

# Attitudes of parents with children aged 12-18 to COVID-19 vaccines for themselves and their children

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## ABSTRACT

**Background.** The incidence of vaccine hesitancy is increasing in many countries. This study aims to determine parents' attitudes and related factors regarding COVID-19 vaccine acceptance for themselves and their children aged 12-18.

**Methods.** A cross-sectional survey was conducted on parents between 16th November and 31st December 2021, after COVID-19 vaccines were initiated for children in Türkiye. In the survey, the sociodemographic characteristics of the parents, whether they and their children were vaccinated against COVID-19, and if not, the reasons for this were asked. Multivariate binary logistic regression analysis was used to evaluate the factors affecting parents' refusal to vaccinate their children for COVID-19.

**Results.** Three hundred and ninety-six mothers and fathers were included in the final analysis. Overall, 41.7% of parents reported vaccine refusal for their children. COVID-19 vaccine refusal was higher in mothers younger than 35 ( $\beta = 6.5$ ,  $p = 0.002$ , 95% CI: 2.0-23.1), children aged 15 and younger ( $\beta = 2.3$ ,  $p = 0.001$ , 95% CI: 1.4-3.7). Concerns about the side effects of the COVID-19 vaccine (29.7%) and their children not wanting to be vaccinated (29.0%) were the most common causes of COVID-19 vaccine refusal.

**Conclusions.** In the present study, the rate of children not vaccinated due to COVID-19 vaccine refusal was relatively high. Parents' concerns about vaccine side effects, as well as their children's unwillingness to be vaccinated, suggest that both parents and adolescents should be informed about the importance of COVID-19 vaccines.

**Key words:** COVID-19, vaccine acceptance, parent, children.

In the three years since the onset of the coronavirus disease 2019 (COVID-19) pandemic, more than 600 million confirmed cases of COVID-19, including more than 6 million deaths, have been reported worldwide.<sup>1</sup>

According to the COVID-19 data reported worldwide, Türkiye is one of the most affected countries, with more than 17 million cases and 100,000 deaths reported as of January 2023.<sup>1,2</sup> The most important approach to controlling the pandemic is to provide immunization against the COVID-19, so vaccine studies have been prioritized. Like many countries, COVID-19 vaccine studies and vaccine applications continue with great effort in Türkiye.

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The first vaccination process in Türkiye started with the inactive COVID-19 vaccine (CoronaVac®) on 13th January 2021. Then, as of 2nd April 2021, the mRNA COVID-19 (Pfizer-BioNTech®) vaccine was started for adults. According to the data of the Ministry of Health of the Republic of Türkiye, the rate of individuals aged 18 and over who have received at least two doses of the COVID-19 vaccine was 85.6%.<sup>2</sup>

The COVID-19 vaccine for individuals under 18 years was first administered on 18th August 2021, over 15 years of age to healthy children and 12-15 years with chronic disease. As of 5th September 2021, all children aged 12 and over started to be vaccinated against COVID-19 before face-to-face education in schools.<sup>2</sup> There is no data yet on the rate of COVID-19 vaccination among children in our country.

Vaccine hesitancy is defined as a delay in accepting or rejecting a vaccine despite the availability of vaccination services.<sup>3</sup> The incidence of vaccine hesitancy is increasing in many countries, leading to the World Health Organization recognizing vaccine hesitancy as a significant threat to global health in 2019.<sup>4</sup> Recently, fears about vaccine safety and long-term side effects stemming from the novelty of the COVID-19 vaccine have revealed COVID-19 vaccine hesitancy.<sup>5</sup> It is stated that the vaccine should cover 55% to 82% of the population to provide herd immunity against Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2); however, COVID-19 vaccine hesitancy threatens the achievement of herd immunity.<sup>6,7</sup> Since children make up 27.2% of Türkiye's population, the vaccination rate of children is significant for increasing community protection against COVID-19.<sup>8</sup> Since parents play a leading role in the acceptance of the COVID-19 vaccine for their children, we aimed to determine parents' attitudes regarding the administration of COVID-19 vaccines to their children of vaccination age and themselves, the relationship between their vaccination status and vaccination of their children, the frequency and reasons of hesitation against COVID-19 vaccines.

## Material and Methods

### Study design

A cross-sectional study was conducted at Izmir Health Sciences University Tepecik Training and Research Hospital between 16th November and 31st December 2021. A survey was applied to both parents face to face, which included questions about their sociodemographic characteristics, family members or close relative history of COVID-19 infection and death due to COVID-19, COVID-19 vaccination status of themselves, and their child, the reason if they were not vaccinated, and information sources about COVID-19 disease and vaccines.

The study was approved by the Izmir Health Sciences University Tepecik Training and Research Hospital Ethics Committee (Decision Number: 2021/10-40). An informed consent form was obtained from the participants before initiating the study.

