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ORIGINAL ARTICLE

Factors Affecting COVID-19 Vaccine Confidence and Prevalence of Post-COVID Syndrome

COVID-19 Aşılarına Yönelik Güven Durumlarını Etkileyen Faktörler ve Post COVID Sendromu Prevalansı

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ABSTRACT

Background/Aims: Determining the attitudes and confidence levels of society towards vaccines is important even after administering vaccinations. The aims of this study are: to determine the prevalence of post-COVID syndrome, the side effects after COVID-19 vaccinations, and the factors affecting COVID-19 vaccine confidence in individuals aged eighteen years old and over.
Methods: The population of this cross-sectional study consisted of people aged eighteen years old and above living in the city center of Amasya. In total, 762 people were reached. Data collection was carried out between August 15 – September 15, 2022 by applying the questionnaire form prepared by the researchers face-to-face in rural areas and face-to-face or online in urban areas.
Results: The number of people having chronic COVID disease was 55 (20.0%). Three hundred nine people (43.2%) developed side effects after at least one dose of the vaccine. The rate of trusting all the vaccines was higher among those who did not develop side effects after vaccination, who did not use social media as a source of information, who were aged 65 and over, who resided in rural areas, who had secondary school education and below, who did not work and who were housewives (p<0.001).
Conclusions: One in five people who have had the disease developed chronic COVID syndrome and almost half of respondents trusted all types of COVID-19 vaccines. For vaccines to be accepted by the society, the ways in which media such as social media reduce the trust in the vaccine should be examined and the reasons for the lack of confidence in the vaccine should be determined, especially in people with a high education level.

Keywords: COVID-19, Vaccine, Side effect, Confidence, Attitude

ÖZ

Amaç: Toplumun aşılara yönelik tutum ve güven düzeylerinin belirlenmesi, aşı uygulaması sonrası da oldukça önem taşımaktadır. Bu çalışmanın amaçları Amasya il merkezinde yaşayan on sekiz yaş ve üstü bireylerde; post COVID prevalansını, COVID-19 aşıları sonrası görülen yan etkileri ve COVID-19 aşılarına yönelik güven durumunu etkileyen faktörleri belirlemektir.
Yöntem: Kesitsel tipteki çalışmanın evrenini Amasya il merkezinde yaşayan on sekiz yaş ve üzeri kişiler oluşturdu. Toplamda 762 kişiye ulaşıldı. Veri toplama işlemi araştırmacılar tarafından hazırlanan anket formunun kırsal kesimde yüz yüze, kentsel bölgede ise yüz yüz veya çevrimiçi uygulanmasıyla 15/08/2022 - 15/09/2022 tarihleri arasında gerçekleştirildi.
Bulgular: Kronik COVID tanımına uyan kişi sayısı 55 (%20,0) olarak tespit edildi. Üç yüz dokuz kişide (%43,2) en az bir doz aşı sonrası yan etki geliştiği bulundu. Aşıların tümüne güvenme oranı aşı sonrası yan etki gelişmeyenlerde, bilgi kaynağı olarak sosyal medya kullanmayanlarda, 65 yaş ve üzeri grupta, köylerde ikamet edenlerde, öğrenim durumu ortaokul ve altı olan bireylerde ve çalışmayanlar ile ev hanımlarında daha yüksekti (p<0,001).
Sonuç: Hastalığı geçiren her beş kişiden birinde kronik COVID sendromu geliştiği ve katılımcıların neredeyse yarısının tüm COVID-19 aşı tiplerine güvendiği tespit edilmiştir. Aşıların toplum tarafından kabul edilmesi için sosyal medya gibi mecraların aşıya olan güveni hangi yollarla azalttığı incelenmeli ve yapılacak çalışmalarla özellikle eğitim düzeyi yüksek olan kişilerde aşıya olan güvensizliğin nedenleri belirlenmelidir.

