RESEARCH ARTICLE

Vaccine hesitancy of adolescents and their parents in a possible future Pandemic based on their COVID-19 experience

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Abstract

Objective: To determine the prevalence of vaccine hesitancy and its influencing factors among adolescents and their parents during the coronavirus disease-2019 pandemic.

Method: The descriptive, cross-sectional study was conducted in central Turkiye in May 2022, one month after the government lifted social distancing restrictions related to the coronavirus disease-2019 pandemic. The sample comprised adolescents aged 12-18 years and their parents. Data was collected using a personal information form and the Vaccine Hesitancy Scale in Pandemics. Data was analysed using SPSS 26. Necessary permissions were obtained from the Provincial Directorate of National Education, the Scientific Research Platform of the Ministry of Health, and the Ethics Committee of Yozgat Bozok University.

Results: Of the 1,324 adolescents, 828(62.5%) were females and 496(37.5%) were males with overall mean age 14.94±1.71 years. Of the 1,305 parents, 689(52.8%) were females and 616(47.2%) were males with overall mean age 41.27±6.27 years. Among the adolescents, 1,215(91.8%) had not received the coronavirus disease-2019 vaccine. Among the parents, 264(20.2%) had not received the vaccine. Among adolescents, 544(44.8%) and among parents, 736(60.6%) cited concerns about potential side effects as the reason for not getting themselves or their child vaccinated. Additionally, 654(49.4%) adolescents and 339(26%) parents expressed vaccine hesitancy in the face of a possible future pandemic. Mean vaccine hesitancy score was 30.78±8.88 among the adolescents, and 31.94±7.72 among the parents. Age, level of their information about the pandemic, intent to be vaccinated in a possible future pandemic, and sources of information about the pandemic were significant factors related to vaccine hesitancy ($p<0.05$).

Conclusion: There was considerable vaccine hesitancy among the subjects, which calls for focussing on strategies to address the issue to avoid potential negative impact during any future pandemic.

Keywords: Adolescent, Parents, Vaccination hesitancy, COVID-19, Pandemics. (JPMA 75: 393; 2025)

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Introduction

The act of preventing the spread of pandemics hinges on the establishment of herd immunity through extensive vaccination. In the case of coronavirus disease-2019 (COVID-19) pandemic, the World Health Organisation (WHO) listed and authorised for emergency use many vaccines for adults first, and then for adolescents and children in a time-staggered manner.[1] For achieving herd immunity, it was assumed that two-thirds of the population needed to be vaccinated.[2] Considering this rate, the vaccination rates of people aged >18 years against the pandemic exceeded 70% worldwide, and reached 93% in Turkey by 2023. However, the vaccination rates of children and adolescents are not known precisely, with an estimated lower rate.[3,4] Even though adolescents typically did not exhibit severe disease symptoms, their inclusion in vaccination programmes primarily revolved around their role in virus transmission. Vaccinating them was crucial for maximising the suppression of viral circulation and achieving community immunity.[3] In future pandemics, adolescents may continue to be less affected compared to adults, with lower vaccination rates.

The low rate of vaccination of the under-18 age group despite the availability of vaccines and their effectiveness for this age group might have been caused by vaccine hesitancy. In studies focussing on parents, the hesitancy towards the COVID-19 vaccine demonstrated significant variation across different countries, with observed rates ranging from 4.6% to 55%.[5] In Turkiye, this rate was approximately 9.4%.[6]

Studies on adolescent vaccine hesitancy have been limited, and their vaccine hesitancy rates were higher compared to parents, ranging from 5.7% to 64.5%.[7] In the only study evaluating COVID-19 vaccine hesitancy among adolescents in Turkiye, this rate was determined to be 36.8%.[8] The