### Participant definitions

Parents of children aged 12-18 years who applied to the pediatrics outpatient clinic for any reason, who agreed to participate in the survey, were included in the study. Parents who refused to participate were excluded. COVID-19 vaccination was still available for people aged 12 and up at the time of the study. For this reason, parents with a child between the ages of 12 and 18 were included in the study.

### Sample size

The sample size was calculated using  $n = Z^2 P (1 - P) / d^2$ .<sup>9</sup> Using a 0.05 margin of error with a 95% confidence interval [CI] and 50% response distribution, the calculated minimum sample size was 352.

### Statistical analysis

We performed the statistical analysis with the statistical software SPSS version 24.0 (IBM Corporation, Armonk, NY, USA). Demographic and clinical data were analyzed descriptively

and reported as proportions of total patients. The mean  $\pm$  standard deviation or median and range (minimum value-maximum value) were used depending on whether the data were parametric or not. Comparisons for categorical variables were made using the Pearson chi-square test.

In the statistical analysis, the parent's educational level was based on years of schooling and divided as lower educational level (i.e., 8 years or less), medium educational level (i.e., 9–12 years), and higher educational level (i.e., more than 12 years of education). Household income was divided into three groups according to our country's monthly minimum wage. Accordingly, the minimum wage and below were determined as low income ( $\leq$ \$300), up to twice as medium income (\$300-600), and more than twice as high income ( $>$ \$600).

Child vaccination status was analyzed in two groups:

- 1-Vaccination acceptance; already vaccinated or willing to be vaccinated.
- 2-Vaccination non-acceptance; unvaccinated and unwilling to be vaccinated.

Variables with  $p < 0.25$  value were included in the binary logistic regression model to compare vaccination non-acceptance for the child in univariate analyses. The Backward Wald method was used as the elimination method to determine the essential variables in the final model. According to the Hosmer Lemeshow goodness-of-fit test result for the final model, the model was suitable for the data ( $\chi^2=8,666$ ;  $p=0.278$ ). A statistical significance level was accepted as  $p < 0.05$  in the study.

## Results

### *Participant characteristics*

Three hundred and ninety-six parents participated in the study. While the median age of the mothers was 40 (28-66) years, the median

age of the fathers was 44 (30-75) years. The median age of children was 15 (12-18).

More than 50% of parents had eight years of education or less, and 48.5% had a low household income. Eight percent of the participants consisted of healthcare workers.

Only 11.4% of the children had a history of COVID-19, while 58.1% of the participants had a history of a family member or friend infected with SARS-CoV-2. In addition, 43 (10.9%) participants reported death of a family member or friend due to COVID-19. Thirty-five (8.8%) participants had previous hesitations about routine childhood vaccinations. Also, 44.9% of parents stated that they were worried that their child would be infected with SARS-CoV-2 at school. When people surveyed were asked where they got information about COVID-19 and vaccines, the most common response was 82.1% via television or radio, followed by the internet (65.2%) and social media (48.0%).

Detailed descriptive features of the participants are displayed in Table I.

### *COVID-19 vaccination status and attitudes*

In the study, both parents' vaccination rate with at least one dose of the COVID-19 vaccine was 84.8%. Neither parent in twenty-four (6.1%) couples had ever been vaccinated against COVID-19 (Table II). When each of the parents were evaluated separately, 88.6% of the mothers and 90.2% of the fathers had at least one dose of the COVID-19 vaccine. Among parents who were not vaccinated for COVID-19, the most common reasons were concerns about the vaccine's side effects and doubts about its safety (75.6% of mothers, 69.3% of fathers). Besides, 11.1% of unvaccinated mothers and 10.3% of unvaccinated fathers stated that they were waiting for a domestic COVID-19 vaccine to be vaccinated.

The vaccination rate with at least one dose of the COVID-19 vaccine was only 46.0% in children. Among children who received at least one dose of the COVID-19 vaccine, 55.5% were

**Table I.** The participants' sociodemographic characteristics and COVID-19-related features.

Variables (n = 396)	n	(%)
Mother age		
Median (min-max), year	40 (28-66)	
≤ 35 years	51	(12.9)
36–50 years	321	(81.1)
> 50 years	24	(6.1)
Father age		
Median (min-max), year	44 (30-75)	
≤ 35 years	15	(3.8)
36–50 years	316	(79.8)
> 50 years	65	(16.4)
Child age		
Median (min-max), year	15 (12-18)	
12-15 years	244	(61.6)
16-18 years	152	(38.4)
Mother education level		
Low	242	(61.1)
Medium	114	(28.8)
High	40	(10.1)
Father education level		
Low	232	(58.6)
Medium	125	(31.6)
High	39	(9.8)
Household income		
Low	192	(48.5)
Medium	144	(36.4)
High	60	(15.2)
Mother or father healthcare worker		
Yes	32	(8.1)
No	364	(91.9)
Child history of COVID-19		
Yes	45	(11.4)
No	351	(88.6)
A family member or friend history of COVID-19		
Yes	230	(58.1)
No	166	(41.9)
A family member or friend death due to COVID-19		
Yes	43	(10.9)
No	353	(89.1)
Other childhood vaccination hesitation		
Yes	35	(8.8)
No	361	(91.2)
Anxiety when sending to school for fear of COVID-19		
Yes	178	(44.9)
No	201	(50.8)
Not attend school	17	(4.3)
Information resources about COVID-19 and vaccines (Multiple Options)		
Television or radio	325	(82.1)
Internet	258	(65.2)
Social media	190	(48.0)
Healthcare professional	157	(39.6)
Friend or close relative	100	(25.3)
All	43	(10.9)