Anahtar Kelimeler: COVID-19, Aşı, Yan etki, Güven, Tutum

Introduction

As of February 12, 2023, more than 755 million confirmed cases and more than 6.8 million deaths have been reported worldwide (1). The epidemic still affects certain parts of the world, and it is always possible for the number of cases and deaths to rise again due to the potential mutations creating new variants of the SARS-CoV-2 virus. Another feature of the disease is that some symptoms can be seen weeks or months later, depending on the prolongation of the expected recovery period. This condition, called long COVID or Post-COVID syndrome, can be divided into two stages depending on the duration of symptoms: post-acute COVID, at which symptoms exceed three weeks but less than 12 weeks, and chronic COVID, at which symptoms exceed 12 weeks (2). Currently, vaccination is still seen as the most effective method of prevention. While the number of vaccines approved for emergency use worldwide is 50, the World Health Organization (WHO) has approved 11 vaccines(3). In Türkiye, the first vaccine application was started with CoronaVac produced by Sinovac company on January 14, 2021. Following the approval of Comirnaty (BNT162b2) produced by Pfizer/BionTech company, and Turkovac (ERUCOV-VAC) produced as a result of cooperation between TÜSEB-Erciyes University; three vaccines continue to be administered based on the

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person's choice. While CoronaVac and Turkovac are inactive, Comirnaty vaccine is an mRNA vaccine. After mRNA vaccines are administered, mRNA enables the production of spike protein, which uses this code in the cell before it reaches the cell nucleus (4).

WHO recommends that 70% of the population should be vaccinated for the formation of herd immunity(5). In Türkiye, people who have received two doses of vaccine constitute of 62.3% of the population, but booster doses are required at regular intervals for effective protection(6). Before the introduction of COVID-19 vaccines, various studies were conducted to determine the attitude and confidence level towards vaccines in many regions. It has been found that the rate of people who have a positive attitude about COVID-19 vaccines in the world varies between 27.7% and 93.3%, depending on countries and the various sociodemographic characteristics of individuals (7). Determining the attitudes and confidence levels of society towards vaccines is also important after vaccination. In the literature review, it was observed that no study was conducted on the general population regarding the trust in vaccines in the process following the administration of vaccines. Mass vaccination programs will be more effective if the reasons for possible mistrust of vaccines and the target population to which various interventions such as education and information can be applied to overcome this mistrust can be identified. The aims of this study are to determine: (i) the prevalence of post-COVID and its symptoms, (ii) the side effects seen after COVID-19 vaccinations, (iii) the factors affecting the state of trust and attitude towards COVID-19 vaccines in individuals aged eighteen and over living in Amasya city center, Türkiye.

Material and Methods

This is a cross-sectional study. In the population of 108,712 people aged eighteen and older living in the city center of Amasya, the minimum sample size was calculated as 196, considering the COVID-19 vaccine confidence as 50% and the deviation rate as 10%, with 80% power and 5% type-1 error. With the calculation of the design effect, it was aimed to reach 392 people. The sample obtained was stratified according to (i) settlement (rural/urban areas), (ii) gender, and (iii) age groups (18-64 years/65 years and above). In determining the factors affecting the trust and attitude towards vaccines, the independent variables were determined as the development of side effects after vaccination, information sources about the vaccine and sociodemographic characteristics. Following the approval from ..... Non-Interventional Research Ethics Committee numbered 2022/76, the data collection was carried out between August 15 – September 15, 2022. A questionnaire form prepared by the researchers was used as the data collection method. While the first part of the questionnaire included 9 items on sociodemographic characteristics, the second part included 12 items on the history of the COVID-19 disease and COVID-19 vaccines. To determine the state of confidence in vaccines, the participants were asked "Which of the following options reflects your opinion on COVID-19 vaccines?". The participants were expected to choose among these three options: "I trust all", "I trust some" and "I trust none". The study was conducted in two main strata, rural and urban areas, with different sampling methods. For the sample in the rural areas, considering the education status of the participants, the data was collected through a face-to-face survey. Through a one-stage random selection method five villages were selected, each as a cluster. The information of the people who were at home during the visiting hours was obtained from the community leader and they were interviewed in their homes. The questionnaire was applied to all those aged 18 and over in the relevant households who agreed to participate in the study. In the urban area, both online and face-to-face surveys were conducted using the non-probabilistic sampling method. In both regions, the face-to-face questionnaire was administered by the researchers in this project. The data collection process started after obtaining informed consent from the participants. Within the scope of post-COVID, people whose complaints continued for 12 weeks or more were categorized as chronic COVID (2).

