 2). The study indicated that 60.6% of the participants feel fear of the possibility of contracting the virus (Tables 1 and 2). Figure 2 shows that a large percentage of the participants (71.8%) follow the news of the virus in terms of the number of infections, deaths, and recoveries. Likewise, a large percentage (71.8%) follow the news about the various vaccines. When asked about sources of information about the global pandemic, social media was identified as the most frequent source of information (32.8%), followed

by the Ministry of Health (21.6%), TV and radio news networks (17.8%), Internet networks (12.7%), and the World Health Organization (12.4%). Newspapers were the last source of information about the pandemic (2.7%). The television and radio news networks were the first source of information for professors, with a rate of 25.4%, followed by the Ministry of Health (23.8%). Social media was the first reference point for students (37.1%), followed by the Ministry of Health (21.1%). These results indicate that students may be more susceptible to rumors than instructors because most of the rumors come from social media. The results indicated that (74.4%) of participants follow the news of the Coronavirus vaccine through the aforementioned information sources. About a quarter of the participants stated they had no interest in hearing news of the vaccines. Although a large percentage (65.6%) claim that they verify the validity of the information they receive, more than a third of the participants admitted that they did not verify the validity of the rumors they heard about the vaccines (Tables 1 and 3). The results show that a large percentage of the participants, 65.4%, re-send the news that they receive to their relatives and acquaintances. This may contribute to the spread of rumors without verifying their validity and reliability (Tables 1 and 3).

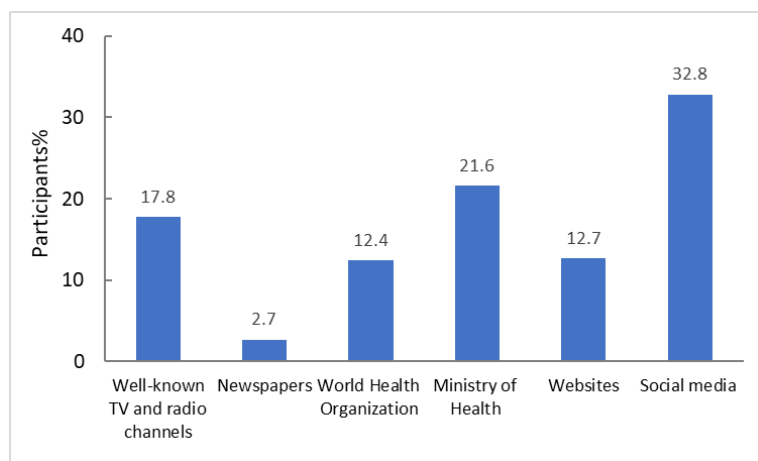


Figure 2. The source of information selected by the participants.

Table 2. Participants’ responses on yes/no questions (n=338).

	Yes	No	I do not know	Maybe
Q3	40 (11.8)	298 (88.1)	-	-
Q4	104 (30.7)	223 (65.9)	11 (3.25)	-
Q5	205 (60.6)	133 (39.3)	-	-
Q18	108 (32.0)	85 (25.1)	-	145 (42.9)
Q26	112 (33.1)	61 (18.0)	-	165 (48.8)

Table 3. Participants’ responses on agree/disagree questions (n=338).

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Q6	15 (4.43)	26 (7.69)	96 (28.4)	145 (42.8)	56 (16.5)

