



Factors Influencing COVID-19 Vaccine Hesitations in Adolescents: Does Anxiety Has a Role?

Ergenlerde COVID-19 Aşı Tereddütlerini Etkileyen Faktörler:
Anksiyetenin Rolü Var mı?

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Abstract

Objective: In the coronavirus disease-2019 (COVID-19) pandemic, adolescents' daily lives have been disrupted by school closures, distance learning arrangements, quarantine and restrictions on recreational activities. Adolescents who are socially isolated may have concerns regarding vaccination. The purpose of this study was to look into the factors that influence vaccine reluctance in teenagers.

Material and Methods: A list of 14-18 year old adolescents admitted to our hospital's pediatric infection COVID-19 outpatient clinic between September 15 and December 15, 2021 was included. They were instructed to complete the electronic questionnaire produced using the Google form by calling the computer system's contact number.

Results: The survey comprised 421 teenagers aged 14 to 18 who provided complete answers to the questions. While 54.4% of those polled claimed to be inoculated, 39.9% were not, and 5.7% were unsure about the vaccine. Adolescents with a family history of COVID-19 immunization were statistically significantly more likely to receive it ($p < 0.001$). A Coronavirus Anxiety Scale (CAS) total score of nine indicates coronavirus-related dysfunctional anxiety. It was observed that none of the adolescents who took the survey had a CAS score lower than nine. There were no significant differences in median CAS scores between groups based on COVID-19 vaccination administration ($p = 0.618$) or COVID-19 history ($p = 0.654$).

Öz

Giriş: Koronavirüs hastalığı-2019 (COVID-19) salgınında, ergenlerin günlük yaşamları okulların kapatılması, uzaktan eğitim düzenlemeleri, karantina ve eğlence faaliyetlerine getirilen kısıtlamalar nedeniyle sektöre uğramıştır. Sosyal olarak izole olan ergenlerin aşı konusunda endişeleri olabilir. Bu çalışmanın amacı, gençlerde aşı isteksizliğini etkileyen faktörleri incelemektir.

Gereç ve Yöntemler: Hastanemizin pediatrik enfeksiyon COVID-19 polikliniğine 15 Eylül-15 Aralık 2021 tarihleri arasında başvuran 14-18 yaş arası ergenlerin listesi dahil edilmiştir. Hastanenin bilgisayar sistemindeki iletişim numarası aranıp Google formu kullanılarak oluşturulan elektronik anketi doldurmaları istendi.

Bulgular: Anket, sorulara eksiksiz yanıt veren 14-18 yaş arası 421 genci kapsamaktadır. Ankete katılanların %54.4'ü aşı olduğunu belirtirken, %39.9'u aşı olmadığını, %5.7'si ise aşı konusunda emin olmadığını ifade etmiştir. Ailesinde COVID-19 aşısı öyküsü olan ergenlerin aşı olma olasılığı istatistiksel olarak anlamlı derecede daha yüksektir ($p < 0.001$). Korumavirüs Anksiyete Ölçeği (CAS) toplam puanının dokuz olması, koronavirüsle ilişkili işlevsiz anksiyeteye işaret etmektedir. Ankete katılan ergenlerin hiçbirinin CAS puanının dokuzdan düşük olmadığı görülmüştür. Korumavirüs hastalığı-2019 aşısı uygulamasına ($p = 0.618$) veya COVID-19 geçmişine ($p = 0.654$) bağlı olarak gruplar arasında medyan CAS puanlarında anlamlı bir fark bulunmamıştır.

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Conclusion: In order to lessen vaccine hesitance and anxiety brought on by the epidemic, it is crucial to convey accurate information regarding the safety of vaccines and to dispel myths. In light of our findings, it was hypothesized that teenagers' vaccinate reluctance would decrease and their acceptance of vaccination would rise.

Keywords: COVID-19 vaccine, hesitation, adolescents, anxiety

Introduction

Coronavirus disease-2019 (COVID-19), caused by the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) coronavirus, was discovered in a group of patients in Wuhan who had respiratory symptoms (fever, cough, shortness of breath) in December 2019 (1). The disease advances from the common cold to serious respiratory failure and possibly death (2). Access to safe and effective vaccines is vital to eliminating the COVID-19 epidemic, thus it is heartening to see so many vaccines being tested and developed (3). The success of the COVID-19 pandemic relies on mass vaccination, with vaccine hesitancy influenced by confidence, complacency, and convenience (4). The World Health Organization defines vaccine hesitancy as a behavior (5). When presented with an opportunity to vaccinate, vaccine acceptance is defined as the individual or group's decision to accept or refuse. Vaccine acceptance and hesitancy are primarily determined by people's knowledge, attitude, practices and concerns regarding the safety, efficacy, risks and benefits associated with the COVID-19 vaccination program (6). Similar to adults, COVID-19 is common in children. Children are leading among essential groups in vaccination against infections (7). Adolescents are the group in which vaccination is most recently applied. Adolescent immunization has been started in many countries all over the world. In our country, as of September 2021, COVID-19 vaccine has been started to be applied to the 12-18 age group (8). The COVID-19 pandemic has led to various mental health issues, including mood disorders, anxiety, depression, obsessive compulsive disorder, and panic attacks, due to the measures, curfews, and shift to online education (9). This study aimed to investigate the factors affecting COVID-19 vaccine acceptance in adolescents.

