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# Pediatric healthcare professionals' opinions, attitudes, and vaccine hesitancy toward personal and children's COVID-19 vaccination

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**Ethics Committee Approval**
This study was approved by Erciyes University, Ethical Committee on Noninvasive Clinical Research (Date: 03.02.2021, Number: 2021/99). All procedures in this study involving human participants were performed in accordance with the 1964 Helsinki Declaration and its later amendments.

**Conflict of Interest**
No conflict of interest was declared by the authors.

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## Abstract

**Background/Aim:** Pediatric healthcare professionals are at the forefront of both facilitating an increase vaccine acceptability and reduction in vaccine hesitancy and play a vital role in eliminating vaccine hesitancy of families. In this context, it was thought that the individual pediatric healthcare professional's vaccine hesitancy could affect successful administration of the coronavirus 2019 (COVID-19) vaccination**.** This study aimed to determine the opinions and attitudes of pediatricians and pediatric nurses toward the COVID-19 vaccination and the reasons for vaccine hesitancy. The study also aimed to identify their views and attitudes toward COVID-19 vaccination in children.

**Methods:** The survey was carried out as a cross-sectional study between February and May 2021. The study sample consisted of 83 pediatricians and 79 pediatric nurses. Necessary permission was obtained before the study began. Data were collected using questionnaires that had been prepared by researchers. Data were analyzed using descriptive statistical methods and a chi-squared test.

**Results:** Almost all pediatricians and more than half of the pediatric nurses reported that they considered getting vaccinated/were vaccinated; however, a greater proportion of nurses were vaccine-hesitant ($P$ = 0.001). Reasons for not being vaccinated/being hesitant among healthcare professionals included harmful ingredients in the COVID-19 vaccines, thinking that vaccines were developed too quickly, vaccine development studies in different phases did not yield conclusive outcomes, hearing from the social media that vaccines are harmful, believing it is not necessary to receive a vaccine that is not included in the routine immunization schedule, and lack of knowledge about vaccines. The majority of the physicians and nurses who participated in the study reported that, if COVID-19 vaccines were available for children, they would not consider advising it or were unsure ($P$ = 0.003). When asked about the reasons for hesitancy, a greater proportion of nurses reported they thought that vaccines had been developed too quickly ($P$ < 0.001) and that the outcomes of vaccine development studies in different phases were not conclusive ($P$ = 0.008).

**Conclusion**: Healthcare workers serve as role models for vaccination acceptance in the community. Identifying the reasons for vaccine hesitancy among healthcare professionals is key to encouraging vulnerable populations to accept and take the vaccine. Vaccine hesitancy may be countered by comprehensive in-service trainings on vaccine development processes and phases of trials relating to COVID-19 vaccines.

**Keywords:** COVID-19, Pediatrician, Nurses, Opinion, Attitude, Vaccine hesitancy

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## Introduction

Coronavirus disease 2019 (COVID-19) is a severe acute respiratory syndrome caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). COVID-19 disease was first identified in Wuhan, Hubei Province of the People's Republic of China in December 2019 and became a pandemic in April 2020 [1, 2]. While all countries across the world are making individual efforts to contain the spread of SARS-CoV-2, the World Health Organization (WHO) is conducting a global campaign of prevention, early detection, and medical treatment. In addition to ongoing measures, including mask-wearing, social distancing, and hygiene measures intended for flattening the curve of infections, development of an effective vaccine against COVID-19 has become a priority for global health organizations. With a large number of clinical vaccine trials underway, the timeline for public distribution of a safe and effective vaccine is projected to be between the end of 2020 and 2022 [3]. Increasing rates of mortality and significant morbidity due to the COVID-19 pandemic accelerated vaccine development in different countries and led to vaccines being administered through emergency use authorization based on phase 3 trials [4]. However, vaccine hesitancy remains an obstacle to herd immunity against highly contagious diseases, such as COVID-19. Indeed, WHO has characterized vaccine hesitancy as "one of the top ten threats to global health" [5].

