



Original Research

Knowledge, Attitudes and Practices of Pediatricians About COVID-19 Vaccination to Children

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Abstract

Objectives: Achieving high vaccination rates is very important in the prevention of the coronavirus disease 2019 (COVID-19) as in other infectious diseases. This study aimed to evaluate pediatricians' knowledge, attitudes and behaviours about COVID-19 vaccination of children.

Methods: Our single-center, descriptive, cross-sectional, prospective study was conducted between September 20, 2022 and November 30, 2022. The sample consisted of 350 physicians who agreed to fill out the questionnaire voluntarily. Participants were asked 21 questions about their sociodemographic data, knowledge about COVID-19 vaccination of children, attitudes and behaviours via Google Forms.

Results: A total of 350 pediatricians, 72.6% of whom were women, participated in our study. 51.4% of the participants were working in a Training and Research Hospital, and 99.1% had received COVID-19 vaccination themselves. While 65.7% (n=230) of pediatricians recommended COVID-19 vaccination for all children, 27.7% (n=97) recommended it only for children in the risk group, and 6.6% (n=23) did not recommend COVID-19 vaccination for children. The most common reasons why pediatricians did not recommend the vaccine to all children were; 56.7% lack of sufficient clinical research on vaccination in children, 50% concerns about the long-term effects of the vaccine, 27.5% vaccine-related side effects. The most risk groups for which participants recommended vaccination were asthma (chronic lung disease) 84.6%, diabetes mellitus 72%, and immunodeficiency 69.7%. 68.9% of pediatricians knew that COVID-19 vaccine was used for children aged 12 years and older in Türkiye, and 60.9% thought that COVID-19 vaccine was safe for children. Those who thought that COVID-19 vaccine was safe for children were more likely to recommend the vaccine to children ($p<0.001$). When the answers given to the knowledge questions were analyzed, it was found that the knowledge level of those who did not recommend vaccination to children was lower than the others ($p<0.001$).

Conclusion: In the present study, pediatricians mostly recommend COVID-19 vaccine to children. The vaccine safety and the level of knowledge about COVID-19 vaccine are effective factors in recommending the vaccine. Therefore, we conclude that trainings to be organized for pediatricians about COVID-19 vaccine will increase the rate of recommending COVID-19 vaccine to children.

Keywords: Attitude, children, COVID-19, knowledge, pediatrician, vaccination

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The coronavirus disease 2019 (COVID-19) is a disease associated with the respiratory system caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).^[1,2] This disease emerged in Wuhan, China in late 2019, spread worldwide in a short time and affected millions of people.^[3,4] The World Health Organization (WHO) declared this situation as a Public Health Emergency of International Con-

cern (PHEIC) on January 30, 2020, and announced the outbreak as a pandemic on March 11, 2020.^[5]

The symptoms and severity of COVID-19 disease vary.^[2-4] Although most people infected with SARS-CoV-2 have mild to moderate symptoms, more than 6.900.000 people worldwide and more than 2 million people died in Europe due to COVID-19 from the beginning of the pandemic until Septem-

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ber 2023.^[5] Among the pediatric population, approximately 17,400 COVID-19-related deaths were reported worldwide.^[6] After more than three years, on May 5, 2023, the WHO Emergency Committee announced that although the disease remained a global threat, it ceased to be a PHIEC due to the high level of public immunization achieved through acquired infections and vaccinations.^[7] However, it recommended States Parties to integrate COVID-19 vaccination into lifelong vaccination programs and maintain high vaccination rates in high-priority populations.^[7]

WHO's recommended immunization rate for COVID-19 is at least 70% of the population.^[8] With the current data of September 2023, the number of people who have received at least one dose of vaccine worldwide is 71.7% and the number of people with a completed primary vaccination series is 66%, while the number of people who have received at least one dose of vaccine in Türkiye is 60.7% and the number of people with a completed primary vaccination series is 59.7%.^[9]

In countries like Türkiye, where the child population rate is high (26.5% of the population is children), vaccination rates in children are important for achieving herd immunity.^[4,10] This study aimed to evaluate pediatricians' knowledge, attitudes, and behaviours about the COVID-19 vaccination of children.