Materials and Methods

Patient selection and Study protocol

Adolescents aged 14-18 years were included in the study. A list of adolescents admitted to our hospital COVID-19 out patient clinic in the last year was created. They were asked to apply the computer system. Ethics Committee approved this study at our hospital in 16/08/2021 (number: 2021/08-09). The participants were informed that their participation was voluntary, and consent was implied by completing the questionnaire.

This study was carried out between 15 September 2021 and 15 December 2021. Before the survey was administered, the adolescents were informed about the purpose of the

Sonuç: Salgının yol açtığı aşı tereddüt ve kaygısını azaltmak için, aşıların güvenliğine ilişkin doğru bilgilerin aktarılması ve mitlerin ortadan kaldırılması büyük önem taşımaktadır. Bulgularımız ışığında, gençlerin aşı konusundaki isteksizliklerinin azalacağı ve aşı yaptıрма konusundaki kabullerinin artacağı varsayılmıştır.

Anahtar Kelimeler: COVID-19 aşısı, tereddüt, ergenler, anksiyete

study, duration of participation, privacy statement and voluntary participation. Participants who gave informed consent were directed to the main questionnaire. The researchers sent this web link to their personal and social contacts via email or Whatsapp messenger. After the patient list was scanned, the questionnaire was not sent to the adolescents who did not want to participate in the study and repeated admissions.

Questionnaire

In the first part of the questionnaire, adolescents were asked about their age, sex, height and weight, and body mass index (BMI) was calculated. The education level of the mothers and fathers was determined according to the years of education and divided into lower education level (eight years or less) and medium education level (≥ 9 years of education) (10). The average monthly household income (Turkish lira, TL) and the number of people in the household were asked to learn the economic levels of the adolescents' families. COVID-19 history was evaluated with the question "Have you had COVID-19 disease?". Those who answered yes were asked "When did you have the COVID-19 disease?". Responses were categorized into five groups as less than one month, 1-3 months, 3-6 months, 6-12 months, and more than 12 months. COVID-19 vaccination status was evaluated with the question "Have you been vaccinated for COVID-19?". Those who answered no were asked "If you haven't been vaccinated against COVID-19, do you plan to be?". Family history of COVID-19, loss due to COVID-19 in the family or the close environment, the information source for COVID-19 disease, information about the side effects of the COVID-19 vaccine, childhood vaccination and flu vaccination status were evaluated.

In the second part of the questionnaire, Coronavirus Anxiety Scale (CAS) was asked (11). CAS is a self-reported mental health screening tool for dysfunctional anxiety associated with the coronavirus crisis. As many people experience clinically significant fear and anxiety during an epidemic of infectious disease, the CAS was developed to assist clinicians and researchers in effectively identifying individuals whose functioning is impaired due to coronavirus-related anxiety. Each item of the CAS was rated on a 5-point scale from 0 (never) to 4 (almost every day) based on experience over the past two weeks. This scaling pattern is consistent with the DSM-5 cross-symptom scale. A CAS total score ≥ 9 indicates coronavirus-related dysfunctional anxiety. High scores on a particular item or a high overall scale score (≥ 9) may show the individual's problematic symptoms that may require further

evaluation and/or treatment. Clinical judgment should guide the interpretation of CAS results. CAS was used for its strong psychometric properties and the Turkish version's availability, reliability, and validity. The Cronbach's α coefficient of the inventory was 0.80 (12).

Statistical analysis

The number of participants in our study was calculated as at least 417, with the number of confounding factors= 20, type 1 error= 5%, statistical power= 95%, to determine the effect of COVID 19 transmission in adolescents on COVID 19 vaccine acceptance with odds ratio= 1.5 effect size. Data was evaluated by using the IBM SPSS Statistics (Windows, Version 24.0, Aronk, NY: IBM Corp) program in computer environment, and the conformity of the variables to the normal distribution were examined by visual [histogram and probability graphs (PP Plot)] and analytical methods. In data evaluation, the descriptive features of the participants were given as numbers and percentages for categorical variables, mean and standard deviation for normally distributed continuous variables, and median for non-normally distributed continuous variables (minimum-maximum values). Numerical data with normal distribution was compared with the Independent samples t-test, data without normal distribution was compared with the Mann-Whitney U test or Kruskal Wallis test according to number of groups. Comparisons for categorical variables were made using the chi-square test. The $p < 0.05$ value was accepted as the statistical significance level in the study.

