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Impact of Pandemic-Driven Parental Fear on Childhood Immunization Rates: Examining Attitudes Toward Vaccination During Crisis Periods in Türkiye

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Abstract

Background: This study aimed to investigate the effect of parents' fear of coronavirus on their attitudes towards the vaccination of their children.

Methods: The study was conducted with 2,350 parents who were selected by using the snowball sampling method. The questionnaire included a personal information form, the Public Attitude towards Vaccination Scale – Health Belief Model, and the Fear of COVID-19 Scale.

Results: The scores of the study group from the sub-dimensions of the Public Attitude towards Vaccination Scale Health Belief Model were as follows: 17.39 ± 2.92 perceived susceptibility, 16.74 ± 3.19 perceived severity, 21.10 ± 3.54 perceived benefits, 14.16 ± 5.08 perceived barriers, and 22.07 ± 2.93 perceived health motivation. The score of the group on the total Fear of COVID-19 Scale was 21.58 ± 5.92 . A statistically positive correlation was found between the scores obtained from the sub-dimensions and the Fear of COVID-19 Scale, except for the 'perceived barriers' sub-dimension.

Conclusions: The study found that parents' fear of COVID-19 positively influenced their attitudes toward childhood vaccination; however, more than three-quarters of parents reported delaying their children's vaccinations due to concerns about COVID-19 exposure, highlighting the need for better parental education on vaccines and vaccine safety.

Keywords: COVID-19, fear, immunization, parents, Türkiye

INTRODUCTION

Vaccination remains one of the most effective, reliable, and cost-efficient methods for protecting the health of both children and adults, while also preventing the spread of infectious diseases.¹ Since 1981, Türkiye's Expanded Immunization Program has made substantial strides in expanding the scope and reach of immunization services.² Following the launch of the Vaccine Campaign for Türkiye in 1985, vaccination coverage reached nearly 90% for most vaccines by the early 2000s, establishing it as one of the world's most successful immunization initiatives.³ Currently, the program requires children to visit healthcare facilities on eight separate occasions before reaching 18 months of age, to receive 17 vaccine doses protecting against 13 infectious diseases.

However, pandemic situations such as COVID-19 serve as prime examples of crises that can severely disrupt health-care systems worldwide, impacting essential services,

including immunization. The COVID-19 pandemic posed unprecedented challenges, leading to the reallocation of healthcare resources, supply chain interruptions, travel restrictions, and heightened fears of exposure to the virus—all factors that contributed to a reduction in healthcare utilization.^{4–6} During such crises, immunization services are particularly vulnerable, as seen during the COVID-19 pandemic, where both high- and low-income countries experienced significant declines in vaccination rates.^{5,7–9} According to a WHO report,¹⁰ in March and April 2020, immunization services were either fully suspended or significantly reduced in 53% of 129 surveyed countries, potentially leaving around 80 million children under the age of one more vulnerable to vaccine-preventable diseases.¹¹ In response, WHO issued guidelines urging countries to prioritize immunization as an essential health service during the pandemic,⁶ while temporarily suspending mass vaccination campaigns and assessing local risks to ensure continuity of these services.¹⁰

Despite the challenges, the pandemic period has also highlighted positive developments, such as heightened public awareness around personal hygiene, general health, and the importance of vaccination.¹² Infectious diseases impact not only affected individuals but also the wider community; thus, failure to vaccinate has societal repercussions, particularly during crisis periods.^{13,14} The

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effectiveness of vaccination programs is directly linked to their acceptance and inclusivity within the population.^{15,16} Although parents may have diverse reasons for delaying, hesitating, or refusing vaccines, these typically fall into four primary categories: religious beliefs, personal or philosophical stances, safety concerns, and a desire for additional information from healthcare providers.^{17,18} Parents need reliable resources that comprehensively address vaccine efficacy, ingredients, benefits, and potential side effects.^{19,20}

Health professionals, especially nurses, play an essential role in the success of immunization programs. Their expertise allows them to provide parents with accurate information, aiding in informed decision-making regarding vaccinations.^{19,20} To effectively monitor and administer vaccinations, nurses must remain updated on current recommendations, including those from the WHO.^{21,22} Familiarity with these guidelines enables nurses to address parental concerns more effectively, providing accurate information to support the best healthcare decisions for children.^{17,23}

Given these factors, this study aims to explore the extent to which parents' fear of COVID-19 influences their attitudes toward vaccinating their children in Türkiye, examining how immunization practices are impacted during crisis periods.