Methods

The present study was single-center, descriptive, cross-sectional, prospective conducted between September 20, 2022 and November 30, 2022. This survey-based study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of Sisli Hamidiye Etfal Training and Research Hospital (Date: September 20, 2022 and No: 2152).

The study questionnaire was prepared by two pediatricians using current articles. This form included a total of 21 questions about the participants' sociodemographic data, knowledge, attitudes, and behaviours about COVID-19 vaccination to children. Multiple-choice, close-ended and semi-close-ended questions were included. There were four 3-point Likert-type questions to assess knowledge. The options for the knowledge questions were "Yes/No/Not sure". The correct answer to the knowledge questions was scored as "1", the wrong answer and not sure were scored as "0". The total scores of the answers given to the knowledge questions (lowest 0- highest 4 points) were compared between the groups that recommended COVID-19 vaccine to children and those that did not. The content validity of the questionnaire was evaluated by a pediatrician. The questionnaire's face validity was tested by administering it

to a group of ten pediatricians who were not respondents in the study. The average response time of the questionnaire was found to be between 4-6 minutes.

Sample size and Study Group

Power analysis was performed with the G-power 3.1.9.4 program to determine the sample size. The sample size was stated as at least 321 with 5 degrees of freedom and 80% power with an effect size of 0.2. For the study, invitations were sent electronically to pediatricians using Google Forms. A total of 354 pediatricians who agreed to fill out the questionnaire voluntarily participated in our study. Four participants were excluded from the study because they did not complete the survey questions. The sample group of the study consisted of 350 pediatricians.

Statistical Analysis

Statistical analyses were conducted using IBM SPSS Statistics for Windows, Version 25.0 (Armonk, NY: IBM Corp.). The conformity of the variables to normal distribution was examined by histogram plots and Kolmogorov-Smirnov test. Mean, standard deviation and median values were used to present descriptive analyses. Categorical variables were compared by the Chi-Square Test. Mann Whitney U Test was used for non-normally distributed (nonparametric) variables between two groups and Kruskal Wallis Test was used for variables between more than two groups. P-values below 0.05 were considered statistically significant results.

Results

The study included 350 pediatricians, 72.6% (n=254) of whom were women. 51.4% (180) of the participants were working in a Training and Research Hospital, 99.1% (n=347) had received COVID-19 vaccination themselves, and 39.4% (n=138) had children under the age of 18. Among those with children aged 12 years and older (n=47), the rate of COVID-19 vaccination was 89.4% (n=42).

While 91.7% (n=321) of the participants recommended vaccines included and not included in the national immunization schedule, 7.7% (n=27) recommended only the vaccines in the national vaccination schedule.

When asked about their attitudes towards influenza vaccination, which is not included in the national vaccination schedule in our country, 64.3% (n=225) stated that they only recommend it to children in the risk group.

While 65.7% (n=230) of pediatricians recommended COVID-19 vaccine for all children, 27.7% (n=97) recommended it only for children in the risk group, and 6.6% (n=23) did not recommend COVID-19 vaccine for children. The most common reasons why pediatricians did not recommend the

COVID-19 vaccine to all children were; 56.7% (n=68) lack of sufficient clinical research on vaccination in children, 50% (n=60) concerns about the long-term effects of the vaccine, 27.5% (n=33) vaccine-related side effects (myocarditis, pericarditis, etc.). The most risk groups for which participants recommended COVID-19 vaccination were asthma (chronic lung disease) 84.6% (n=296), diabetes mellitus 72% (n=252), and immunodeficiency 69.7% (n=244). While 60.9% (n=213) thought that the COVID-19 vaccine was safe for children, 85.4% (n=299) contemplated that COVID-19 vaccine administration to children could positively change the course of the pandemic. The sociodemographic data of the participants and their attitudes about childhood immunization and COVID-19 vaccination are shown in Table 1.