Results

The study involved 421 adolescents aged 14-18 who completed the questionnaire, excluding 24 incomplete respondents and ensuring all participants provided complete answers. Median age of the participants was 16 (min-max: 14-18) years, the male ratio was 51.1%, and the normal limits of BMI was calculated in 51.1%. In our study, median average monthly household income was determined as 4000 TL (min-max: 1.500-30.000 TL). Since the minimum wage in Türkiye was 4250 TL, 54.1% of them had an income below the minimum wage. Lower education level was determined in 54.3% of mothers and 42.1% of fathers, 28.3% of the participants had a history of COVID-19, and 30% had it before 12 months. It was seen that adolescents benefited most from social media (78.6%) as source of information on COVID-19. Demographic characteristics are summarized in Table 1. While 54.4% of the participants stated that they were vaccinated, 39.9% indicated that they were not vaccinated, and 5.7% were hesitant about the vaccine. Among them, 57.5% of the individuals who have not yet been vaccinated stated that they are considering getting vaccinated. The vaccination rate of their families was 86.7%. Thinking that the vaccine would not work was evaluated at 23.5%, worrying that the vaccine is not safe was 23.8%, not

Table 1. Demographical and individual characteristics

Characteristics	
Age (year) ^a	16 (14-18)
Sex (male) ^b	215 (51.1)
BMI	
<18.5	85 (20.2)
18.5-24.9	232 (55.1)
25-30	71 (16.9)
>30	33 (7.8)
Number of people in the house ^a	4 (2-15)
Average monthly household income (Turkish lira) ^a	4000 (1.500-30.000)
Continue high school education ^b	397 (94.3)
Chronic diseases ^b	33 (7.8)
Drug use for chronic disease ^b	28 (6.7)
Mother's education ^b	
Lower educational level	225 (53.4)
Medium educational level or above	196 (46.6)
Father's education ^b	
Lower educational level	177 (42.1)
Medium educational level or above	244 (57.9)
History of COVID-19 diagnosis ^b	119 (28.3)
Time to get diagnosed with COVID-19 ^b	
<1 month	13 (16.3)
1-3 month	13 (16.3)
3-6 month	14 (17.5)
6-12 month	16 (20)
>12 month	24 (30)
Information source(s) about COVID-19 ^{ac}	
National news and radio channels	255 (60.6)
Social media	331 (78.6)
Ministry of health institutions	133 (31.6)
Friends and family members	219 (52.0)
Family doctor	83 (19.7)
Other	26 (6.2)

^aMedian (min-max), ^bn (%), ^cMore than one option marked.
BMI: Body mass index, COVID-19: Coronavirus disease-2019.

knowing enough about the COVID-19 vaccine was evaluated as 34%. Worrying about contracting COVID-19 was detected as 34%, worrying about the side effects of the COVID-19 vaccine was 41.9%. Completing the national immunization program was found to be high with 85.5%, while getting a regular flu vaccine was found low with 9%. Table 2 summarizes attitudes towards COVID-19 and vaccines.

Table 2. Attitudes towards COVID-19 and the vaccines

	Yes (n,%)	No (n,%)	Hesitant (n,%)
Family history of diagnosis of COVID-19	206 (48.9)	215 (51.1)	-
Family history of death due to COVID-19	31 (7.4)	390 (92.6)	-
Family history of COVID-19 vaccination	365 (86.7)	56 (13.3)	-
Vaccinated for COVID-19	229 (54.4)	168 (39.9)	24 (5.7)
Probability of vaccination acceptance in the unvaccinated group	84 (57.5)	13 (3.1)	24 (34.7)
Do not think it will work	99 (23.5)	226 (53.7)	96 (22.8)
Worried about the vaccine is not safe	100 (23.8)	192 (45.6)	129 (30.6)
Do not know enough about the COVID-19 vaccine	143 (34)	163 (38.7)	115 (27.3)
Worried about getting COVID-19	143 (34)	233 (55.3)	45 (10.7)
Worried about the side effects of COVID-19 vaccine	176 (41.9)	169 (40.2)	75 (17.9)
Thought that the vaccine causes infertility	42 (10)	312 (74.3)	66 (66)
Considering that a chip has been inserted with a vaccine	15 (3.6)	363 (87.6)	37 (8.8)
Waited for TURCOVAC	35 (8.3)	348 (82.7)	38 (9)
Thought that even if I get COVID-19, I will get over the disease less severe	213 (50.6)	104 (24.7)	104 (24.7)
Believing that the COVID-19 vaccination program will end the disease	181 (43)	111 (26.4)	129 (30.6)
Believing that if I do not get the vaccine, the probability of getting the disease will increase	259 (61.5)	87 (20.7)	75 (17.8)
Most of my friends are considering getting the COVID-19 vaccine	305 (72.4)	65 (15.4)	51 (12.1)
Completing the national immunisation program	360 (85.5)	23 (5.5)	38 (9)
Get the flu shot regularly	38 (9)	383 (91)	22 (5.2)
COVID-19: Coronavirus disease-2019.			