METHODS

This study was a cross-sectional and descriptive study. Prior to the research, ethics approval was obtained from Izmir Democracy University Non-Interventional Clinical Research Ethics Committee on 07/04/2021 with the number 2021/04-07. The study was conducted in accordance with ethical principles, and all participants voluntarily consented to participate in the study. Since the data were collected online via Google Forms, the anonymity and confidentiality of the participants were meticulously protected. The Informed Voluntary Consent Form was attached at the beginning of the questionnaire, and participants were informed about the purpose of the study and provided their consent by selecting 'yes' before accessing the questionnaire. Participants were assured to provide their consent voluntarily and without coercion. Written informed consent to participate was obtained from all of the participants in this study. This study explores how pandemic-driven parental fear influenced attitudes toward childhood immunization in Türkiye. Additionally, it examines whether parents' fear of COVID-19 contributed to delays in vaccinating their children.

The study was conducted between 1 May–1 June 2021 with parents who met the inclusion criteria and were selected on a voluntary basis using the snowball sampling method. The sample size was determined using a formula designed to calculate the number of individuals needed to

examine the prevalence of an event. The formula used when the population size is unknown is $N = t^2 \cdot p \cdot q / d^2$, where p represents the probability of the event occurring, $q = 1 - p$ and d represents the effect size.²⁴ Based on the sampling method from an unknown population, the sample size was calculated as at least 384 people with a confidence level of 0.95%, a standard deviation of 5%, and an unknown prevalence rate of 50%. The final sample consisted of 2,350 parents who expressed their willingness to participate in the study.

Inclusion criteria were parents who reside in Türkiye, are 18 years or older, and have at least one child aged 0–24 months were eligible to participate in the study. Participants were required to be willing to voluntarily take part in the research, actively use social media platforms such as Facebook, Instagram, or WhatsApp, and be able to complete the online survey in Turkish. Exclusion criteria were individuals who did not have access to the internet or social media platforms were excluded from the study.

In this study, the researchers used a personal information form, the Public Attitude towards Vaccination Scale–Health Belief Model (PAVS-HBM), and the COVID-19 Fear Scale for the collection of the data. Personal information form developed by the researchers based on the existing literature,^{25–27} and comprises nine questions designed to gather demographic and vaccination-related data. The collected information includes the parents' age, gender, marital status, educational level, number of children aged 0–24 months, the child's age, routine vaccination practices, and the impact of the COVID-19 pandemic on vaccination delays, along with the reasons for postponement.

PAVS-HBM, created by Koçoğlu-Tanyer *et al.* in Türkiye, was used in this study.²⁷ The PAVS-HBM consists of 26 items organized on a five-point Likert scale. The scale is divided into five factors: perceived severity (4 items), perceived susceptibility (4 items), perceived benefit (5 items), perceived barriers (8 items), and health motivation (5 items). Each item is rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Higher scores indicate stronger positive health beliefs about vaccination, while lower scores reflect greater perceived barriers. Notably, the PAVS-HBM does not yield a total score; instead, it is evaluated independently across its sub-dimensions. To prevent potential misinterpretations, it is important to emphasize that the scale measures attitudes toward vaccination through distinct sub-dimensions rather than an overall composite score.²⁷ Koçoğlu-Tanyer *et al.* reported the internal consistency coefficient (Cronbach's alpha) for the overall scale as 0.86, with subdimension values ranging between 0.85 and 0.90.²⁷ In this study, the internal consistency coefficient was 0.87, with subdimension values of 0.89 for perceived susceptibility, 0.90 for perceived severity, 0.85 for perceived benefits, 0.87 for perceived barriers, and 0.85 for health motivation.