Table 1. Participant's sociodemographic data, attitudes about childhood immunization and COVID vaccination

| | % (n) |
|---|------------|
| Time from university graduation, years (n=350) | |
| 0-10 years | 58.6 (205) |
| 11-20 years | 23.7 (83) |
| Over 20 years | 17.7 (62) |
| Have you been vaccinated against COVID-19? (n=350) | |
| Yes | 99.1 (347) |
| No | 0.9 (3) |
| What are your recommendations about childhood vaccination? | |
| Recommended on vaccines included and not included in the national immunization schedule | 91.7 (321) |
| Recommended only the vaccines in the national vaccination schedule. | 7.7 (27) |
| I have vaccine hesitancy, not recommended vaccination to children | 0.6 (2) |
| Do you recommend to children COVID-19 vaccine? (n=350) | |
| Yes, I recommend it to all children | 65.7 (230) |
| Yes, I recommend it only for children in the risk group | 27.7 (97) |
| No, I don't recommend it for children | 6.6 (23) |
| If you suggest a COVID-19 vaccine to children, which one do you recommend? (n=327) | |
| mRNA vaccine | 85.6 (280) |
| Inactivated vaccine | 14.4 (47) |
| If you don't recommend COVID-19 vaccine for children or recommend it only to risk groups, what are the reasons? (n=120) | |
| lack of sufficient clinical research on vaccination in children | 56.7 (68) |
| Concerns about the long-term effects of COVID-19 vaccine | 50.00 (60) |
| Don't recommend it because of side effects (myocarditis, pericarditis, etc.). | 27.50 (33) |
| Children have mild COVID-19 disease, no vaccine is needed | 22.5 (27) |
| I don't trust COVID-19 vaccines | 5.8 (7) |
| I don't think COVID-19 vaccines are effective | 5.8 (7) |
| Providing natural immunity to infection | 5 (6) |
| In which risk(s) group do you recommend COVID-19 vaccine to children? (n=315) | |
| Asthma- Chronic lung disease | 84.6 (296) |
| Diabetes mellitus | 72.0 (252) |
| Immunodeficiency (congenital/acquired) | 69.7 (244) |
| Congenital heart disease | 68.6 (240) |
| Chronic renal failure | 68 (238) |
| Children with cancer disease | 62.6 (219) |
| Chronic liver disease | 62 (217) |
| Neurological disease (Cerebral Palsy, Epilepsy, etc.) | 60.9 (213) |
| Obesity | 59.7 (209) |
| Sickle cell anemia | 58.6 (205) |
| Children with metabolic diseases | 56.6 (198) |
| Children with rheumatologic diseases | 54.3 (190) |
| Thalassemia | 53.4 (187) |
| Cardiomyopathy | 53.4 (187) |

In this study, it was found that age, gender, institution where the participants worked and having children were not effective factors in recommending COVID-19 vaccine to children ($p=0.592$, $p=0.124$, $p=0.701$, $p=0.164$, respectively) (Table 2). However, those who thought that COVID-19 vaccine was safe for children were more likely to recommend the vaccine to all children ($p<0.001$). In addition, participants who recommended influenza vaccine to all children were more likely to recommend COVID-19 vaccine to all children ($p=0.001$) (Table 2). Another effective factor in recommending COVID-19 vaccine to children was the level of knowledge of the participants (Table 3). When the answers given to the knowledge questions were analyzed, the knowledge level of those who did not recommend vac-

ination to children was lower ($p<0.001$) compared to the others (Table 3).

Discussion

In the present study, we found that pediatricians mostly recommended the COVID-19 vaccine to all children, while one-third recommended it only to children in the risk group. The most common reasons for not recommending it to all children were a lack of sufficient clinical research on vaccination in children, concerns about the long-term effects of the vaccine, and vaccine-related side effects (myocarditis, pericarditis, etc.).