When the characteristics of the vaccinated participants and those who were not-vaccinated or hesitant were compared, age was statistically different between the groups ($p=0.003$), age was smaller in non-vaccinated groups than others. However, sex, BMI, average monthly income were similar between the groups ($p=0.175$, $p=0.131$, $p=0.211$, respectively). Total number of people in the house was statistically significant between the groups ($p=0.002$), in the non-vaccinated group, the number of people in the house was less than other groups. It was seen that the education of the parents of the

adolescents did not have a significant effect on vaccination. Vaccination of adolescents with a family history of COVID-19 vaccine was found to be statistically significantly higher ($p<0.001$). Vaccination status rates were similar between the groups according to participants' history of diagnosis of COVID-19 ($p=0.078$), and their family history of death due to COVID-19 ($p=0.288$), but participants whose family had a history of diagnosis of COVID-19 was more hesitant to do COVID-19 vaccination ($p=0.025$). Table 3 provides a summary of participant characteristics and vaccination status.

Table 3. Vaccination by participant characteristics

	Vaccinated (n= 229)	Non-vaccinated (n= 168)	Hesitant (n= 24)	p
Age (year) ^a	16 (14-18)	15 (14-18)	16 (14-17)	0.003
Sex (male) ^b	107 (46.7)	83 (49.4)	16 (66.7)	0.175
BMI (18.5-24.9)	123 (73.2)	95 (41.4)	14 (58.3)	0.131
Number of people in the house ^a	4 (2-10)	4 (2-15)	4 (2-10)	0.002
Average monthly household income	4250 (1000-30000)	4000 (1000-13000)	4000 (1000-7000)	0.211
Continue high school education ^a	222 (96.9)	154 (91.7)	21 (87.5)	0.027
Had a chronic disease ^b	21 (9.2)	9 (5.4)	3 (12.5)	0.257
Drug use for chronic disease ^b	18 (7.9)	8 (4.8)	2 (8.3)	0.441

Table 3. Vaccination by participant characteristics (continue)

	Vaccinated (n= 229)	Non-vaccinated (n= 168)	Hesitant (n= 24)	p
Mother's education ^b				0.355
Lower educational level	166 (68.4)	133 (71.9)	19 (70.4)	
Medium educational level or above	77 (31.6)	52 (28.1)	8 (29.6)	
Father's education ^b				0.863
Lower educational level	150 (66)	114 (68.7)	16 (33.3)	
Medium educational level or above	77 (34)	52 (31.3)	8 (66.7)	
History of COVID-19 diagnosis ^b	66 (28.8)	51 (30.4)	2 (8.3)	0.078
Family history of diagnosis of COVID-19 ^b	105 (45.9)	83 (49.4)	18 (75)	0.025
Family history of death due to COVID-19 ^b	13 (5.7)	15 (8.9)	3 (12.5)	0.288
Family history of COVID-19 vaccination ^b	219 (95.6)	123 (73.2)	23 (95.8)	<0.001
Applied all childhood vaccinations ^b	195 (85.2)	149 (88.7)	16 (66.7)	0.075
Get the flu shot regularly ^b	22 (9.6)	14 (8.3)	2 (8.3)	0.751
The total score of Coronavirus Anxiety Scale ^b	0 (0-5)	0 (0-8)	0 (0-5)	0.618

^amedian (min-max), ^bn (%).
BMI: Body mass index, COVID-19: Coronavirus disease-2019.

Age (p= 0.507), sex (p= 0.075), maternal education (p= 0.114) and paternal education levels (p= 0.863) were similar in patients with a history of COVID-19. As expected, adolescents

with a family history of COVID-19 had a statistically significant higher incidence of COVID-19 (p< 0.001). Table 4 provides an overview of COVID-19's history by participant characteristics.

Table 4. History of COVID-19 by participant characteristics

	Yes (n= 302)	No (n= 119)	p
Age (year) ^a	15 (14-18)	16 (14-18)	0.507
Sex (male) ^b	50 (42)	156 (51.7)	0.075
BMI (18.5-24.9 ^a)	70 (58.8)	162 (53.6)	0.107
Number of people in the house ^a	4 (2-8)	4 (2-15)	0.446
Average monthly household income ^a	4000 (1000-10000)	4100 (1000-30000)	0.694
Continue high school education ^b	112 (94.1)	285 (94.4)	0.920
Had a chronic disease ^b	6 (5)	27 (8.9)	0.180
Drug use for chronic disease ^b	6 (5)	22 (7.3)	0.401
Mother's education ^b			0.114
Lower educational level	95 (81.1)	223(73.8)	
Medium educational level or above	22 (18.9)	79 (26.2)	
Father's education ^b			0.863
Lower educational level	79 (68.1)	201 (66.7)	
Medium educational level or above	37 (31.9)	100 (33.3)	
Family history of diagnosis of COVID-19 ^b	78 (65.5)	128 (42.4)	<0.001
Family history of death due to COVID-19 ^b	6 (5)	25 (8.3)	0.252
Family history of COVID-19 vaccination ^b	105 (88.2)	260 (81.6)	0.560
Applied all childhood vaccinations ^b	104 (87.4)	256 (84.8)	0.773
Get the flu shot regularly ^b	6 (5)	32 (10.6)	0.163
The total score of Coronavirus Anxiety Scale ^b	0 (0-5)	0 (0-8)	0.654

^amedian (min-max), ^bn (%).
BMI: Body mass index, COVID-19: Coronavirus disease-2019.