After the data were coded, they were transferred to the SPSS (Version 22 for Windows, SPSS Inc, Chicago, IL, USA) package program and analyzed. In statistical analyses, the conformity of the numerical variables to the normal distribution was evaluated with the Kolmogorov-Smirnov test. Since the continuous numerical variables did not fit the normal distribution, their median (interquartile range) values were presented. The categorical data were presented as numbers and percentages. Chi-square test was used to compare categorical variables. Statistical significance level was accepted as $p<0.05$ for all tests.

Results

The median age of the 762 people participated in the study was 41 (IQR 23) years, and 385 (50.5%) were women. Of the participants, 537 (70.5%) resided in urban areas; 396 (52.2%) had associate degrees or higher education level; and 494 (64.8%) worked in an income generating job (Table 1). Of the participants, 276 individuals (36.3%) had a self-reported diagnosis of COVID-19 with a PCR test; 77 (28.0%) of the participants who had the disease stated that they had symptoms that started with COVID-19 and still continued. While the median period between the diagnosis of the disease and the time the data were collected was 7 (IQR 12) months, the median of this period was 6 (IQR 10) months in people who stated that they had symptoms that started with the disease and still continued. The number of people who were diagnosed with chronic COVID (whose complaints continued for at least 12 weeks) was 55 (20.0%). The most common symptom among these individuals was weakness and easy fatigue (25.5%) (Table 2).

It was found that 721 (94.6%) of the participants had at least one dose of the COVID-19 vaccine. Among

the answers given to the reasons for not being vaccinated, the most frequent reason was "I do not trust the vaccines" (90.2%). It was found that the most administered vaccine was Comirnaty (89.2%), 293 people (41.5%) had 3 doses of vaccines, and 309 people (43.2%) developed side effects after at least one dose of the vaccine. The rate of developing a side effect after the Comirnaty vaccine was 45.3%. The most common side effect in all three vaccine types was arm pain at the injection site.

Table 1. Distribution of participants' sociodemographic characteristics

Sociodemographic characteristic	n	%
Age group (years) (n=762)		
18-25	115	15.1
26-50	388	50.9
51-64	161	21.1
65 and over	98	12.9
Gender (n=762)		
Male	377	49.5
Female	385	50.5
Place of residence (n=762)		
Urban area	537	70.5
Rural area	225	29.5
Educational status (n=758)		
Illiterate	29	3.8
Primary school	182	24.0
Middle school	34	4.5
High school	117	15.4
Associate's degree and above	396	52.2
Working status (n=762)		
Working	494	64.8
Unemployed/housewife	117	15.4
Retired	79	10.4
Student	72	9.4

Table 2. Distribution of the Characteristics of the Participants Regarding the COVID-19 Disease

COVID-19 Disease (n=761)	n	%
Diagnosed	276	36.3
Undiagnosed	485	63.7
Ongoing Symptom After Disease (n=275)		
Yes	77	28.0
No	198	72.0
Chronic COVID Symptoms (n=55)*		
Weakness/fatigue	14	25.5
Shortness of breath	8	14.5
General muscle/joint pain	7	12.7
Brain fog/drowsiness/forgetfulness	6	10.9
Loss of taste/smell	5	9.1
Lower back pain	4	7.3
Psychiatric symptoms	4	7.3
Cough	3	5.5
Back pain	3	5.5
Hoarseness	2	3.6
Hypertension	2	3.6
Dizziness	2	3.6
Vision loss/impairment	2	3.6
Other†	6	10.9