We demonstrated that the thought that the vaccine is safe for children and the level of knowledge of pediatricians are

Table 2. Factors that influenced participants to recommend the COVID-19 vaccine to children

| | n | Do you recommend to children COVID-19 vaccine? | | | | | | p |
|--|-----|--|--------|-----------------------------|--------|----------------------|--------|--------|
| | | No, I don't recommend | | Yes, only in the risk group | | Yes, to all children | | |
| | | n | % | n | % | n | % | |
| Age | | | | | | | | |
| 25-29 | 102 | 7 | (6.9) | 30 | (29.4) | 65 | (63.7) | 0.592 |
| 30-39 | 142 | 11 | (7.8) | 42 | (29.6) | 89 | (62.7) | |
| 40-49 | 63 | 3 | (4.8) | 18 | (28.6) | 42 | (66.7) | |
| 50 years and older | 43 | 2 | (4.7) | 7 | (16.3) | 34 | (79.1) | |
| Gender | | | | | | | | |
| Male | 96 | 8 | (8.3) | 33 | (34.3) | 55 | (57.3) | 0.124 |
| Female | 254 | 15 | (5.9) | 64 | (25.2) | 175 | (68.9) | |
| Institution | | | | | | | | |
| State Hospital | 49 | 4 | (8.2) | 13 | (26.5) | 32 | (65.3) | 0.701 |
| Training and Research Hospital | 180 | 10 | (5.6) | 54 | (30.0) | 116 | (64.4) | |
| University Hospital | 80 | 4 | (5.0) | 21 | (26.3) | 55 | (68.8) | |
| Private Sector | 41 | 5 | (12.2) | 9 | (22) | 27 | (65.9) | |
| Do you have children under the age of 18? | | | | | | | | |
| No | 212 | 11 | (5.2) | 54 | (25.5) | 147 | (69.3) | 0.758 |
| Yes | 138 | 12 | (8.7) | 43 | (31.2) | 83 | (60.1) | |
| COVID-19 vaccine is safe for children. | | | | | | | | |
| No/I am not sure | 137 | 21 | (15.3) | 67 | (48.9) | 49 | (35.8) | <0.001 |
| Yes | 213 | 2 | (0.9) | 30 | (14.1) | 181 | (85) | |
| COVID-19 vaccine administration to children could positively change the course of the pandemic | | | | | | | | |
| No/I am not sure | 51 | 17 | (33.3) | 28 | (54.9) | 6 | (11.8) | <0.001 |
| Yes | 299 | 6 | (2.0) | 69 | (23.1) | 224 | (74.9) | |
| Do you recommend influenza vaccination for children? | | | | | | | | |
| No, I don't recommend it | 8 | 1 | (12.6) | 4 | (50.0) | 3 | (37.5) | 0.001 |
| Yes, only for the risk group | 225 | 20 | (8.9) | 72 | (32.0) | 133 | (59.1) | |
| Yes, to all children | 117 | 2 | (1.7) | 21 | (18) | 94 | (80.3) | |

Chi-Square Test.

Table 3. Effect of knowledge questions and knowledge level on recommending COVID-19 vaccination to children

| Knowledge questions about COVID-19 vaccine | % (n) | | | |
|---|----------------|---------------------------------|----------|--|
| From what age is the COVID-19 vaccine administered in Türkiye? (n=350) | | | | |
| 15 years and older | 17.4 (61) | | | |
| 12 years and older | 68.9* (241) | | | |
| 5 years and older | 5.7 (20) | | | |
| 6 months and older | 0.9 (3) | | | |
| I don't know | 7.1 (25) | | | |
| COVID-19 vaccination protects children from severe COVID-19 infections and hospitalization. | 86* (301) | | | |
| Getting vaccinated against COVID-19 protects children against complications related to COVID-19, such as MIS-C. | 66.3* (232) | | | |
| COVID-19 vaccine can be given on the same day as other vaccines. | 73.4* (257) | | | |
| | Mean±SD | Median[†] (IQR) | p | |
| Do you recommend to children COVID-19 vaccine? | | | | |
| Yes, I recommend it to all children | 3.18±0.92 | 3 (3-4) | <0.001‡ | |
| Yes, I recommend it only for children in the risk group | 2.7±1.19 | 3 (2-4) | | |
| No, I don't recommend it for children | 1.61±1.2 | 2 (1-2) | | |