Table 5. Responses to the CAS

How often have you experienced the following activities over the last two weeks, n (%)					
	Not at all	Rarely, less than a day or two	Several days	More than seven days	Nearly every day over the last two weeks
I felt dizzy, lightheaded, or faint, when I read or listened to news about the coronavirus.	393 (93.3)	24 (5.7)	4 (1)	-	-
I had trouble falling or staying asleep because I was thinking about the coronavirus.	404 (96)	14 (3.3)	3 (0.7)	-	-
I felt paralyzed or frozen when I thought about or was exposed to information about the coronavirus.	409 (97.1)	12 (2.9)	-	-	-
I lost interest in eating when I thought about or was exposed to information about the coronavirus.	408 (96.9)	10 (2.4)	3 (0.7)	-	-
I felt nauseous or had stomach problems when I thought about or was exposed to information about the coronavirus.	404 (96)	14 (3.3)	2 (0.5)	-	-

The CAS total score ≥ 9 indicates coronavirus-related dysfunctional anxiety. None of the adolescents who answered the questionnaire was found to have a CAS score of ≥ 9 . The median score of the CAS was 0 (min-max: 0-8), the median score of the vaccinated group was 0 (min-max: 0-5), the median score was 0 (min-max: 0-8) in the non-vaccinated group, the median score was 0 (min-max: 0-5) in the vaccine undecided group. The median CAS score was found to be 0 (min-max: 0-5) in the group with a history of COVID-19, and 0 (min-max: 0-8) in the group without a history of COVID-19. There were no significant differences in the median CAS scores between the groups according to the application of COVID-19 vaccine ($p=0.618$) and history of COVID-19 ($p=0.654$). In Table 5, the responses to the CAS are compiled.

Discussion

WHO describes vaccine hesitancy as the "Delay in acceptance or refusal of vaccines despite availability of vaccine services" and categorises it within the top ten threats to global health (13). According to the WHO/UNICEF joint report using 2015-2017 data, the main reasons for vaccine hesitations were lack of knowledge and awareness about vaccines and lack of understanding of the importance of the vaccine (14). The rapid development of COVID-19 vaccines and the uncertainty of their long-term effects increase vaccine instability. On May 10, 2021, The Food and Drug Administration expanded its Emergency Use Authorization for the Pfizer-BioNTech COVID-19 vaccine to include adolescents aged 12-15 years (15). The study evaluated the relationship between COVID-19 vaccination and anxiety in our country, focusing on adolescents aged 12 and over, who were granted the right to be vaccinated on September 5, 2021, attracting more attention since then.

Adolescents were the last age group in our nation to receive vaccinations, thus it is crucial to comprehend the variables that influence their decision to get immunized. Therefore, in the first part of our study, we evaluated their general thoughts about COVID-19 and vaccines, and their COVID-19 stories and concerns. The COVID-19 vaccination rate in our study was 54.4%, compared to the willingness to be vaccinated in other studies (16,17). The reason for this may be that the date of our survey was later than other studies since the COVID-19 vaccines were found.

Examining the literature reveals research that show females are more receptive to vaccination, and vaccine reluctance is more prevalent in females; however, in our study, there was no discernible difference in vaccination rates between males and females (5,16,18). This may be because other studies included more individuals over the age of 18, and they were less concerned about the vaccine's side effects. The benefits of the vaccine are expected to outweigh theoretical risks, especially in patients with immunosuppressive medical conditions. In a study conducted in individuals with chronic diseases and elderly individuals, it was observed that there was no difference in willingness to vaccinate (19). Therefore, COVID-19 vaccine is recommended for immunocompromised patients (20). There was no significant difference in vaccine acceptance among participants with chronic diseases, which may be because it was administered to outpatients. There is a need for more detailed studies on adolescents with chronic diseases.

Our study found that low socioeconomic status and low education levels in Türkiye, particularly in the mother's and father's education levels, contribute to vaccine rejection. Higher education was found to be a protective factor against vaccine

rejection, while low parental education did not affect vaccination rates. Therefore, low socioeconomic status and low parent education are ineffective in reducing vaccine hesitancy.