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diminished vaccination rates observed among adolescents, alongside their elevated vaccine hesitancy, could potentially originate from the presence of "optimistic biases" (that is, their belief that they are less susceptible than others to harm or adverse outcomes, and the relatively less severe disease spectrum of COVID-19 for their age) inherent in adolescents, consequently fostering hesitancy towards vaccination.[2,9] Within the context of parental studies, concerns regarding the potential adverse effects and safety of vaccines have been consistently shown to significantly contribute to vaccine hesitancy.[5] While distinct studies addressing the factors contributing to vaccine hesitancy among parents and adolescents exist, no study, to the best of our knowledge, has assessed the compared vaccine hesitancy between the two demographics, making this an important research gap. Examining the relationship between vaccine hesitancy among adolescents and parents, who are increasingly taking on more responsibility for healthcare decisions and forming lifelong plans for personal and public health initiatives, could provide guidance for measures to reduce vaccine hesitancy and develop strategies for future pandemics.[5,7,10]

The current study was planned to fill the gap in literature by determining the prevalence of vaccine hesitancy and its influencing factors among adolescents and their parents during the COVID-19 pandemic.

Subjects and Methods

The descriptive, cross-sectional study was conducted in central Turkiye in May and June 2022. Data collection started in May, one month after the Ministry of Health (MH) lifted social distancing restrictions, including the mandatory use of masks in schools. This timing was chosen to eliminate any potential influence of these restrictions on the vaccine hesitancy of adolescents and their parents. The researchers delivered survey questionnaires face-to-face to the students and their parents after permission from the Provincial Directorate of National Education (PDNE), the MH Scientific Research Platform, and the relevant school administrators.

After approval from the ethics review committee of Yozgat Bozok University, the sample size was calculated using the software provided by Arslan et al. (2018).[11] According to PDNE website, there were 41,893 students aged[12-18] registered in the province where the study was conducted.[12] For sample size calculation, estimated proportion of vaccine hesitancy (P) was taken as 0.258, error (d) 0.05, alpha error 0.01, and Z value (0.975) 1.959964.5 At an estimated response rate of 50%, a sample size of 1,120 students was calculated.[11]

Among approximately 80 middle and high schools, eight schools—The Religious Vocational High School, The Science High School, The Anatolian High School, The Vocational and Technical Anatolian High School, Republic Middle School, Atatürk Middle School, and The Religious Vocational Middle School—were selected for inclusion in the sample using a simple random number generator.[13] Given that each school had multiple levels (for instance, the Anatolian High School had two 8th-grade levels and two 9th-grade levels), the number of levels to be sampled from each grade was determined using a proportional stratified sampling method. To select the required levels and classes, a simple random number table was used.

The students and their parents were informed about the study content in a meeting in the adolescents' school, and data was collected anonymously. The survey forms were distributed to all the students in the selected classes who lived in the city where the study was conducted, were present at school on the data-collection day, and agreed to participate. Only completely filled up survey forms were included for further analysis.

The survey form included a personal information form (PIF) prepared separately for adolescents and their parents based on the literature.[5-8] It included sociodemographic characteristics, such as age, gender, class or education level, and income (self-reported). It also collected data regarding influenza vaccination in the current year, COVID-19 infection, COVID-19 vaccination, reasons for not getting COVID-19 vaccination, perception of having enough information about the pandemic, willingness to be vaccinated in a possible future pandemic, and the source of information about the pandemic.

Vaccine hesitancy data from adolescents and parents was collected using the Vaccine Hesitancy Scale in Pandemics (VHSP). Its validity and reliability has been reported with a Cronbach alpha value of 0.90. The scale consists of 10 items and 2 sub-dimensions; lack of confidence, and risk. It is evaluated using a 5-point Likert scale, with 1=strongly disagree and 5=strongly agree. High scores indicate high level of hesitation, although no cut-off point is provided.[14,15] In the current study, the Cronbach's alpha reliability coefficient was 0.84 for parents and 0.87 for adolescents. The mean VHSP score was the lone dependent variable in the study, while the entire PIF data comprised independent variables.

Data was analysed using SPSS 26. It was found to be normally distributed and presented as frequencies and percentages, or mean and standard deviation, as appropriate. Independent samples *t*-test, Pearson correlation analysis, and multiple regression analysis were

used for further analysis.. P<0.05 was considered statistically significant.