COVID-19: Coronavirus Disease 2019

**Table II.** Parents' COVID-19 vaccination status and attitudes to vaccinate their children.

	Parental vaccination attitudes						p
	Acceptance		Non-acceptance		Total		
	n	(%)*	n	(%)*	n	(%)*	
Both vaccinated**	218	(55.0)	118	(29.8)	336	(84.8)	<0.001
Only one vaccinated**	10	(2.5)	26	(6.6)	36	(9.1)	
Both unvaccinated	3	(0.8)	21	(5.3)	24	(6.1)	

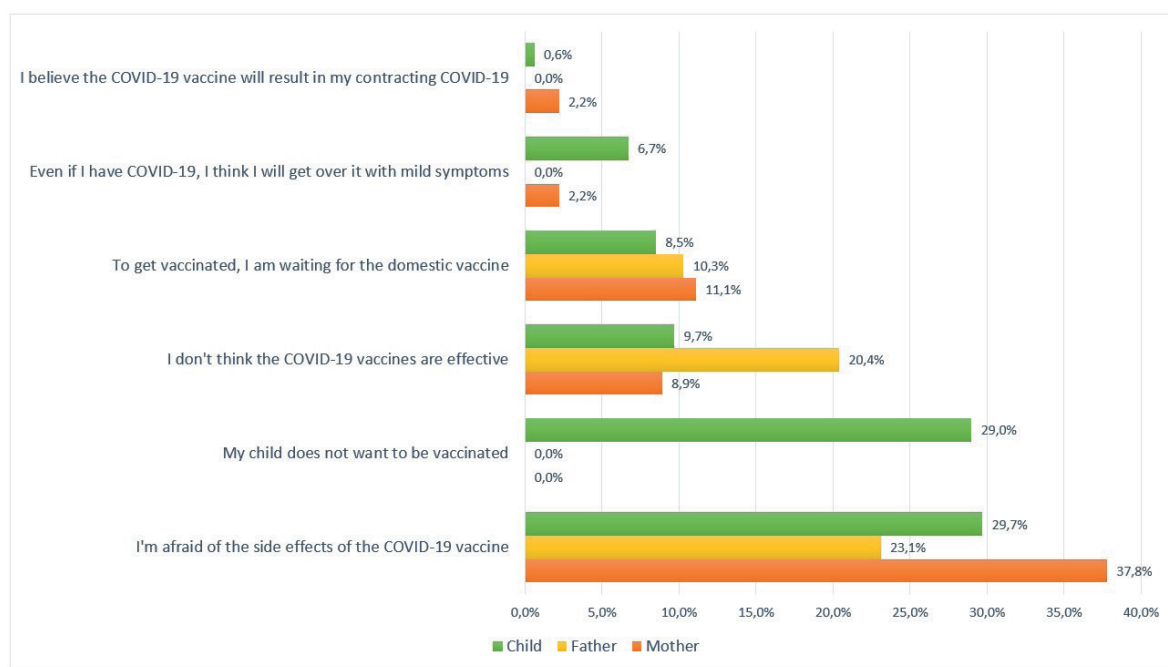
\* Percentage by the total number of parents, \*\* Receipt of ≥1 COVID-19 vaccine dose, COVID-19: Coronavirus Disease 2019

older than 15 years. When parents who had not yet vaccinated their child against COVID-19 were asked whether they were considering vaccinating their children, 12.3% said they were, whereas 41.7% said they were not. Accordingly, COVID-19 vaccine acceptance (vaccinated or willing to be vaccinated) for children was 58.3%. Concerns about the side effects of the COVID-19 vaccine (29.7%) and their children not wanting to be vaccinated (29.0%) were most common, followed by doubts about the safety of the vaccine (15.8%). The reasons parents are hesitant to vaccinate their children and themselves are summarized in Fig. 1.

There was no statistically significant difference between vaccination acceptance and non-

acceptance for children, mother and father education level, household income level, or other childhood vaccination hesitation ( $p = 0.442, p = 0.743, p = 0.294, p = 0.611$ , respectively).