Q8	10 (2.95)	32 (9.46)	71 (21.0)	156 (46.1)	69 (20.4)
Q9	34 (10.0)	55 (16.2)	97 (28.6)	88 (26.0)	64 (18.9)
Q10	33 (9.76)	47 (13.9)	92 (27.2)	128 (37.8)	38 (11.2)
Q11	44 (13.0)	63 (18.6)5	105 (31.0)	87 (25.7)	39 (11.5)
Q12	127 (37.5)	83 (24.5)	81 (23.9)	35 (10.3)	12 (3.55)
Q13	10 (2.95)	41 (12.1)	82 (24.2)	148 (43.7)	57 (16.8)
Q14	118 (34.9)	86 (25.4)	103 (30.4)	27 (7.98)	4 (1.18)
Q15	78 (23.0)	93 (27.5)	122 (36.0)	35 (10.3)	10 (2.95)
Q16	37 (10.9)	70 (20.7)	143 (42.3)	72 (21.3)	16 (4.73)
Q17	17 (5.02)	52 (15.3)	176 (52.0)	82 (24.2)	11 (3.25)
Q20	18 (5.32)	70 (20.7)	150 (44.3)	80 (23.6)	20 (5.91)
Q21	37 (10.9)	50 (14.7)	166 (49.1)	72 (21.3)	13 (3.84)
Q22	29 (8.57)	49 (14.4)	169 (50.0)	67 (19.8)	24 (7.10)
Q23	31 (9.17)	53 (15.6)	176 (52.0)	62 (18.3)	16 (4.73)
Q24	35 (10.3)	59 (17.4)	183 (54.1)	52 (15.3)	9 (2.66)
Q25	32 (9.46)	52 (15.3)	189 (55.9)	53 (15.6)	12 (3.55)

The participants were asked about rumors circulating on social media, their reaction to them (Figure 3 and Table 1) and their participation in re-publishing them. One of the rumors is a conspiracy theory that some countries or drug companies have bioengineered the virus and marketed the vaccines for the sake of controlling human behavior. The results of this survey indicated that 60.8% of the participants believed the conspiracy theory that the virus was manufactured in laboratories. Additionally, 43.6% of the participants tried to convince their family and acquaintances that the belief was a fact. A rumor that the vaccine contains a microchip that can control people and direct their behavior has also circulated on social media and 43.0% of the participants believed that rumor to be true. Another belief that the vaccine will change the human DNA of the recipient is a popular myth circulating on social media. The study indicated 48.6% of the participants believed this misconception. One of the rumors is that the vaccines have dangerous side effects. The study suggested 57.6% of the participants believe the rumor. A rumor that the pharmaceutical companies were not honest in the results of the experiments they conducted on the vaccine and did not abide by the standard protocols for testing vaccine safety. In contradiction to responses to other questions related to conspiracy theories, most participants (61.0%) expressed confidence in the pharmaceutical companies in terms of the overall safety and effectiveness of the vaccines (Tables 1 and 3). However, the negative impact of the many false rumors circulating on social media was reflected in the low participant acceptance of the vaccine. Only 32.0% of participants agreed to take the vaccine when it became available. One in four participants (25.1%) stated they would not take the vaccine and 42.9% were hesitant about accepting the vaccine as shown in Figure 3. When participants were asked about the reason why they did not want to receive the vaccine (Figure 4), the study indicated that 43.0% refused to take the vaccine due to their lack of confidence in the pharmaceutical companies while 35.5% did not want to take the vaccine because of fear of complications. Interestingly, 15.0% believed that the vaccine is not necessary, while 5.1% believed a conspiracy theory about the vaccines, and 1.4% reject the idea of taking the vaccine for alleged religious reasons. Although 61.0% of the participants declared their confidence in the pharmaceutical companies the largest percentage of those who stated that they will

refuse the vaccine (42.9%) attributed the reason to their lack of confidence in the pharmaceutical companies. This represented the percentage of those who stated they would not take the vaccine, not of the total number of participants.

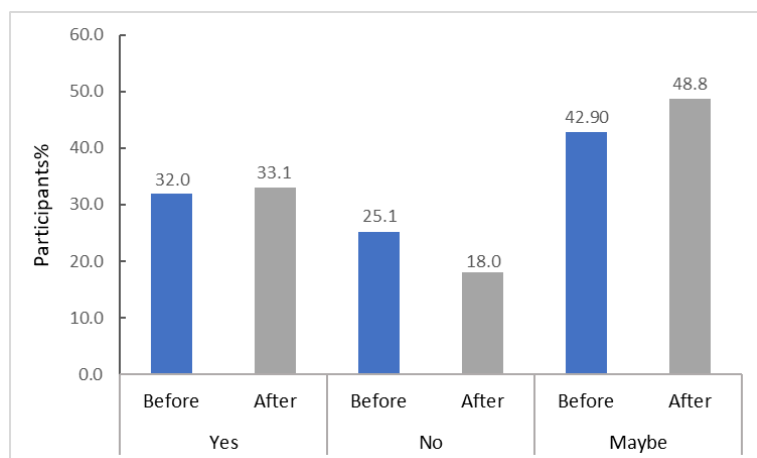


Figure 3. Willingness of the participants to take the vaccine before and after being provided information about the safety of the vaccines.