Results

Of the 1,324 adolescents, 828(62.5%) were females and 496(37.5%) were males with overall mean age 14.94±1.71 years. Of the 1,305 parents, 689(52.8%) were females and 616(47.2%) were males with overall mean age 41.27±6.27 years. Among the adolescents, 1,215(91.8%) had not received the COVID-19 vaccine. Among the parents, 264(20.2%) had not received the vaccine. Among adolescents, 544(44.8%) and among parents, 736(60.6%) cited concerns about potential side effects as the reason for not getting themselves or their child vaccinated. Additionally, 654(49.4%) adolescents and 339(26%) parents expressed vaccine hesitancy in the face of a possible future pandemic. Among the adolescents, 868 (65.6%) felt they had insufficient knowledge about the pandemic, and

Table-1: Characteristics of the adolescents.

Variables	n (%)	Mean±SD
Age (years)		
14.94±1.71 (min–max: 12-18)		
12-14	418 (31.6)	32.19±8.71
15-18	906 (68.4)	30.03±8.78
Gender		
Female	828 (62.5)	30.76±8.52
Male	496 (37.5	30.83±9.45
Grade level		
6th grade	142 (10.7)	32.15±8.83
7th grade	174 (13.1)	32.24±8.63
8th grade	178 (13.4)	31.91±6.90
9th grade	324 (24.5)	30.53±7.19
10th grade	206 (15.6)	30.96±9.18
11th grade	193 (14.6)	29.05±9.30
12th grade	107 (8.1)	27.73±11.34
Income		
Income less than expenses	198 (15.0)	31.06±8.47
Income equals expenses	1016 (76.7)	29.27±10.19
Income more than expenses	110 (8.3)	30.98±9.85
Had influenza vaccine		
No	936 (70.7)	31.25±10.51
Yes	388 (29.3)	30.59±8.11
Was infected with COVID-19		
No	786 (59.4)	31.02±8.92
Yes	538 (40.6)	30.44±8.81
Had received COVID-19 vaccine		
No	1215 (91.8)	30.78±8.75
Yes	109 (8.2)	30.80±10.24
Reason for vaccine hesitancy (n=1,215)		
Concern about the side effects	544 (44.8)	32.91±8.43
Parents' decision	401 (33.0)	28.63±9.41
Not effective	270 (22.2)	31.31±8.05
Has enough information about the pandemic		
No	868 (65.6)	31.26±8.57
Yes	456 (34.4)	29.87±9.38
Vaccine uptake in a possible pandemic		
No	148 (11.2)	28.93±10.49
Yes	522 (39.4)	28.51±9.04
Not sure	654 (49.4)	34.16±6.91
Information source		
Media	233 (17.6)	30.58±9.90
Family or friends	372 (28.1)	29.80±8.74
Social media	584 (44.1)	32.84±7.79
Health units	135 (10.2)	29.72±9.55
VHSP		
Total	1324 (100)	30.78±8.88
Lack of Confidence Subdimension	1324 (100)	24.33±7.91
Risk Subdimension	1324 (100)	6.45±2.14

SD: Standard deviation, COVID-19: Coronavirus disease-2019, VHSP: Vaccine Hesitancy Scale in Pandemics.

Table-2: Characteristics of the parents.