According to binary logistic regression analysis, mothers under 35 years of age were 6.5-fold ( $p = 0.002, 95\% \text{ CI: } 2.0\text{-}23.1$ ) more likely not to have their children vaccinated than mothers over 50 years of age. Also, in children aged 15 and younger, the rate of not being vaccinated was 2.3-fold ( $p = 0.001, 95\% \text{ CI: } 1.4\text{-}3.7$ ) higher than in those aged 16 and over. It was 3.3-fold ( $p = 0.026, 95\% \text{ CI: } 1.1\text{-}8.0$ ) more common for non-healthcare workers not to have their children vaccinated than healthcare workers. The rate of not vaccinating the children of those whose



**Fig. 1.** Reasons why parents were refusing to get COVID-19 vaccinations for themselves and their children.



family members or friends did not have a history of COVID-19 was found to be 1.9-fold ( $p = 0.006$ , 95% CI: 1.2-3.0) more than in those with a history (Table III).

According to the vaccination status of the parents, the rate of not vaccinating the children when both parents were unvaccinated was 12.8-fold ( $p < 0.001$ , 95% CI: 3.5-46.5) higher than that of both vaccinated parents, and the rate of not vaccinating their children with only one vaccinated parent was 2.2-fold ( $p < 0.001$ , 95% CI: 2.2-11.3) higher than that of both vaccinated parents (Table III).

As a result, according to Wald statistics, it can be said that the most influential factor for children not accepting COVID-19 vaccines was “both parents being unvaccinated” (Table III).

### Discussion

In our study, parents’ rates of not accepting the COVID-19 vaccine for their children was 41.7%. While COVID-19 vaccines were not yet available, in three of the studies conducted in our country, the willingness of parents to have their children vaccinated was reported as 10.4%, 36.3%, 73.9%.<sup>10-12</sup> In the other two studies with conditional vaccination willingness rates, the acceptance rate increased from 38.4% to 41.9% when the vaccine was free, and the acceptance rate was higher for parents’ domestic vaccines (56.8%) compared to foreign vaccines (28.9%).<sup>13,14</sup> A striking feature in some of this research is that the rate of parents who stated that they were undecided was between 24-48%, which was close to the acceptance rate.<sup>11-13</sup> Also, unlike our survey, it was seen that the majority of the participants

**Table III.** Multivariate binary logistic regression of risk factors that cause parents not to vaccinate their children for COVID-19.

	$\beta$	S.E.	Wald Statistics	p	Exp ( $\beta$ )	95% C.I. for exp ( $\beta$ )	
						Lower	Upper
Constant	-3.253	0.739	19.386	<0.001	0.039		
Mother age distribution							
> 50 years	Reference						
≤ 35 years	1.925	0.622	9.577	0.002	6.582	2.025	23.184
36–50 years	0.668	0.536	1.558	0.212	1.951	0.683	5.574
Child age distribution							
16-18 years	Reference						
12-15 years	0.835	0.242	11.874	0.001	2.305	1.433	3.706
Mother or father healthcare worker							
Yes	Reference						
No	1.111	0.498	4.982	0.026	3.037	1.145	8.054
A Family member or friend history of COVID-19							
Yes	Reference						
No	0.643	0.235	7.479	0.006	1.902	1.200	3.014
Parents vaccinated status							
Both vaccinated	Reference						
Both unvaccinated	2.554	0.657	15.619	<0.001	12.853	3.548	46.561
Only one vaccinated	1.617	0.413	15.326	<0.001	2.242	2.242	11.320

Variables entered on step 1: Mother age distribution, father age distribution, child age distribution, mother or father healthcare worker, child history of COVID-19, family member or friend history of COVID-19, family member or friend lost due to COVID-19, parents vaccinated status.

Nagelkerke R Square= 0.258, COVID-19: Coronavirus Disease 2019

in the survey had a higher education level and included a higher percentage of healthcare workers. Therefore, these studies are more limited than ours in terms of reflecting the generality of our country. Another point was that the vaccination acceptance rate of parents for themselves was between 49-62%, which was relatively low compared to our study.<sup>10,11,13,14</sup> The socioeconomic consequences of COVID-19-related restrictions and increased reliance on vaccines over the past year may have contributed to vaccine acceptance among parents.

The COVID-19 vaccine willingness rate of parents for their children under 18 has shown a wide range from 17.2% to 91.6% in national surveys in other countries.<sup>15-42</sup> On the other hand, in a study conducted in 16 countries, the acceptance rate of the COVID-19 vaccine for their children was 69.2%, while in another international study with participants from six countries, it was 65.2%.<sup>43,44</sup> As in our research, studies investigating the vaccination acceptance rate for the children of parents with children aged 12-18 was reported as 74.5% in Italy, 83.1% in the United States, and 84.1% in Singapore.<sup>45-47</sup> The differences in results may be related to many factors, including the socio-cultural characteristics of the survey population.