* Correct answer rate; □ Knowledge questions answer score: The correct answer to the knowledge questions was scored as "1", the wrong answer and not sure was scored as "0". □ Kruskal Wallis Test.

effective factors in recommending COVID-19 vaccination. Previous studies have reported that healthcare professionals were the most reliable source in the acceptance of the COVID-19 vaccine.^[11,12] There are few studies investigating the knowledge and attitudes of pediatricians about COVID-19 vaccination of children.

Vaccination has critical importance in controlling and preventing COVID-19, as in other infectious diseases.^[12] For this reason, many vaccine development studies in different technologies have started since the first days of the pandemic that threaten global health.^[4] Since December 2020, when the first COVID-19 mass vaccination started in the world, each country has determined its national vaccination strategy.^[12,13] In Türkiye, COVID-19 vaccination started with healthcare professionals on January 14, 2021.^[14,15] Afterwards, free vaccination was provided by the Ministry of Health to everyone over the age of 18, starting with priority groups according to risk assessment.^[14,15] For the childhood period, the U.S. Food and Drug Administration (FDA) reported in May 2021 that the COVID-19 vaccine is suitable for use by people over the age of 12, and the Advisory Committee on Immunization Practices (ACIP) decided to recommend vaccination for adolescents aged 12-15 years.^[16] In our country, in August 2021, all children aged 15 years and older, high-risk children with chronic diseases aged 12-15 years were included in COVID-19 vaccination programme. This definition was expanded to all children aged 12 years and older, in September 2021.^[17] In October 2021, FDA issued emergency use authorization for the Pfizer- BioNTech

COVID-19 vaccine for use in children aged 5-11 years and an update for use in children aged 6 months–5 years, on June 17, 2022.^[18,19]

Due to increasing rates of herd immunity as well as the Omicron variant becoming the dominant circulating variant, WHO SAGE (The Strategic Advisory Group of Experts on Immunization) updated the COVID-19 vaccination roadmap in March 2023 and reported that healthy children between the ages of 6 months and 18 years are not included in the high priority group for vaccination.^[20] In this roadmap, while recommending high-priority vaccination for children and adolescents in the risk group, it suggested that countries should decide on the vaccination of healthy children and adolescents by many factors such as disease burden, cost-effectiveness, benefit-harm, program suitability, and leave the decision on the age limit to the countries.^[20] In September 2023, when we wrote this article, the Centers for Disease Control and Prevention (CDC) and the American Academy of Pediatrics (AAP) recommended the COVID-19 vaccine that all persons aged 6 months and older.^[21] In Türkiye, there has been no change about childhood COVID-19 vaccination after September 2021, the vaccine is administered to all children over the age of 12.^[22,23] In the present study, approximately two-thirds of the participants were informed that the COVID-19 vaccine is authorized for use in our country for children aged 12 years and older.

In a previous study investigating the knowledge and opinions of pediatricians in our country about COVID-19 vaccination at a time when COVID-19 vaccination had not yet

started in the world, 83% of the participants reported that they would have the COVID-19 vaccine administered to themselves if the vaccine was released, and 85% reported that they would recommend the vaccine to their patients.

^[24] Almost all of the pediatricians who participated in our study had received COVID-19 vaccination themselves.

In a study conducted in Canada between February and March 2022 to investigate the opinions and practices of pediatricians regarding COVID-19 vaccination in children aged 5-11 years, 92% of the participants strongly recommended the COVID-19 vaccination for children aged 5-11 years.^[25] In another study conducted by Steletou et al.^[26] in Greece at the end of 2021, it was reported that 92.6% of pediatricians recommended the COVID-19 vaccine to all children, 5.9% only to high-risk children, and 1.5% did not recommend COVID-19 vaccine to children. Similarly, pediatricians mostly recommended the COVID-19 vaccine to all children, but the rate of pediatricians who did not recommend the COVID-19 vaccine to children was found to be higher in our study.