Healthcare workers are disproportionately exposed to infectious diseases and play a role in hospital-acquired transmission; thus, these workers are an important target group for vaccination. Although several countries promote vaccination for healthcare workers, vaccination rates vary [6–8]. Healthcare workers, even when asymptomatic, can transmit the virus to patients. In addition, being at risk for contracting infections from their patients often causes them to be viewed as a source of vaccine-preventable nosocomial infections that seem particularly threatening during the COVID-19 pandemic [9, 10]. A previous study that evaluated and substantiated this information [11] compared centers that advised or did not advise vaccination for their healthcare workers and found that all-cause mortality was lower in centers in which healthcare professionals were vaccinated against influenza. Another study conducted during a season when only 15% of healthcare personnel were vaccinated against influenza found 19 cases and one death in an outbreak of nosocomial influenza reported from a neonatal intensive care unit [12]. Pediatric patients, one of the most vulnerable groups, also play a key role in the spread of the epidemic and deserve particular attention. These reports suggest that vaccination of healthcare professionals is critical not only for their own health but also for the health of the patients for whom they care.

Pediatric healthcare professionals administering vaccines are the most experienced group in terms of understanding the effects, efficacy, and side effects of vaccines. Healthcare professionals serve as role models and thus contribute to the success of vaccination campaigns, particularly at a time that is characterized by increasing distrust of vaccines and dominated by discussions about the safety of vaccines rather than about their efficacy. So, given the critical nature of pediatric healthcare professionals' acceptance of the COVID-19 vaccination, it is important to investigate vaccination rates and reasons for vaccine hesitancy among these professionals to protect vulnerable populations and promote vaccination in the community [9, 10]. Against this background, this study was conducted to determine the rates of COVID-19 vaccination among pediatricians and pediatric nurses and to reveal their opinions and attitudes toward vaccinating children in addition to the reasons for vaccine hesitancy.

## Materials and methods

Our research, designed as a cross-sectional study, was carried out between February and May 2021. The study population consisted of 250 physicians and nurses working at a children's hospital in a province in the Central Anatolian Region. To determine the minimum number of required study participants, the formula $n = N \times t2 \times \sigma2/d2\ (N - 1) + t2 \times \sigma2$ was used. The sample size calculated 5% acceptable error, 95% confidence level, and 1.96 degrees of freedom. The minimum sample size was calculated as\ 152 participants. After exclusion of healthcare professionals who were on maternity leave, were in self-quarantine because of testing positive for COVID-19, or refused to participate in the study, the study sample comprised a total of 162 participants (83 pediatricians and 79 pediatric nurses) who volunteered to participate in the study.

The study received approval from the scientific research board of the ministry of health, institution. This study was approved by Erciyes University, Ethical Committee on Noninvasive Clinical Research (Date: 03.02.2021, Number: 2021/99). Data were collected using an online survey as part of the infection control measures against the pandemic. Participants were informed about the purpose of the study and the confidentiality of the data on a note included at the beginning of the online survey and was asked to provide informed consent. The second part of the online form consisted of a questionnaire that was prepared by the researchers based on a literature review and that collected information about demographic characteristics of pediatricians and pediatric nurses, such as age, sex, number of children, and questionnaires inquiring views and attitudes towards COVID-19 vaccination [13–15]. Data were collected through online questionnaires shared with online groups.

**Statistical analysis**

Data were analyzed using the statistical software suite IBM SPSS Statistics 25.0 (IBM Corp., Armonk, New York, USA). Descriptive statistics were expressed in unit number (n) and percentage (%), and the relationship between categorical variables was evaluated using a chi-squared test. Statistical significance was set at $P < 0.05$.

## Results

In this study 38.9% of the healthcare professionals who participated in the study were in the 22–30-year-old age group, and 81.5% of them were female. Almost three-quarters (71.6%) of the participants were married, and 62.3% had children. Just over half (51.2%) were pediatricians, and 48.8% were pediatric nurses (Table 1).