In our investigation, mothers under 35, parents of children aged 15 and under, those with no history of COVID-19 in family members or friends, and non-healthcare workers were the least willing to vaccinate their children. Cross-sectional international and national studies in various countries reported that young parents were more concerned about potential adverse effects and had lower vaccine acceptance rates for their children.<sup>22-24,35,41,43</sup> Other age-related differences in vaccine acceptability between the under 35 and over 50 age groups may be due to the fact that the under 35 generation rarely witnesses deaths from vaccine-preventable diseases compared to those aged 50 and over. In contrast, the results of a survey of more than 3000 women of reproductive age in China

revealed that COVID-19 vaccine refusal was higher in women over the age of 45.<sup>41</sup>

Our study found that parents are less willing to get their children vaccinated if they are younger, which is in line with other similar studies.<sup>22,25,35,38,42,43,45,48</sup> This is probably related to parents' perception that young children are more susceptible to vaccine side effects.<sup>34</sup> In our country, COVID-19 vaccination appointments for children aged 12 and older can only be made online with the approval of their parents. However, adolescents over the age of 15 can make their appointments without parental approval. This may have contributed to the vaccination rate in children over the age of 15 being higher than in children aged 15 and under. Parents with a family or friend's history of being infected with SARS-CoV-2 showed a greater intent to vaccinate their children against COVID-19, reflecting a similar observation in two other studies.<sup>11,42</sup>

Our study results revealed a strong correlation between a parent's vaccination status and refusal to vaccinate their child, consistent with other studies.<sup>11,18,42,48</sup> According to all these results, parents' hesitation about vaccination deprives children of their right to vaccinations and causes a decrease in vaccination rates. Revealing the reasons for the refusal of parents and providing accurate information about vaccines will increase the vaccination rates of both parents and children against COVID-19.

The primary concerns reported by parents were the side effects and the vaccine's safety. Various studies on the acceptance of COVID-19 vaccines have shown that the main concerns of parents for vaccines are safety and effectiveness.<sup>49</sup> Parental concerns aside, one-third of parents of unvaccinated children said that their child did not want to be vaccinated. In studies evaluating adolescents' attitudes towards the COVID-19 vaccine, the intention to be vaccinated was found to be 39-51.7%.<sup>46,50,51</sup> It has also been determined that adolescents have a higher intention to be vaccinated if their parents or peers have been immunized with COVID-19

vaccines.<sup>50,51</sup> In this case, there is a need to investigate how often adolescents willing to get the COVID-19 vaccine face barriers and whether parental consent requirements limit their access to vaccines.

The internet and social media remain essential components of sharing health-related information sharing.<sup>52,53</sup> While the internet and social media are instrumental in accessing information, unverified misinformation on these platforms can lead to anti-vaccine attitudes. In our study, the participants explained that they mostly got information about COVID-19 and their vaccines from television, radio, the internet, and social media. Previous research has shown that parents who encounter positive news on social media are more willing to let their children get the COVID-19 vaccine.<sup>11,26</sup> It is clear that social media should be included in approaches to eliminate parents' hesitance about vaccination and increase children's vaccination rates. The rate of getting information from healthcare professionals was only 39.6%, and it was in fourth place. A survey of parents' vaccine safety information resources showed that pediatricians are one of the most reliable sources for vaccines.<sup>54</sup> Therefore, our most important duty as pediatricians is to keep the parents of our patients informed concerning vaccine safety and efficacy.

There are several strengths and limitations to our study. This is one of the few studies that has evaluated parents' attitudes towards vaccinating their children against COVID-19 after approved vaccines for children aged 12-18. In addition, previous research found that mothers were significantly less likely to be willing to vaccinate their children against COVID-19.<sup>23,46,49</sup> Because both parents were interviewed, our findings better reflect the current attitudes of parents than previous studies. However, since this research was conducted in only one region of Türkiye, it has limitations in reflecting the situation throughout the country. Nevertheless, the rate of at least two doses of COVID-19 adult vaccination (86%) in the province of Izmir,

where the research was conducted, is similar to the general average in Türkiye.<sup>2</sup> Another limitation was that when evaluating parents' attitudes towards vaccinating their children for COVID-19, we did not assess their COVID-19 anxiety levels. Therefore, we could not evaluate the effect of this condition on vaccine acceptance.

We discovered that 41.7% of children will not be vaccinated because their parents are concerned about COVID-19 vaccination. Our results from the study suggest that providing evidence of the safety of vaccines and informing parents and adolescents of the importance of vaccination can help increase the acceptability of the COVID-19 vaccine.

### **Ethical approval**

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Izmir Health Sciences University Tepecik Training and Research Hospital Ethics Committee (Decision Number: 2021/10-40). An informed consent form was obtained from the participants before initiating the study.

### **Author contribution**

The authors confirm contribution to the paper as follows: study conception and design: AKA, AK, EKO, DY; data collection: AS, BA, YEK, GU, AET, AAM, Gİ; analysis and interpretation of results: AKA, FE; draft manuscript preparation: AS, AKA. All authors reviewed the results and approved the final version of the manuscript.

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### **Conflict of interest**

The authors declare that there is no conflict of interest.