Droplets/aerosols emitted by COVID-19 patients cause transmission of the virus between humans (21). SARS-CoV-2 circulation may grow in populations with high vaccination rates due to a potential decline in vaccine protection against infection and subsequent transmission. In a study conducted in the Netherlands, the effectiveness of full vaccination was found to be 63% compared to unvaccinated household contacts (22). In our study, a significant relationship was found with the vaccination of adolescent individuals with a family history of the COVID-19 vaccine ($p < 0.001$). In our study, the closest environment of the adolescents was their families. A significant correlation was found with the history of COVID-19 in those with a family history of COVID-19 diagnosis. The high household population also resulted in a high rate of vaccination requests at the same time. Maintaining the same social distancing within the home is difficult, so we were not surprised by this result we found. This result shows us that adolescents are affected by family members related to COVID-19 vaccination. Knowing more about adolescent COVID-19 vaccine safety and vaccine efficacy will increase parents' and adolescents' adolescent COVID-19 vaccination intentions.

One of the things that makes the worry brought on by the possibility of a fatal disease and the uncertainty around it worse is the flood of unreliable information. In previous pandemics, access to the internet and social media was not as advanced as it is today. Now, information sources are more accessible, so when the COVID-19 information sources were questioned in our study, it was not surprising that social media was the highest at 78.6%. Via digital technology and national and worldwide visual media, there can be questionable news concerning COVID-19. In order to obtain correct news, it is crucial to contact appropriate news sources. Unfortunately, during the pandemic period, children and adolescents were able to continue their education online for a while. Although this situation created communicative and sharing problems for them, it may have contributed positively to the appropriate use of technology. Another point of view was examined in a study on vaccine instability in China. Social media polarization may be a factor in vaccine reluctance, as users reinforce their beliefs by interacting with other people who share their views. Vaccine reluctance and severe vaccine rejection, in other words, are likely due to the peculiarities of vaccine conversations on social media (23).

A study in the USA found that 57.6% of the adults plan to be vaccinated, while 31.6% are undecided. Factors include vaccine-specific concerns, information need, and anti-vaccine attitudes (24). Our study found that while vaccine manufacturing reduced reluctance, the causes of vaccine hesitancy

remained unchanged, with 41.9% of participants fearing side effects and 34% unaware of vaccines.

The COVID-19 pandemic continues to affect people socially, economically, physiologically and psychologically. Intense negative emotions during this period may exacerbate existing mental problems or cause mental problems that did not exist before. In a study conducted with university students after the COVID-19 outbreak in China, 0.9% of the participants stated that they experienced intense, 2.7% moderate and 21.3% mild anxiety symptoms (25). In another study, a survey of 8079 Chinese adolescents aged 12-18 years reported high rates of depression (43%), anxiety (37%), and combined symptoms of depression and anxiety (31%) during the COVID-19 pandemic (26). There are many studies examining the relationship between the COVID-19 pandemic and anxiety. However, we wanted to conduct this study because of the limited number of studies evaluating the relationship between the COVID-19 vaccine and adolescent anxiety. No significant association was found between COVID-19 vaccination and COVID-19 transmission history in adolescents to whom we administered the CAS to assess coronavirus-related dysfunctional anxiety. This may be because adolescents think that they will be less affected by the COVID-19 vaccine and COVID-19 because they are young and healthy individuals. The COVID-19 vaccine has been shown to reduce the incidence of infection and serious illness (27). In addition, despite the increase in the number of people infected with COVID-19 between September and December 2021 in our country, death rate remained low (28). The most important reason why most of those who get COVID-19 are outpatient and mild is the widespread use of the COVID-19 vaccine. The spread of the COVID-19 vaccine in individuals who learned about the positive effects of the vaccine may be one of the reasons that reduces anxiety.

There are still some limitations to this study. The scope of the survey during the COVID-19 pandemic was limited, and the intensity of the pandemic and shifting national policies may have affected teenagers' willingness and attitude toward vaccination. In addition, the study's generalizability has been impacted because it could not reflect the population in other regions because it was only conducted in one facility due to the pandemic crisis. There are many studies on the parents of adolescents who want to be vaccinated. Our study is one of the few to examine adolescents' perceptions of COVID-19 vaccination in addition to parental perspectives. Our study's flaw is that we were unable to prioritize their views because adolescents were the last group to receive vaccinations in our nation.

Conclusion

It is important to provide reliable information about the safety of vaccines and to eliminate misinformation, in order to reduce vaccine hesitations and anxiety due to the epidemic.

More youth-friendly messages about COVID-19 and mentioning that adolescents are a valuable part of immunization will increase immunization. In the light of our results, it was thought that the positive view of the families towards vaccines would reduce vaccine hesitancy and increase vaccine acceptance in adolescents.

Ethics Committee Approval: This study was approved by the non-Interventional Research Ethics Committee of S.B.Ü Tepecik Training and Research Hospital (Decision no: 2021/08-09, Date: 16.08.2021).