Since the first days of the pandemic, the risk of severe illness and death from COVID-19 has been high in some groups.^[20] Continued vaccination of these vulnerable subgroups, giving importance to both primary and booster vaccinations, is strongly recommended.^[20,21] For COVID-19 vaccination in the pediatric age group, those with active cancer, transplant recipients and those receiving immunosuppressive treatment or immunodeficient are defined in the high-priority group as they are medium-severe immunocompromised persons.^[20] Children with severe obesity and comorbidity are in the medium priority group and primary vaccine series and booster dose vaccine are recommended for them.^[20] In our study, the participants recommended vaccination for children with comorbidity because they were in the high-risk group; however, two-thirds of them considered children with immunodeficiency and almost half of them considered children with obesity and cancer as risk groups and recommended vaccination.

In a study investigating the factors affecting the acceptance of the COVID-19 vaccine by healthcare professionals in our country, the two most common reasons for not accepting the vaccine were concerns about the safety of the COVID-19 vaccine (73.6%) and unknown side effects (62%).^[27] Steletou et al.^[26] reported that short clinical trial duration and safety concerns were reported as reasons for not recommending the vaccine to all children. In another study, the reasons why pediatricians did not recommend the vaccine were; "COVID-19 infection is not severe among children in this age group", "limited data on the long-term effects of COVID-19 vaccine in this age group" and "con-

cerns about side effects such as myocarditis or pericarditis after COVID-19".^[25] In our study, the reasons why pediatricians did not recommend COVID-19 vaccine for all children were similar to these studies.

Previous studies conducted with both parents and healthcare professionals have reported that confidence in the vaccine is a very important factor in vaccination.^[4,11,25,26] In a study exploring the attitudes of general practitioners, gynecologists, and pediatricians towards the COVID-19 vaccine and their confidence in vaccine safety in Germany, physicians with positive attitudes towards COVID-19 vaccine had high confidence in vaccine safety.^[28] Similarly, in our study, those who thought that COVID-19 vaccine was safe for children were more likely to recommend the vaccine to all children.

In our study, another effective factor for pediatricians to recommend COVID-19 vaccine to children was the level of knowledge of physicians about COVID-19 vaccine. The level of knowledge of those who did not recommend COVID-19 vaccine to children was lower than the others. Tolossa et al.^[29] reported that healthcare professionals who had negative attitudes towards COVID-19 vaccination had lower levels of knowledge about COVID-19 vaccine.

There were some limitations in our study. Firstly, pediatricians' answers to questions about COVID-19 vaccination were self-reported. We don't know the participants' clinical practice. Another limitation is that since participation in the study was through an online survey, the participation rate of those with a positive opinion about COVID-19 vaccination may have been higher than others, which may have caused some form of selection bias. Despite these limitations, our study contributes to the literature since there are few studies investigating the knowledge, attitudes and behaviours of pediatricians regarding COVID-19 vaccination and these studies were mostly conducted at the beginning of the pandemic. We think that our study conducted later in the pandemic will not only improve the vaccination strategy during the COVID-19 pandemic but also contribute to the acceptance of vaccines for infectious diseases that may occur in the future and threaten public health.

Conclusion

In the present study, we found that the majority of pediatricians had a positive attitude toward COVID-19 vaccination in children. Lack of sufficient clinical research on the administration of the vaccine in children, concerns about the long-term effects of the vaccine and vaccine-related side effects were the most reasons why pediatricians did not recommend COVID-19 vaccination for all children. In addition, the thought that the COVID-19 vaccine is safe for children and

the level of knowledge about the COVID-19 vaccine were effective factors in recommending the vaccine.

We conclude that organizing training programs on COVID-19 vaccine to increase the knowledge level of pediatricians will increase the rate of recommending this vaccine to children.

Disclosures

Ethics Committee Approval: This study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of Şişli Hamidiye Etfal Training and Research Hospital (Date: 20/09/2022 & No: 2152).

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

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