## REFERENCES

1. World Health Organization (WHO). WHO Coronavirus (COVID-19) dashboard with vaccination data. Available at: <https://covid19.who.int/> (Accessed on January 04, 2023).
2. Minister of Health of The Republic of Türkiye. COVID-19 vaccine information platform. Available at: <https://covid19.saglik.gov.tr/> (Accessed on January 04, 2023).
3. MacDonald NE; SAGE Working Group on Vaccine Hesitancy. Vaccine hesitancy: definition, scope and determinants. *Vaccine* 2015; 33: 4161-4164. <https://doi.org/10.1016/j.vaccine.2015.04.036>
4. World Health Organization (WHO). Ten threats to global health in 2019 [internet]. 2019. Available at: <https://www.who.int/vietnam/news/feature-stories/detail/ten-threats-to-global-health-in-2019>
5. Lin C, Tu P, Beitsch LM. Confidence and receptivity for COVID-19 vaccines: a rapid systematic review. *Vaccines (Basel)* 2020; 9: 16. <https://doi.org/10.3390/vaccines9010016>
6. Schaffer DeRoo S, Pudalov NJ, Fu LY. Planning for a COVID-19 vaccination program. *JAMA* 2020; 323: 2458-2459. <https://doi.org/10.1001/jama.2020.8711>
7. Omer SB, Yildirim I, Forman HP. Herd immunity and implications for SARS-CoV-2 control. *JAMA* 2020; 324: 2095-2096. <https://doi.org/10.1001/jama.2020.20892>
8. Turkish Statistical Institute. İstatistiklerle Çocuk, 2020 [internet]. 2021. Available at: <https://data.tuik.gov.tr/Bulten/Index?p=İstatistiklerle-Cocuk-2020-37228>
9. Daniel WW, Cross CL. *Biostatistics: a foundation for analysis in the health sciences*. Hoboken: Wiley; 2018.
10. İkişik H, Akif Sezerol M, Taşçı Y, Maral I. COVID-19 vaccine hesitancy: a community-based research in Turkey. *Int J Clin Pract* 2021; 75: e14336. <https://doi.org/10.1111/ijcp.14336>
11. Yılmaz M, Şahin MK. Parents' willingness and attitudes concerning the COVID-19 vaccine: a cross-sectional study. *Int J Clin Pract* 2021; 75: e14364. <https://doi.org/10.1111/ijcp.14364>
12. Yılmazbaş P, Terzi O, Özçeker D. Did COVID-19 pandemic changed parents' approach to vaccination? *Erciyes Med J* 2021; 43: 130-134. <https://doi.org/10.14744/etd.2020.85451>
13. Akarsu B, Canbay Özdemir D, Ayhan Baser D, Aksoy H, Fidancı İ, Cankurtaran M. While studies on COVID-19 vaccine is ongoing, the public's thoughts and attitudes to the future COVID-19 vaccine. *Int J Clin Pract* 2021; 75: e13891. <https://doi.org/10.1111/ijcp.13891>
14. Yigit M, Ozkaya-Parlakay A, Senel E. Evaluation of COVID-19 vaccine refusal in parents. *Pediatr Infect Dis J* 2021; 40: e134-e136. <https://doi.org/10.1097/INF.0000000000003042>
15. Fedele F, Aria M, Esposito V, et al. COVID-19 vaccine hesitancy: a survey in a population highly compliant to common vaccinations. *Hum Vaccin Immunother* 2021; 17: 3348-3354. <https://doi.org/10.1080/21645515.2021.1928460>
16. Dror AA, Eisenbach N, Taiber S, et al. Vaccine hesitancy: the next challenge in the fight against COVID-19. *Eur J Epidemiol* 2020; 35: 775-779. <https://doi.org/10.1007/s10654-020-00671-y>
17. Pierantoni L, Lenzi J, Lanari M, et al. Nationwide COVID-19 survey of Italian parents reveals useful information on attitudes to school attendance, medical support, vaccines and drug trials. *Acta Paediatr* 2021; 110: 942-943. <https://doi.org/10.1111/apa.15614>
18. Bell S, Clarke R, Mounier-Jack S, Walker JL, Paterson P. Parents' and guardians' views on the acceptability of a future COVID-19 vaccine: a multi-methods study in England. *Vaccine* 2020; 38: 7789-7798. <https://doi.org/10.1016/j.vaccine.2020.10.027>
19. Largent EA, Persad G, Sangenito S, Glickman A, Boyle C, Emanuel EJ. US public attitudes toward COVID-19 vaccine mandates. *JAMA Netw Open* 2020; 3: e2033324. <https://doi.org/10.1001/jamanetworkopen.2020.33324>
20. Marquez RR, Gosnell ES, Thikkurissy S, Schwartz SB, Cully JL. Caregiver acceptance of an anticipated COVID-19 vaccination. *J Am Dent Assoc* 2021; 152: 730-739. <https://doi.org/10.1016/j.adaj.2021.03.004>
21. Wang Q, Xiu S, Zhao S, et al. Vaccine hesitancy: COVID-19 and influenza vaccine willingness among parents in Wuxi, China-a cross-sectional study. *Vaccines (Basel)* 2021; 9: 342. <https://doi.org/10.3390/vaccines9040342>
22. Montalti M, Rallo F, Guaraldi F, et al. Would parents get their children vaccinated against SARS-CoV-2? Rate and predictors of vaccine hesitancy according to a survey over 5000 families from Bologna, Italy. *Vaccines (Basel)* 2021; 9: 366. <https://doi.org/10.3390/vaccines9040366>
23. Kelly BJ, Southwell BG, McCormack LA, et al. Predictors of willingness to get a COVID-19 vaccine in the U.S [published correction appears in *BMC Infect Dis* 2021; 21: 383]. *BMC Infect Dis* 2021; 21: 338. <https://doi.org/10.1186/s12879-021-06085-9>
24. He K, Mack WJ, Neely M, Lewis L, Anand V. Parental perspectives on immunizations: impact of the COVID-19 pandemic on childhood vaccine hesitancy. *J Community Health* 2022; 47: 39-52. <https://doi.org/10.1007/s10900-021-01017-9>