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References

- Lin Y, Hu Z, Zhao Q, Alias H, Danaee M, Wong LP. Understanding COVID-19 vaccine demand and hesitancy: A nationwide online survey in China. *PLoS Negl Trop Dis* 2020;14(12):e0008961. <https://doi.org/10.1371/journal.pntd.0008961>
- Zhou P, Yang XL, Wang XG, Hu B, Zhang L, Zhang W, et al. A pneumonia outbreak associated with a new coronavirus of probable bat origin. *Nature* 2020;579(7798):270-3. <https://doi.org/10.1038/s41586-020-2012-7>
- World Health Organization. COVID-19 vaccines. Available from: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/covid-19-vaccines> (Accessed date: 08.04.2022).
- Bendau A, Plag J, Petzold MB, Ströhle A. COVID-19 vaccine hesitancy and related fears and anxiety. *Int Immunopharmacol* 2021;97:107724. <https://doi.org/10.1016/j.intimp.2021.107724>
- Troiano G, Nardi A. Vaccine hesitancy in the era of COVID-19. *Public Health* 2021;194:245-51. <https://doi.org/10.1016/j.puhe.2021.02.025>
- Kumari A, Ranjan P, Chopra S, Kaur D, Kaur T, Upadhyay AD, et al. Knowledge, barriers and facilitators regarding COVID-19 vaccine and vaccination programme among the general population: A cross-sectional survey from one thousand two hundred and forty-nine participants. *Diabetes Metab Syndr*. 2021;15(3):987-92. <https://doi.org/10.1016/j.dsx.2021.04.015>
- Pavone P, Ceccarelli M, Taibi R, Rocca GLA, Nunnari G. Outbreak of COVID-19 infection in children: Fear and serenity. *Eur Rev Med Pharmacol Sci* 2020;24(8):4572-5.
- T.C. Sağlık Bakanlığı. COVID-19 aşısı bilgilendirme platformu. Available from: <https://covid19asi.saglik.gov.tr/> (Accessed date: 08.04.2022).
- Can R, Kurtuluş Ş. Reflection of vaccine and COVID-19 fear in young groups in the COVID-19 pandemic. *Rev Assoc Med Bras* 2021;67(9):1333-7. <https://doi.org/10.1590/1806-9282.20210677>
- Mangrio E, Hansen K, Lindström M, Köhler M, Rosvall M. Maternal educational level, parental preventive behavior, risk behavior, social support and medical care consumption in 8-month-old children in Malmö, Sweden. *BMC Public Health* 2011;11:891. <https://doi.org/10.1186/1471-2458-11-891>
- Lee SA. Coronavirus anxiety scale: A brief mental health screener for COVID-19 related anxiety. *Death Stud* 2020;44(7):393-401. <https://doi.org/10.1080/07481187.2020.1748481>
- Evren C, Evren B, Dalbudak E, Topcu M, Kutlu N. Measuring anxiety related to COVID-19: A Turkish validation study of the coronavirus anxiety scale. *Death Stud* 2020;46(5):1052-8. <https://doi.org/10.1080/07481187.2020.1774969>
- Olusanya OA, Bednarczyk RA, Davis RL, Shaban-Nejad A. Addressing parental vaccine hesitancy and other barriers to childhood/adolescent vaccination uptake during the coronavirus (COVID-19) pandemic. *Article* 2021;12:663074. <https://doi.org/10.3389/fimmu.2021.663074>
- Lane S, MacDonald NE, Marti M, Dumolard L. Vaccine hesitancy around the globe: Analysis of three years of WHO/UNICEF Joint Reporting Form data-2015-2017. *Vaccine* 2018;36(26):3861-7. <https://doi.org/10.1016/j.vaccine.2018.03.063>
- Scherer AM, Gedlinske AM, Parker AM, Gidengil CA, Askelson NM, Petersen CA, et al. Morbidity and mortality weekly report acceptability of adolescent COVID-19 vaccination among adolescents and parents of adolescents-United States, April 15-23, 2021. *MMWR Morb Mortal Wkly Rep* 2021;70(28):997-1003. <https://doi.org/10.15585/mmwr.mm7028e1>
- Rehati P, Amaerjiang N, Yang L, Xiao H, Li M, Zunong J, et al. COVID-19 Vaccine hesitancy among adolescents: Cross-Sectional school survey in four Chinese cities prior to vaccine availability. *Vaccines (Basel)* 2022;10(3):452. <https://doi.org/10.3390/vaccines10030452>
- Wong WHS, Leung D, Chua GT, Duque JSR, Peare S, So HK, et al. Adolescents' attitudes to the COVID-19 vaccination. *Vaccine* 2022;40(7):967-9. <https://doi.org/10.1016/j.vaccine.2022.01.010>
- Nazlı ŞB, Yiğman F, Sevindik M, Deniz Özturan D. Psychological factors affecting COVID-19 vaccine hesitancy. *Ir J Med Sci* 2022;191(1):71-80. <https://doi.org/10.1007/s11845-021-02640-0>
- Wang J, Yuan B, Lu X, Liu X, Li L, Geng S, et al. Willingness to accept COVID-19 vaccine among the elderly and the chronic disease population in China. *Hum Vaccin Immunother* 2021;17(12):4873-88. <https://doi.org/10.1080/21645515.2021.2009290>
- Duly K, Farraye FA, Bhat S. COVID-19 vaccine use in immunocompromised patients: A commentary on evidence and recommendations. *Am J Health Syst Pharm* 2022;79(2):63-71. <https://doi.org/10.1093/ajhp/zxab344>
- Salian VS, Wright JA, Vedell PT, Nair S, Li C, Kandimalla M, et al. COVID-19 transmission, current treatment, and future therapeutic strategies. *Mol Pharm* 2021;18(3):754-71. <https://doi.org/10.1021/acs.molpharmaceut.0c00608>
- de Gier B, Andeweg S, Backer JA; RIVM COVID-19 surveillance and epidemiology team; Hahné SJ, van den Hof S, et al. Vaccine effectiveness against SARS-CoV-2 transmission to household contacts during dominance of Delta variant (B.1.617.2), the Netherlands, August to September 2021. *Euro Surveill* 2021;26(44):2100977. <https://doi.org/10.2807/1560-7917.ES.2021.26.44.2100977>
- Xie L, Wang D, Ma F. Analysis of individual characteristics influencing user polarization in COVID-19 vaccine hesitancy. *Comput Human Behav* 2023;143:107649. <https://doi.org/10.1016/j.chb.2022.107649>
- Fisher KA, Bloomstone SJ, Walder J, Crawford S, Fouayzi H, Mazor KM. Attitudes toward a potential SARS-CoV-2 vaccine. *Ann Intern Med* 2020;173(12):964-73. <https://doi.org/10.7326/M20-3569>
- Cao W, Fang Z, Hou G, Han M, Xu X, Dong J, et al. The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry Res*. 2020;287:112934. <https://doi.org/10.1016/j.psychres.2020.112934>
- Zhou SJ, Zhang LG, Wang LL, Guo ZC, Wang JQ, Chen JC, et al. Prevalence and socio-demographic correlates of psychological health problems in Chinese adolescents during the outbreak of COVID-19. *Eur Child Adolesc Psychiatry* 2020;29:749-58. <https://doi.org/10.1007/s00787-020-01541-4>