Table 1: Demographic characteristics of pediatricians and pediatric nurses (n = 162)

| Characteristics | Number (n) | Percent (%) |
|---|---|---|
| Age | | |
| 22–30 years | 63 | 38.9 |
| 31–40 years | 63 | 38.9 |
| 41 years and older | 36 | 22.2 |
| Gender | | |
| Female | 132 | 81.5 |
| Male | 30 | 18.5 |
| Marital status | | |
| Married | 116 | 71.6 |
| Single | 46 | 28.4 |
| Educational status | | |
| Undergraduate | 82 | 50.6 |
| Masters | 47 | 29.0 |
| Doctorate | 33 | 20.4 |
| Profession | | |
| Physician | 83 | 51.2 |
| Nurse | 79 | 48.8 |
| Having children | | |
| Yes | 101 | 62.3 |
| No | 61 | 37.7 |

In all, 91.6% of the physicians and 69.6% of the nurses reported that they thought it necessary to be vaccinated against COVID-19. In this study, 6% of the physicians and 29.1% of the nurses were found to be hesitant about COVID-19 vaccination or about whether it was necessary *(P* = 0.001). Pediatricians and pediatric nurses listed healthcare workers, people over 65 years of age, and women in the 15–49-year-old age group as priority groups for vaccination, but both groups placed pregnant women and children at the end of the list. However, a statistically significant difference between physicians and nurses in mentioning healthcare workers as a priority group for vaccination (*P* = 0.005) was found. When asked if the country of origin of the vaccine is important, 42.2% of the physicians and 62% of the nurses gave a positive answer (*P* = 0.011). When asked, "If you had a choice, which vaccine (in terms of country of origin) would you prefer?", 39.8% of the physicians said they would prefer vaccines originating from Germany, and 41.8% of the nurses said they would prefer vaccines produced in Turkey (*P* = 0.004),

In all, 90.4% of the pediatricians and 65.8% of the pediatric nurses reported that they considered getting vaccinated/were vaccinated, which showed a higher rate of vaccine hesitancy among nurses (*P* = 0.001). The most common reasons for not being vaccinated/being hesitant among both groups of healthcare professionals included several factors: (1) thinking that vaccines were developed too quickly (*P* = 0.520*)*, (2) thinking that the results of vaccine development studies in different phases were inconclusive (*P* = 0.236), and (3) lack of

Table 2: Pediatricians' and pediatric nurses' opinions and attitudes toward coronavirus 2019 (COVID-19) vaccination