25. Lu J, Wen X, Guo Q, et al. Sensitivity to COVID-19 vaccine effectiveness and safety in Shanghai, China. *Vaccines (Basel)* 2021; 9: 472. <https://doi.org/10.3390/vaccines9050472>
26. Zhang KC, Fang Y, Cao H, et al. Parental acceptability of COVID-19 vaccination for children under the age of 18 years: cross-sectional online survey. *JMIR Pediatr Parent* 2020; 3: e24827. <https://doi.org/10.2196/24827>
27. Thunström L, Ashworth M, Finnoff D, Newbold SC. Hesitancy toward a COVID-19 vaccine. *Ecohealth* 2021; 18: 44-60. <https://doi.org/10.1007/s10393-021-01524-0>
28. Zhou Y, Zhang J, Wu W, Liang M, Wu Q-S. Willingness to receive future COVID-19 vaccines following the COVID-19 epidemic in Shanghai, China. *BMC Public Health* 2021; 21: 1103. <https://doi.org/10.1186/s12889-021-11174-0>
29. Ruggiero KM, Wong J, Sweeney CF, et al. Parents' intentions to vaccinate their children against COVID-19. *J Pediatr Health Care* 2021; 35: 509-517. <https://doi.org/10.1016/j.pedhc.2021.04.005>
30. Greenhawt M, Kimball S, DunnGalvin A, et al. Media influence on anxiety, health utility, and health beliefs early in the SARS-CoV-2 pandemic-a survey study. *J Gen Intern Med* 2021; 36: 1327-1337. <https://doi.org/10.1007/s11606-020-06554-y>
31. Alfieri NL, Kusma JD, Heard-Garris N, et al. Parental COVID-19 vaccine hesitancy for children: vulnerability in an urban hotspot. *BMC Public Health* 2021; 21: 1662. <https://doi.org/10.1186/s12889-021-11725-5>
32. Humble RM, Sell H, Dubé E, et al. Canadian parents' perceptions of COVID-19 vaccination and intention to vaccinate their children: Results from a cross-sectional national survey. *Vaccine* 2021; 39: 7669-7676. <https://doi.org/10.1016/j.vaccine.2021.10.002>
33. Xu Y, Xu D, Luo L, et al. A cross-sectional survey on COVID-19 vaccine hesitancy among parents from Shandong vs. Zhejiang. *Front Public Health* 2021; 9: 779720. <https://doi.org/10.3389/fpubh.2021.779720>
34. Evans S, Klas A, Mikocka-Walus A, et al. "Poison" or "protection"? A mixed methods exploration of Australian parents' COVID-19 vaccination intentions. *J Psychosom Res* 2021; 150: 110626. <https://doi.org/10.1016/j.jpsychores.2021.110626>
35. Wisniak A, Baysson H, Pullen N, et al; Specchio-COVID19 Study Group. COVID-19 vaccination acceptance in the canton of Geneva: a cross-sectional population-based study. *Swiss Med Wkly* 2021; 151: w30080. <https://doi.org/10.4414/smw.2021.w30080>
36. Choi SH, Jo YH, Jo KJ, Park SE. Pediatric and parents' attitudes towards COVID-19 vaccines and intention to vaccinate for children. *J Korean Med Sci* 2021; 36: e227. <https://doi.org/10.3346/jkms.2021.36.e227>
37. Bagateli LE, Saeki EY, Fadda M, Agostoni C, Marchisio P, Milani GP. COVID-19 vaccine hesitancy among parents of children and adolescents living in Brazil. *Vaccines (Basel)* 2021; 9: 1115. <https://doi.org/10.3390/vaccines9101115>
38. Szilagyi PG, Shah MD, Delgado JR, et al. Parents' intentions and perceptions about COVID-19 vaccination for their children: results from a national survey. *Pediatrics* 2021; 148: e2021052335. <https://doi.org/10.1542/peds.2021-052335>
39. AlHajri B, Alenezi D, Alfouzan H, et al. Willingness of parents to vaccinate their children against influenza and the novel coronavirus disease-2019. *J Pediatr* 2021; 231: 298-299. <https://doi.org/10.1016/j.jpeds.2020.11.059>
40. Du M, Tao L, Liu J. The association between risk perception and COVID-19 vaccine hesitancy for children among reproductive women in China: an online survey. *Front Med (Lausanne)* 2021; 8: 741298. <https://doi.org/10.3389/fmed.2021.741298>
41. Delgado-Gallegos JL, Padilla-Rivas GR, Gastelum-Arias LJ, et al. Parent's perspective towards child COVID-19 vaccination: an online cross-sectional study in Mexico. *Int J Environ Res Public Health* 2021; 19: 290. <https://doi.org/10.3390/ijerph19010290>
42. Temsah MH, Alhuzaimi AN, Aljamaan F, et al. Parental attitudes and hesitancy about COVID-19 vs. routine childhood vaccinations: a national survey. *Front Public Health* 2021; 9: 752323. <https://doi.org/10.3389/fpubh.2021.752323>
43. Skjefte M, Ngirbabul M, Akeju O, et al. COVID-19 vaccine acceptance among pregnant women and mothers of young children: results of a survey in 16 countries. *Eur J Epidemiol* 2021; 36: 197-211. <https://doi.org/10.1007/s10654-021-00728-6>
44. Goldman RD, Yan TD, Seiler M, et al. Caregiver willingness to vaccinate their children against COVID-19: cross sectional survey. *Vaccine* 2020; 38: 7668-7673. <https://doi.org/10.1016/j.vaccine.2020.09.084>
45. Di Giuseppe G, Pelullo CP, Volgare AS, Napolitano F, Pavia M. Parents' willingness to vaccinate their children with COVID-19 vaccine: results of a survey in Italy. *J Adolesc Health* 2022; 70: 550-558. <https://doi.org/10.1016/j.jadohealth.2022.01.003>