Variables	n (%)	Mean±SD
Age (years)		
41.27±6.27 (min–max: 30.00–60.00)		
Up to 41	524 (40.2)	32.89±8.82
42 and above	781 (59.8)	31.30±6.81
Gender		
Female	689 (52.8)	32.39±8.59
Male	616 (47.2)	31.54±6.82
Education level		
Primary education	424 (32.5)	31.45±6.25
High school	584 (44.8)	31.81±8.48
University	231 (17.7)	32.73±7.63
Postgraduate	66 (5.1)	33.48±9.14
Had influenza vaccine		
No	840 (64.4)	33.73±8.54
Yes	465 (35.6)	30.95±7.04
Was infected with COVID-19		
No	459 (35.2)	32.28±7.77
Yes	846 (64.8)	31.32±7.59
Received the COVID-19 vaccine		
No	264 (20.2)	32.82±7.47
Yes	1041 (79.8)	28.48±7.72
Had enough information about the pandemic		
No	904 (69.3)	32.83±7.48
Yes	401 (30.7)	28.47±7.71
Vaccine uptake of a child in a possible pandemic		
No	169 (13.0)	30.20±8.43
Yes	797 (61.0)	28.62±6.71
Not sure	339 (26.0)	33.72±7.41
Reasons for vaccine hesitancy for the child (n=1,215)		
Concern about the side effects	736 (60.6)	29.30±8.42
Not effective	479 (39.4)	27.22±6.33
Information source		
Media	639 (49.0)	31.45±7.81
Family or friends	122 (9.3)	30.77±7.19
Social media	100 (7.7))	33.28±7.32
Health units	444 (34.0	30.54±8.64
VHSP		
Total	1305 (100)	31.94±7.72
Lack of Confidence Subdimension	1305 (100)	25.42±7.01
Risk Subdimension	1305 (100)	6.52±2.02

SD: Standard deviation, COVID-19: Coronavirus disease-2019, VHSP: Vaccine Hesitancy Scale in Pandemics.

584(44.1%) had obtained information about the pandemic from social media (Table 1). In contrast, 904(69.3%) parents considered themselves insufficiently informed about the pandemic, and 639(49%) had obtained information about the pandemic from conventional media sources (Table 2).

Mean vaccine hesitancy score was 30.78±8.88 among the adolescents, and 31.94±7.72 among the parents. While there was a significant difference between adolescents and their parents in terms of the mean VHSP scores for the total (t=-3.576, p=0.004) and the lack of confidence subscale (t=-3.74, p=0.0002), no significant difference was found in the mean scores of the risk subscale (t=-0.862, p=0.389) (Table 3).

Table-3: Comparison of VHSP point averages between the adolescents and parents.

VHSP	Adolescents Mean±SD	Parents Mean±SD	t-test	*p*-value
Total	30.78±8.88	31.94±7.72	-3.576	0.004*
Lack of Confidence Subdimension	24.33±7.91	25.42±7.01	-3.74	0.0002*
Risk Subdimension	6.45±2.14	6.52±2.02	-0.862	0.389

SD: Standard deviation, VHSP: Vaccine Hesitancy Scale in Pandemics, *p<0.05

Table-4: Multiple regression analysis of independent variables on VHSP total score.

Multiple regression model	Beta value	*p*-value	95% Confidence Interval
Adolescents			
Fix	26.979	<0.001	26.084 - 27.874
Age	0.059	0.001	0.100 - 0.026
Enough information about the pandemic (0.Yes , 1.No)	1.621	0.001	0.670 - 2.572
Vaccine uptake to child in a possible pandemic (0.No / Not sure , 1. Yes)	5,412	<0.001	4.481 - 6.342
Information source (0.Media/Family-Friends/ Health units , 1. Social media)	2.181	<0.001	1.170 - 3.192
R: 0.337 Adjusted R 2 : 0.112 F : 56.491 p<0.001 Durbin-Watson: 2.011			
Parents			
Fix	26.187	<0.001	23.190 - 29.183
Age	0.052	0.001	0.310 - 0.095
Influenza vaccine (0.No , 1.Yes)	2.759	<0.001	1.950 - 3.567
Get infected with Covid-19 (0.No , 1.Yes)	-0.321	0.045	- 1,159 - 0.516
Covid-19 vaccine (0.No , 1.Yes)	3,729	<0.001	2.726 - 4.732
Vaccine uptake to child in a possible pandemic (0.No / Not sure , 1. Yes)	3,702	<0.001	2.858 - 4.545
Information source (0.Media/Family-Friends/ Social Media, 1. Health units)	1.842	<0.001	1.024 - 2.659

R: 0.403 Adjusted R 2 : 0.158 F: 36,000 p<0.001 Durbin-Watson: 1.896, VHSP: Vaccine Hesitancy Scale in Pandemics.