| Characteristics | Physician (83) n | % | Nurse (79) n | % | $\chi^2$ | *P*-value |
|---|---|---|---|---|---|---|
| Thinking COVID-19 vaccination should be received/is necessary during the pandemic | | | | | | |
| Yes | 76 | 91.6 | 55 | 69.6 | 15.182 | 0.001 |
| No | 2 | 2.4 | 1 | 1.3 | | |
| Unsure | 5 | 6.0 | 23 | 29.1 | | |
| Which group do you think should be vaccinated first* | | | | | | |
| Healthcare workers | 75 | 90.4 | 57 | 72.2 | 7.729 | 0.005 |
| Children | 9 | 10.8 | 5 | 6.3 | 0.551 | 0.458 |
| Pregnant women | 7 | 8.4 | 3 | 3.8 | 0.808 | 0.369 |
| Women 15–49 years of age | 9 | 10.8 | 13 | 16.5 | 0.661 | 0.416 |
| People over 65 years of age | 48 | 57.8 | 39 | 49.4 | 0.851 | 0.356 |
| Whether the country of origin of COVID-19 vaccines is an important factor in vaccination | | | | | | |
| Yes | 35 | 42.2 | 49 | 62.0 | 6.392 | 0.011 |
| No | 48 | 57.8 | 30 | 38.0 | | |
| If you had a choice (in terms of country of origin), our vaccine choice would be | | | | | | |
| Turkey | 14 | 16.9 | 33 | 41.8 | 15.144 | 0.004 |
| Germany | 33 | 39.8 | 17 | 21.5 | | |
| China | 14 | 16.9 | 14 | 17.7 | | |
| It doesn't matter | 8 | 9.6 | 3 | 3.8 | | |
| Other | 6 | 7.2 | 7 | 8.9 | | |
| No idea | 8 | 9.6 | 5 | 6.3 | | |
| Considering vaccination/vaccination status as healthcare workers | | | | | | |
| Yes | 75 | 90.4 | 52 | 65.8 | 14.423 | 0.001 |
| No | 3 | 3.6 | 9 | 11.4 | | |
| Hesitant | 5 | 6.0 | 18 | 22.8 | | |
| Reason for not being vaccinated and being hesitant* | | | | | | |
| I believe COVID-19 vaccines contain harmful ingredients | 1 | 12.5 | 5 | 18.5 | 1.716 | 0.190 |
| I think I have a lack of knowledge about vaccines | 3 | 37.5 | 9 | 33.3 | 2.526 | 0.112 |
| I think vaccines were developed very quickly | 6 | 75.0 | 9 | 33.3 | 0.413 | 0.520 |
| I think the results of the studies in different phases are inconclusive | 5 | 62.5 | 10 | 37.0 | 1.404 | 0.236 |
| I've heard from the television and the Internet that vaccines are harmful. | 0 | 0.0 | 1 | 3.7 | 1.443 | 0.488 |
| My family doesn't want me to get this vaccine | 0 | 0.0 | 1 | 3.7 | 1.443 | 0.488 |
| I think that healthcare institutions have not provided sufficient information about vaccines. | 0 | 0.0 | 2 | 7.4 | 2.899 | 0.236 |
| I do not believe it is necessary to receive a vaccine that is not included in the routine immunization schedule. | 0 | 0.0 | 3 | 11.1 | 1.462 | 0.114 |
| I don't think any vaccine is safe or protective. I won't get this as I haven't received other vaccinations. | 0 | 0.0 | 2 | 7.4 | 2.899 | 0.236 |
| Based on my religious beliefs, I believe that vaccines contain inadvisable substances. | 1 | 12.5 | 0 | 0.0 | 1.343 | 1.000 |
| I'm concerned about potential side effects | 4 | 50.0 | 7 | 25.9 | 0.504 | 0.361 |

*More than one option has been selected.

Table 3: Comparison of healthcare professionals' views and attitudes towards COVID-19 vaccination in children

| Characteristics | Physician (83) n | % | Nurse (79) n | % | $\chi^2$ | *P*-value |
|---|---|---|---|---|---|---|
| Whether they would recommend vaccination if COVID 19 vaccines were available for children | | | | | | |
| Yes | 9 | 10.8 | 22 | 27.8 | 11.385 | 0.003 |
| No | 44 | 53.0 | 24 | 30.4 | | |
| Hesitant | 30 | 36.2 | 33 | 41.8 | | |
| Reason for hesitancy* | | | | | | |
| I believe COVID-19 vaccines contain harmful ingredients | 1 | 3.3 | 3 | 9.1 | 1.176 | 0.278 |
| I think vaccines were developed very quickly | 5 | 16.7 | 23 | 69.7 | 15.522 | <0.001 |
| I think the results of the studies in different phases are inconclusive | 8 | 26.7 | 17 | 51.5 | 7.005 | 0.008 |
| I've heard from the television and the Internet that vaccines are harmful. | 0 | 0.0 | 1 | 3.0 | 1.443 | 0.488 |
| I think that healthcare institutions have not provided sufficient information about vaccination in children. | 2 | 6.7 | 7 | 21.2 | 3.373 | 0.066 |
| I do not believe it is necessary to receive a vaccine that is not included in the routine immunization schedule. | 1 | 3.3 | 1 | 3.0 | 0.001 | 0.972 |
| I'm concerned about potential side effects | 13 | 43.3 | 11 | 33.3 | 1.285 | 0.257 |
| I think it can cause neurological diseases like autism | 0 | 0.0 | 2 | 6.1 | 2.899 | 0.236 |

*More than one option has been selected.

knowledge about vaccines ($P$ = 0.112). A greater proportion of physicians (50%) than nurses were concerned about potential side effects (Table 2).