*Multi-choice

†Angina, palpitations/arrhythmia, sore mouth, headache, insomnia, knee pain

Table 3. Distribution of Confidence in Vaccines by Sociodemographic Characteristics

	COVID-19 Vaccine confidence				
Sociodemographic Characteristics	Trusting all		Not trusting at least one		
Age Group (Year) (n=754)	n	%*	n	%*	p
18-25	34	29.6	81	70.4	<0.001
26-50	131	34.4	250	65.6	
51-64	119	74.4	41	25.6	
65 and over†	80	81.6	18	18.4	
Gender (n=754)					
Male	185	49.6	188	50.4	0.47
Female	179	47.0	202	53.0	
Place of residence (n=754)					
Urban area	174	32.9	355	67.1	<0.001
Rural area	190	84.4	35	15.6	
Educational status (n=750)					
Middle school and below	213	86.9	32	13.1	<0.001
High school and above	149	29.5	356	70.5	
Working status (n=754)					
Working	214	44.0	272	56.0	<0.001
Unemployed/housewife†	77	65.8	40	34.2	
Retired	49	62.0	30	38.0	
Student	24	33.3	48	66.7	

*Row percentage

†The subgroup from which the difference originates

Table 4. Attitudes and Confidence Towards Vaccines According to Post-Vaccination Side Effects Development

	Post Vaccine Side Effect				
	Developed		Not developed		
Vaccine Confidence Status*	n	%†	n	%†	p
Trusting all	128	42.1	224	55.6	<0.001
Not trusting at least one	176	57.9	179	44.4	
Reminder Dose*	n	%†	n	%†	p
Considering	163	53.1	228	56.2	0.41
Not considering/indecisive	144	46.9	178	43.8	

*Due to missing answers, the numbers in the eyes do not give the total.

†Column percentage

Of the 754 people who answered the question "Which of the following options reflects your thinking about COVID-19 vaccines?", 364 (48.3%) stated that they trusted all the vaccines, 281 (37.3%) trusted some of them, and 109 (14.5%) did not trust any of them. Of those who declared that they trusted some of the vaccines, 217 (77.2%) stated that they trust the Comirnaty vaccine. Of the participants, 402 (52.9%) stated that they were considering the reminder doses. It was found that the most preferred vaccine for the reminder dose was Comirnaty (78.8%). Regarding the source of information, written and visual media (63.7%) were the most commonly used source about COVID-19 vaccines.

The rate of 'confidence in all the vaccines' was higher in the 65-year-old and above group, in those residing in rural areas, in individuals with secondary school education and below, and in those who do not work or are housewives (p<0.001) (Table 3). When looked at separately for the vaccine types, it was determined

that individuals with a secondary education level and below were more likely to trust each vaccine type too ($p<0.001$). Of the 253 participants who declared that they use social media platforms as one of the sources of information about vaccines, 70 (27.7%) stated that they trusted all the vaccines. Of the 501 people who stated that they did not use social media as a source of vaccine information, 294 (58.7%) stated that they trusted all the vaccines ($p<0.001$).

While the level of confidence in all vaccines was lower in the participants who stated that they developed side effects after any vaccine dose ($p<0.001$), it was seen that the development of side effects did not affect the thoughts of the individuals about the reminder dose ($p>0.05$) (Table 4).

Discussion

The number of people whose symptoms continued for 12 weeks, defined as chronic COVID, constituted 20% of those who had the disease. In two studies conducted in England, this rate was 65% and 74% in patients hospitalized with the diagnosis of COVID-19 (8, 9). As a result of the more severe course of the disease in hospitalized patients, a higher rate of chronic COVID-19 cases can be expected. In the literature, the two most frequent symptoms in chronic COVID cases are fatigue and shortness of breath (8, 9). In this study, the most common symptoms in chronic COVID cases were similarly weakness/fatigue and shortness of breath. In the study conducted in Türkiye, the most common symptoms among patients admitted to the COVID-19 outpatient clinic of a hospital were fatigue, musculoskeletal pain, cough, joint pain and exertional dyspnea (10). Studies show that sporadic necrosis, general atrophy of muscle fibers, focal infiltration of muscle fibers and neuronal demyelination contribute to this condition (11). The other most reported symptoms reported in previous studies are general muscle-joint pain, brain fog/drowsiness/forgetfulness, and loss of taste-smell (2).