27. Mendola M, Tonelli F, Garletti FS, Greco D, Fiscella M, Cucchi I, et al. COVID-19 impact and vaccine effectiveness among healthcare workers of a large University Hospital in Lombardy, Italy. *Med Lav* 2021;112(6):453. <https://doi.org/10.23749/mdl.v112i6.11983>
28. T.C. Sağlık Bakanlığı. Genel koronavirüs tablosu. Available from: <https://covid19.saglik.gov.tr/TR-66935/genel-koronavirus-tablosu.html> (Accessed date: 29.04.2024)

Annex 1.

Coronavirus Anxiety Scale (11,12)						
How often have you experienced the following situations during the last two weeks?		Never	Rarely less than one day or two	Several days	More than seven days	Nearly every day for the last two weeks
1.	I felt dizzy, light-headed or faint when I read or listened to news about the coronavirus.	0	1	2	3	4
2.	I had trouble falling asleep or staying asleep because I was thinking about the coronavirus.	0	1	2	3	4
3.	I felt paralyzed or frozen when I thought about or was exposed to information about the coronavirus.	0	1	2	3	4
4.	I lost interest in eating when I thought about or was exposed to information about coronavirus.	0	1	2	3	4
5.	I felt nauseous or had stomach problems when I thought about or was exposed to information about coronavirus.	0	1	2	3	4
Column totals		_____ +	_____ +	_____ +	_____ +	_____ +
		Total point _____				

Basic information

The Coronavirus Anxiety Scale (CAS) is a self-report mental health screening tool for dysfunctional anxiety associated with the coronavirus crisis. As a significant number of people experience clinically significant fear and anxiety during an infectious disease outbreak, the CAS was developed to help clinicians and researchers effectively recognize individuals with impaired functioning due to coronavirus-related anxiety.

Psychometric properties

Independent studies in adults residing in the United States have shown that the CAS is a reliable scale (>0.90) with robust factorial (single-factor; invariance across sociodemographics) and construct (correlated with anxiety, depression, suicidal ideation, and substance/alcohol coping) validity. The diagnostic properties of the CAS (90% sensitivity and 85% specificity) are comparable to related screening tools such as Generalized Anxiety Disorder-7.

Scoring and interpretation

Each item of the CAS is rated on a 5-point scale from 0 (not at all) to 4 (almost every day) based on experiences over the past two weeks. This scaling format is consistent with the DSM-5 intersectional symptom scale. A CAS total score ≥ 9 indicates dysfunctional anxiety associated with the coronavirus. High scores on a particular item or a high total scale score (≥ 9) may indicate problematic symptoms that may require further assessment and/or treatment. Clinical judgment should guide the interpretation of CAS results.