Table-5: VHSP correlation between adolescents and parents.

	VHSP	Adolescent Lack of confidence sub-dimension	Risk sub-dimension
Parent			
VHSP	*r*:0.055	*r*:0.042	*r*:0.075
	p<0.001*	p=0.133	p=0.007**
Lack of confidence	*r*:-0.065	*r*:-0.046	*r*:-0.102
sub-dimension	p=0.018*	p=0.099	p<0.001**
Risk sub- dimension	*r*:0.016	*r*:-0.001	*r*:0.068
	p=0.566	p=0.985	p=0.014*

*p<0.05, **p<0.01, r: Pearson correlation analysis, VHSP: Vaccine Hesitancy Scale in Pandemics.

Significant factors contributing to vaccine hesitancy among the adolescents included age, information about the pandemic, willingness to be vaccinated in a possible future pandemic, and sources of pandemic-related information (F: 56,491, p<0.001). Additionally, the regression coefficients associated with these variables were significant (t: 59.150, p<0.001). However, the identified criteria only explained 11.2% of the variance in vaccine hesitancy in the multiple regression model (adjusted R^2=0.112), indicating a modest contribution. Regarding parents, significant variables included age, willingness to be vaccinated in a possible future pandemic, information sources about the pandemic, receiving the influenza vaccine, COVID-19 infection history, and receiving the COVID-19 vaccine (F: 36,000, p<0.001). The regression coefficients for these variables were also significant (t: 17,144, p<0.001). However, the identified criteria explained only 15.8% of the variance in vaccine hesitancy (adjusted R^2=0.158) in the multiple regression model (Table 4). A very weak correlation was found between the VHSP scores of the parents and adolescents (r: 0.055, p=0.047) (Table 5).

Discussion

The current study delved into the intricate relationship between adolescents' and parents' vaccine hesitancy, particularly in anticipation of a future pandemic, while thoroughly examining the rates, reasons and underlying factors influencing their vaccine hesitancy. The findings revealed a discernible albeit weak association between the vaccine hesitancy of adolescents and that of their parents. While considerable attention has been devoted to understanding parental vaccine hesitancy in existing literature, scant research has focussed on adolescents' vaccine hesitancy.[5,7] The current study stands out as the first to comprehensively explore the dynamic interplay between these two demographics. The observed weak correlation suggests nuanced differences in the factors influencing adolescents' vaccine hesitancy compared to those affecting their parents. The intention to get vaccinated in a possible future pandemic was one of the variables explaining the weak relationship between vaccine hesitancy among adolescents and parents. The study found that almost half of the adolescents and over a quarter of the parents hesitant about getting vaccinated in such a scenario, with a higher rate among adolescents compared to previous studies.[7,16] Parental hesitancy varied

significantly before and after the COVID-19 vaccine's availability for children, ranging from 4.6% to 55% before and 6.7% to 27.9% afterwards.[5,17,18] The data-collection coincided with the easing of social distancing measures and declining cases, potentially influencing hesitancy rates. The notable disparity between adolescent and parental hesitancy rates in the current study emphasises the necessity for tailored interventions for each demographic group. Despite parental willingness, the reluctance of adolescents to get vaccinated suggests a need for comprehensive strategies targeting both adolescents and parents to enhance vaccination uptake in future pandemics.

In the current study, among adolescents and parents, older age emerged as a significant factor in vaccine hesitancy. This finding aligns with previous studies.[5,10,19] The vaccine hesitancy observed among adolescents and younger parents could be attributed to a misjudgement of their exposure to the pandemic's risks, or a belief that adolescents were less vulnerable to its harmful or negative consequences.[9,16] While current evidence does not suggest an increase in youth mortality linked to the pandemic, there are concerns about significant indirect impacts on their mortality.[20] By emphasising the current and potential long-term effects of the pandemic on adolescents, and implementing effective measures, vaccine hesitancy could be reduced.