The most preferred type of vaccine by the participants was Comirnaty, followed by CoronaVac and Turkovac vaccines, respectively. It is worth noting that, Coronavac was the first vaccine administered in Türkiye, to healthcare workers and individuals over 65 years of age, without the possibility of making a choice. Despite this, it is thought that the preference of the Comirnaty vaccine is due to the higher protection rate of the vaccine (12). In another study in which dentists and dentistry students participated, it was also seen that the Comirnaty was the more preferred vaccine (13).

Of the people vaccinated, 43% had a side effect after at least one dose of vaccination. The incidence of developing a side effect was higher in the Comirnaty vaccine compared to the other two vaccines (45%). The most common side effects after this vaccine were pain, weakness, and fever at the injection site. In a review, the average rate of side effects seen after the first and second dose of the Comirnaty vaccine was 79% and 89% respectively, which is higher than the rates in this study. In terms of the type of side effects, injection site pain and fatigue were the most common symptoms similar to this study (14). Side effects associated with vaccines are mostly attributed to the production of type-I interferon, a cytokine that plays a vital role in enhancing the early stages of the immune response. The fatigue and headache seen after COVID-19 vaccines have suggestively been attributed to effective immune response as a result of adequate release of type-I interferon (15). The incidence of side effects in any dose of CoronaVac vaccine was 26%, and the most common types of side effects were pain at the injection site, weakness, and muscle/joint pain. In another study conducted among healthcare professionals in Türkiye, the incidence of side effects after any CoronaVac dose was 62%, and the most common types of side effects were fatigue and pain at the injection site similar to this study. In brief, several studies show that pain at the injection site and fatigue are the most common symptoms after COVID-19 vaccines. We think that the most probable reason for the lower incidence of side effects after vaccination in our study compared to the literature is the memory factor.

Of the individuals in this study, 48% stated that they trusted all of the COVID-19 vaccines. In one of the few studies conducted after the introduction of vaccines in Türkiye, 42% of the participants from a health sciences faculty stated that they found COVID-19 vaccines safe (16). In a study in which students from the Faculty of Medicine participated, 40% of the participants stated that they trusted the COVID-19 vaccines, and 41% stated that this situation might vary according to the type of vaccine (17). The most striking finding in our study was that the rate of trusting all vaccines was higher in those residing in rural areas, those with a secondary education level and below, those who were not working, housewives, and those over the age of 65. It is indicated that education level is the main determinant of vaccine confidence in these subgroups. It is interesting that while the rate of trusting all vaccines is 86%, among those with a secondary education level and below, this rate is 29% for those with a high school or higher education level. In fact, it has been shown in the literature that higher education level is a protective factor against COVID-19 vaccine refusals. In a review of fifteen studies, it was observed that the level of acceptance of COVID-19 vaccines increased as the level of education increased, and only two of these studies had similar results to our study (18). In studies conducted in Türkiye on this subject, it was observed that parents with a high level of education had a more negative attitude towards COVID-19 vaccines (19). In another study, it was observed that education level did not affect the attitude towards COVID-19 vaccines in individuals aged 18 and over (20). In this case, the first explanation that comes to mind is that those with a high level of education responded according to the protection rates of the vaccines. As such, it is expected that the Comirnaty vaccine will be more reliable in people with a higher education level. However, although the Comirnaty vaccine is seen as