More than two-thirds of the physicians and nurses (53% and 36.2% for physicians; 30.4% and 41.8% for nurses) who participated in the study reported that they did not consider recommending COVID-19 vaccination if it were available for children or were hesitant about making such a recommendation ($P$ = 0.003). Reasons for hesitancy were different between physicians and nurses. A greater proportion of nurses versus physicians thought that vaccines were developed too quickly ($P$ < 0.001) and that the results of vaccine development studies in different phases were inconclusive ($P$ = 0.008). Other reasons for hesitancy mentioned by the physicians included several factors: (1) thinking that healthcare institutions did not provide sufficient information about vaccination in children, (2) concern about potential side effects, and/or (3) COVID-19 vaccination not listed in the routine vaccination schedule. Nurses were also hesitant because they thought that COVID-19 vaccines contained harmful substances ($P$ = 0.278) and that vaccines may cause neurological diseases, such as autism ($P$ = 0.236) as shown in Table 3.

## Discussion

Vaccines can provide protection against a great number of infectious diseases. The tremendous success of vaccination campaigns that prevent exposure to the devastating effects of vaccine-preventable diseases have paradoxically resulted in people fearing the side effects of vaccines more than those vaccine-preventable diseases themselves [16–18]. The COVID-19 pandemic has severely affected people and healthcare systems globally. Increasing rates of mortality and significant morbidity have made the development of a COVID-19 vaccine a priority goal. COVID-19 vaccines started to be administered in the phase 3 of trials through emergency use authorization. Despite high mortality rates resulting from COVID-19 disease, there has been significant vaccine hesitancy in the community [16].

To help vaccination campaigns succeed, healthcare professionals should set an example of accepting vaccines and becoming vaccinated, especially at a time characterized by increased distrust of vaccines and dominated by concerns about safety of vaccines rather than by efficacy [6, 19–21]. The reason this study involved pediatricians and pediatric nurses is because most vaccines included in the national immunization program in Turkey are delivered during childhood. Pediatricians and pediatric nurses know more than other healthcare professionals about the protective effects, efficacy, and side effects of vaccines. For this reason, determining the rationale for vaccine hesitancy in this group could be instructive. This study was conducted to reveal pediatricians' and pediatric nurses' views and attitudes toward the COVID-19 vaccination, to determine whether they advised vaccination in children, and reasons for vaccination hesitancy.

This study found that physicians and nurses held different views about vaccination against COVID-19 during the pandemic. Physicians were more likely than nurses to believe in the necessity of vaccines and to consider getting vaccinated, whereas pediatric nurses were more hesitant than pediatricians. Previous studies have found that nurses have lower vaccine acceptance and higher vaccine hesitancy compared to physicians [3, 22, 23]. In one of these studies, the vaccine acceptance rate among 2047 healthcare workers in France was found to be 76.9%; doctors (92%) and physiotherapists (96%) were among the groups with the highest acceptance rates, while nurses (65%) and assistant nurses (60%) were among those with the lowest acceptance rates [24]. These results were attributed to low levels of health literacy, defined as receiving medical information as part of their interaction with the healthcare system [25]. Based on this definition, it can be suggested that future studies should investigate the relationship between health literacy and vaccination.

Most common reasons for not being vaccinated/being hesitant among both pediatricians and pediatric nurses included several factors: (1) thinking that vaccines were developed too quickly, (2) that the results of vaccine development studies in different phase are inconclusive, and/or (3) lack of knowledge about vaccines. Vaccine hesitancy can originate from several causes. Dube et al. [17] reviewed 22 qualitative studies that used the socioecological framework and found that vaccine hesitancy was influenced by previous experiences, emotions, ways of thinking, sources of information, family and friends, perceptions of disease risk, and trust in healthcare systems. A study conducted during influenza A/H1N1 and Ebola outbreaks, which can lead to pandemic, such as the COVID-19 pandemic, identified seven key points that influenced vaccine hesitancy or acceptance: (1) demographic features that affect vaccination, (2) vaccine availability and cost, (3) precautionary measures based on the decision to be vaccinated, (4) personal responsibility and perceptions of risk, (5) level of confidence in healthcare authorities and vaccines, (6) safety and efficacy of new vaccines, and/or (7) lack of information or misinformation about vaccines [18]. Similar to this study, Fakonti et al. [26] found COVID-19 vaccination acceptance to be related to nurses' and midwives' knowledge of vaccination. Gönüllü et al. [27] found pediatricians' concerns were caused by insufficient knowledge about new vaccines and especially by the lack of information on long-term side effects. Dara et al. [28] found results similar to those in our study and listed several main reasons for healthcare professionals not accepting vaccines: (1) insufficient information on safety of vaccines, (2) concerns about potential side effects of vaccination, (3) lack of sufficient data on safety, and (4) lack of data from clinical trials involving chronic diseases and COVID-19 vaccines. Another study reported that safety of vaccines influenced willingness to be vaccinated [29]. Studies have also shown that vaccine hesitancy may be influenced by several other factors, including the rapid development of COVID-19 vaccines globally, thinking that vaccines have not been used and tested for a sufficient period of time, thinking that a new vaccine is not needed, and limited public knowledge and misinformation [3, 30].