46. Scherer AM, Gedlinske AM, Parker AM, et al. 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: 997-1003. <https://doi.org/10.15585/mmwr.mm7028e1>
47. Griva K, Tan KYK, Chan FHF, et al. Evaluating rates and determinants of COVID-19 vaccine hesitancy for adults and children in the Singapore population: Strengthening Our Community's Resilience against Threats from Emerging Infections (SOCRATEs) cohort. *Vaccines (Basel)* 2021; 9: 1415. <https://doi.org/10.3390/vaccines9121415>
48. Brandstetter S, Böhmer MM, Pawellek M, et al. Parents' intention to get vaccinated and to have their child vaccinated against COVID-19: cross-sectional analyses using data from the KUNO-Kids health study. *Eur J Pediatr* 2021; 180: 3405-3410. <https://doi.org/10.1007/s00431-021-04094-z>
49. Pan F, Zhao H, Nicholas S, Maitland E, Liu R, Hou Q. Parents' Decisions to vaccinate children against COVID-19: a scoping review. *Vaccines (Basel)* 2021; 9: 1476. <https://doi.org/10.3390/vaccines9121476>
50. Rogers AA, Cook RE, Button JA. Parent and peer norms are unique correlates of COVID-19 vaccine intentions in a diverse sample of U.S. adolescents. *J Adolesc Health* 2021; 69: 910-916. <https://doi.org/10.1016/j.jadohealth.2021.09.012>
51. Wong WHS, Leung D, Chua GT, et al. Adolescents' attitudes to the COVID-19 vaccination. *Vaccine* 2022; 40: 967-969. <https://doi.org/10.1016/j.vaccine.2022.01.010>
52. Smolarchuk C, Mohammed H, Furegato M, et al. Just Google it! Impact of media coverage of an outbreak of high-level azithromycin-resistant *Neisseria gonorrhoeae* on online searches, and attendances, testing and diagnoses at sexual health clinics in England between 2015 and 2016: an interrupted time series analysis using surveillance data. *Sex Transm Infect* 2019; 95: 594-601. <https://doi.org/10.1136/sextrans-2019-053986>
53. Paguio JA, Yao JS, Dee EC. Silver lining of COVID-19: Heightened global interest in pneumococcal and influenza vaccines, an infodemiology study. *Vaccine* 2020; 38: 5430-5435. <https://doi.org/10.1016/j.vaccine.2020.06.069>
54. Freed GL, Clark SJ, Butchart AT, Singer DC, Davis MM. Sources and perceived credibility of vaccine-safety information for parents. *Pediatrics* 2011; 127 Suppl 1: S107-12. <https://doi.org/10.1542/peds.2010-1722P>