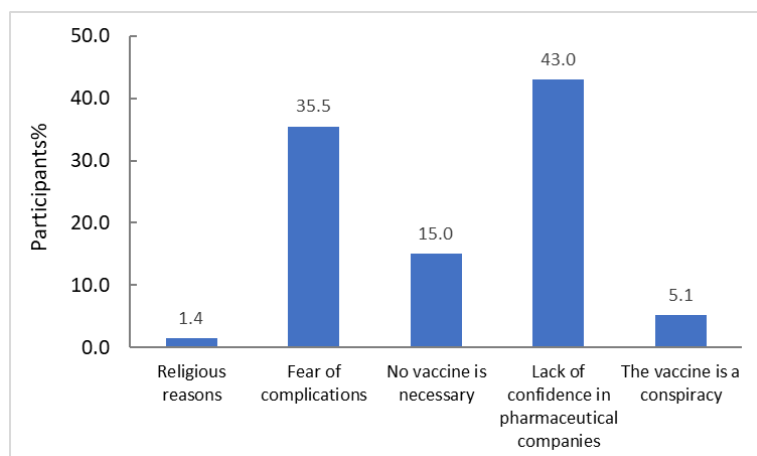


Figure 4. The causes of fear of vaccination.

At the end of the survey, information was presented about the safety of the vaccines against COVID-19. Then, the question addressing willingness to take the vaccine was restated. The results showed no statistically significant increase in willingness of participants to take the vaccine (Tables 1 and 3) after receiving information about the mechanism of action of each vaccine. The slight increase in the number of those who agreed to take the vaccine (32.0% to 33.1%) and a decrease in those who stated they would refuse the vaccine (25.1% to 18.0%). However, the percentage of those who were hesitant to take the vaccine increased from 42.9% to 48.8% as shown in Figure 3. This would suggest that the impact of “fake news” on the participants, despite having a graduate-level of education, continued to be an obstacle to maintaining a rational acceptance of scientific information.

Because of the high percentage of participants hesitant to take the vaccine, it will be difficult to vaccinate all segments of the population unless governments mount educational campaigns to fight false rumors about the safety of the COVID-19 vaccines. Although 60.8% of participants believe that the information provided by health authorities, this study reflects the extent to which participants respond to misinformation that is spread on social media.

Conclusion

This study looked at the history of fear of vaccines and how that fear can be spread by organized anti-vaccination groups through social media. These groups pose a challenge to scientists and health authorities, by spreading misleading and false information about vaccinations. With the emergence of COVID-19 and its rapid spread across the globe, many false rumors about COVID-19 have been disseminated. Social media has spread fears with a false narrative. This study was aimed at a university population comprised of Turkish and international graduate students and university faculty in Turkey. One drawback to the study was the relatively small sample size. It is recommended that future studies increase the sample size. This study highlights the importance of governmental health agencies mounting educational programs to counter the false information that is circulated on social media about the COVID-19 vaccines. All segments of society need to be provided with accurate information about the most effective ways to fight the global pandemic and the safety of the vaccines that will be a significant component of ending the crisis. This study addressed the effect of false rumors on willingness of participants to take the vaccine against COVID-19. After being presented information about safety of the vaccines, participants were asked about their willingness to take the vaccine. The results showed that 60.6% of the participants were afraid of contracting COVID-19 and nearly a third of the participants or their family members (30.7%) had caught the virus. The results suggested a not statistically significant slight increase in willingness of participants to take the vaccine from 32.0% to 33.1% after being provided accurate information about the vaccines. This would suggest that participants remain susceptible to false rumors about the vaccines. Therefore, it is recommended that the World Health Organization and health authorities in all countries work to reduce the negative impact of misinformation about the vaccines and mount an educational campaign that addresses the safety of the vaccines and the importance of vaccination as an integral part of ending the global pandemic.

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Conflicts of Interest: The authors declare no competing interests.

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