The current study noted that adolescents primarily sourced their information from social media, while parents relied more on traditional media. There was a high level of hesitancy amongst those who received information from social media, whereas those who received information from health units exhibited low hesitancy. Studies have suggested that obtaining information from reliable sources, such as healthcare providers, can guide adolescents and their parents in making informed vaccination decisions and can alleviate their hesitancy.[21-23] The current pandemic has been rife with misinformation and anti-vaccine propaganda, which could also be a concern in future pandemics.[24] Particularly in today's era of information overload on social media, it is challenging for individuals to discern the accuracy and timeliness of the information they receive.[25] It is clear that health authorities should prioritise devising more effective social media strategies targetting adolescents to counteract unfounded rumours and harmful misinformation during potential pandemics.

Another contributing factor to vaccine hesitancy among adolescents was the extent of the current participants' knowledge about the pandemic. This finding is consistent with earlier studies.[26] This could be due to the spread of misinformation, often exacerbated by the indiscriminate use of social media as a source of information. The characteristics of the current sample pooled from a rural area may have also influence the results.

Contrary to adolescents, the decision-making process of parents to vaccinate their children was found in the current study to be significantly influenced by their personal health experiences, such as having received the influenza vaccine, the COVID-19 vaccine, and having had a COVID-19 infection. This finding underscores the pivotal role of firsthand knowledge about potential side effects, gained through personal experiences, in shaping parents' attitudes towards vaccinating their children. This finding underscores the importance of parents' personal health experiences and knowledge in overcoming vaccine hesitancy and increasing vaccine acceptance.[27]

In accordance with the existing literature, the current study highlighted that the primary factors driving vaccine hesitancy among adolescents and their parents were concerns about the safety and efficacy of the vaccines.[27] In a study, 80% of the parents had been vaccinated, but only 8% had chosen to have their children vaccinated. The remaining 92% harboured understandable concerns about the potential long-term effects of the vaccines, serious side effects, perceived inefficacy of the vaccines, and a perceived lack of transparency in the vaccine development process.[28] To alleviate vaccine hesitancy, it is crucial for policymakers to employ clear and succinct communication strategies to dispel misinformation stemming from uncertainties about vaccine safety and efficacy. Additionally, it is of paramount importance that the results of studies investigating the effectiveness and side effects of vaccines are disseminated to the public in a transparent manner.

The current study has some limitations. First, the data was collected after the MH approved the vaccine for children aged >12 years. Although this was an advantage, since it coincided with the period when the effects of the pandemic were already diminishing, it might have led to the perception that the risk was lower, and, thus, it might have shown a higher vaccine hesitancy than the actual level. Another limitation is that the study was conducted in rural areas, so the results may differ from those of other population segments. Although such results cannot be generalised, they can guide the development of strategies for similar populations.

On the basis of the findings, it is clear that addressing vaccine hesitancy requires providing accurate information and alleviating common concerns. To achieve this, several policy and practice initiatives are recommended. These

include developing and implementing family-based educational programmes and community workshops to encourage intergenerational dialogue, incorporating vaccine education into school curricula and developing school-based programmes, and equipping healthcare providers with strategies to address the specific concerns of each group, and promote vaccine acceptance through empathetic and evidence-based conversations. Additionally, designing public health campaigns that effectively reach both adolescents and parents is crucial. By implementing these recommendations, a comprehensive and targetted approach to mitigating vaccine hesitancy can be fostered, ultimately leading to improved vaccination rates and public health outcomes.

Conclusion

While there was a weak relationship between adolescents' and parents' vaccine hesitancy, both groups exhibited significant hesitancy. Additionally, differing information-seeking behaviours were noted, with adolescents primarily relying on social media, while parents trusting traditional media sources.

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Author Contribution:

STA: Study conception, design, analysis and interpretation of results.

STA, AK, DC, ST: Data collection, draft and manuscript preparation.

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