the most trusted vaccine in the entire sample, the rate of confidence in vaccines was lower in individuals with higher education levels for each vaccine. The high level of education for vaccines in general is known as a factor that positively affects vaccine acceptance (21). However, it is thought that the most likely reason for the emergence of contradictory results in the case of COVID-19 vaccines is the spread of scientifically invalid information, especially through social media. As a matter of fact, the findings of our study support this. People who use social media as a source of vaccine information have a lower rate of trust in COVID-19 vaccines. This situation makes us think that health literacy is independent of education level and that there is a need for community-oriented studies on this issue. In a study conducted with the employees of the organized industrial site in Aydın province, Türkiye which examined the effect of education status on the knowledge of COVID-19 vaccines and the reason for preference was, it was determined that the average score of high school graduates was significantly higher than other education groups, including university graduates (22).

In previous studies it is seen that the most important determinants of vaccine hesitancy are the side effects that can be experienced after vaccination (23, 24). It is known that serious side effects such as anaphylaxis occur at rates as low as 5 per million vaccine doses (25). It was observed that such a situation did not develop in any of the participants in this study, and the expected mild side effects negatively affected the level of confidence in vaccines. To prevent this situation, it is suggested that health professionals should clearly explain what side effects are expected and how long after vaccination.

A parallel situation with the level of confidence in COVID-19 vaccines is also seen in reminder doses. More than half of the individuals in the study consider taking the reminder dose. It was observed that the most preferred vaccine for reminder doses was Comirnaty vaccine, followed by Turkovac and CoronoVac, respectively. In a study conducted in industrial field workers in Türkiye, it was seen that the Comirnaty vaccine was preferred over CoronaVac (22). Although it is a new type of vaccine, the high level of protection shown for the Comirnaty vaccine in many scientific studies, and its high preference by developed countries has made the Comirnaty vaccine the most reliable and preferred vaccine (26).

The most important limitations of this study are that the samples in rural and urban areas do not represent their general population due to the sampling method used, and that the confidence in vaccines is measured with a single question. In addition, the effect of vaccination on COVID-19 disease could not be determined well, since the majority of the participants did not have precise information about whether they were first vaccinated or contracted the disease.

Conclusion

It has been determined that one out of every five people who have had COVID-19 disease develop symptoms lasting for more than 12 weeks; nearly half of the participants trust all COVID-19 vaccine types. Nearly half of people reported developing side effects after any dose of COVID-19 vaccines and the side effects occurred most commonly after the Comirnaty vaccine. It was determined that the most common side effects after vaccination were local pain at the injection site and fatigue. The level of trust in vaccines was lower in those with a high level of education, those who reported side effects after vaccination, and those who used social media as a source of information. For the vaccines to be accepted by society, the ways in which media -such as social media- reduce the trust in the vaccine should be examined. Also, particularly among people with a high education level, the reasons for the lack of confidence in the vaccine should be determined. Another important precaution is that healthcare professionals clearly explain what side effects are expected after the vaccination and that they are temporary.

Compliance with Ethics Guidelines

Approval number 2022/76 was obtained from the Amasya University Non-Interventional Research Ethics Committee. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Informed Consent

Informed consent was obtained from all of the participants included in the study.

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Conflict of Interests

The authors have no conflicts of interest to declare.

Author Contributions

Conception: B.T., Design: B.T., Supervision: B.T., Resource: B.T., M.Ç., A.M., Z.K., Materials: B.T., M.Ç., A.M., Z.K., Data Collection and/or Processing: B.T., A.M., Z.K., Analysis and/or Interpretation: B.T., Literature Review: B.T., A.M., Z.K., Writer: B.T., M.Ç., A.M., Z.K., Critical Review: B.T., M.Ç., A.M., Z.K.

Main Points

- One out of every five people who have had COVID-19 disease develop symptoms lasting for more than 12 weeks.
- Nearly half of the participants trust all COVID-19 vaccine types.
- The rate of people who stated that they developed side effects after any dose of COVID-19 vaccines was 43%.

• The level of trust in vaccines was found lower in those with a high level of education, those who reported side effects after vaccination, and those who used social media as a source of information.

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