This study found that the country of origin of vaccines was a factor involved in vaccine-related decisions. Acı et al. [30] found that vaccine myths and prejudices about the country in which the vaccine was developed influence vaccination decisions. In line with our results, the same study reported that some participants were biased toward the country of origin of the

vaccine and would prefer waiting for a domestic vaccine. It has been hypothesized that healthcare professionals' confidence in vaccines is affected by the COVID-19 pandemic's impact on the whole world and negative information that has spread quickly on social media and prejudice. A study by Motta [31] concluded that Americans would be more inclined to accept vaccines if they were produced in the United States rather than in China, a finding that could be attributed to suspicions that the Chinese government was involved in the "creation" or "spread" of the virus. Based on these results, we can hypothesize that producing vaccines locally, if possible, could increase vaccine acceptance.

Most physicians and more than two-thirds of the nurses participating in the study reported that they did not consider advising or were hesitant to advise the COVID-19 vaccine for children if such a vaccine was available for them. When asked about the reasons for hesitancy, a greater proportion of nurses reported that they thought vaccines were developed too quickly and that the results of vaccine development studies in different phases were inconclusive. Vaccines, which save the lives of millions of children by preventing infectious diseases and related complications, are seen as one of the most effective ways of fighting infectious diseases today [32]. Studies on COVID-19 vaccination for children have mostly been conducted with parents who have reported the following reasons for hesitancy: (1) children are at a lower risk of contracting a disease, (2) concerns about safety, efficacy, and (3) rapid development of vaccines, (4) low education levels of parents, and/or (5) distrust of information available on the web/social media and vaccination policies [33, 34]. Vaccination prevents complications that might be caused by diseases and thus allows children to become more productive adults in the future eventually contributing to the welfare and development of the community. A report from the World Health Organization's (WHO's) Commission on Macroeconomics and Health qualified health interventions as "techniques for economic recovery and poverty reduction" and vaccination as "investment in human capital" [35]. Based on these findings, this study is important as it reveals pediatric healthcare professionals' hesitancy to advise vaccination, suggesting the need for trainings and interventions to protect and improve child health and contain the pandemic.

**Limitations**:

This study is a single center, time-limited study. The study involved only pediatricians and pediatric nurses; thus, the findings can only be generalized to this group.

**Conclusion**

Healthcare workers serve as role models for vaccination acceptance in the community. Identifying the reasons for vaccine hesitancy among healthcare professionals is key to protecting vulnerable populations and promoting vaccination in the community. Thus, we can recommend comprehensive in-service trainings on vaccine development processes and trial phases relating to COVID-19 vaccines, COVID-19 vaccination in children, and other training and interventions to counter vaccine hesitancy. It can be recommended that vaccines be produced domestically, if possible, as this process can contribute to vaccine confidence and acceptance.

**Proposal for future research**

The impact of educational studies on vaccine hesitancy can be addressed as education may contribute to vaccine trust and acceptance. Similarly, the impact of vaccination literacy on the vaccination status of pediatric healthcare professionals and their recommendation for vaccination to pediatric patients may be the subject of another study.

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