The Fear of COVID-19 Scale, originally developed by Ahorsu *et al.*²⁸ and later adapted into Turkish by Bakioğlu *et al.*²⁵ comprises seven items rated on a five-point Likert scale. Each item is scored from 1 (strongly disagree) to 5 (strongly agree), with higher scores indicating greater fear of COVID-19. The original version of the scale demonstrated an internal consistency coefficient (Cronbach's alpha) of 0.82, while the Turkish adaptation reported a value of 0.88.²⁵ In this study, the internal consistency coefficient was found to be 0.84.²⁵ In this study, the Fear of COVID-19 Scale's Cronbach's alpha was found to be 0.84.

To reduce the risk of transmission and avoid face-to-face contact, data were collected through an online platform (Facebook, WhatsApp, Instagram) using Google Forms over the course of one month, from May 1 to June 1, 2021. The authors shared the Google Forms link on their social media platforms—Facebook, WhatsApp, and Instagram—to reach potential participants. Completing the questionnaire took approximately 20 minutes. In the study, consent for data collected online was obtained through an informed voluntary consent process at the beginning of the questionnaire. Before accessing the survey questions, participants were presented with an Informed Voluntary Consent Form, which explained the study's purpose, procedures, and ethical considerations. Participants were explicitly informed that their participation was voluntary and that their responses would be kept confidential. They had to select "Yes" to indicate their agreement to participate. Only after choosing "Yes" were they able to proceed to the study questions. This ensured that informed consent was actively obtained before data collection.

The data were analyzed using SPSS for Windows, version 21.0 (SPSS Inc, Chicago, Illinois). Descriptive statistics such as number, percentage, mean, standard deviation, median, and 25%–75% quartile values were utilized in the data evaluation process. To assess the correlation between the Fear of COVID-19 Scale and the Public Attitude towards Vaccination Scale–Health Belief Model (PAVS-HBM) scores, Spearman correlation analysis was conducted. Regression analysis was employed to examine the impact of the independent variable, fear of COVID-19, on each dependent variable (perceived severity, perceived susceptibility, perceived benefit, perceived barriers, and health motivation). Each independent variable related to fear of COVID-19 was analyzed individually through regression modeling ($p < 0.05$).

RESULTS

The ages of the parents who participated in the study ranged from 23 to 50 years, with a mean age of 31.84 ± 4.62 years. Additionally, 98.3% of the parents were female and married, and 95.7% had one child. The average age of the children was 10.82 ± 5.73 months. Before the pandemic,

96.6% of participants reported that they regularly vaccinated their children, while during the pandemic, 89.8% indicated that they postponed vaccinations. The top three reasons given by those who delayed vaccinations were "fear of visiting a healthcare institution during the pandemic" (44.35%), "risk of transmission" (38.15%), and "not using public transportation" (6.4%) (Table 1). The rate of regular vaccination decreased significantly from 96.6% before the pandemic to 10.2% during the pandemic.

Table 2 presents the parents' mean scores, median, and 25%–75% quartile values from the Public Attitude towards Vaccination Scale–Health Belief Model (PAVS-HBM) and the Fear of COVID-19 Scale. Table 2 shows the parents' scores in the PAVS-HBM sub-dimensions. The average score on the Fear of COVID-19 scale was 21.58 ± 5.92 , with a median of 22. When examining the correlation between the PAVS-HBM sub-dimensions and the Fear of COVID-19 scale scores, a statistically significant positive correlation was found between the mean scores for perceived, perceived severity, perceived benefits, and health motivation with the Fear of COVID-19 scale score (Table 3).

TABLE 1. Distribution of the descriptive characteristics of the study group (N = 2,350)

Variables	N	%
Gender		
Female	2310	98.3
Male	40	1.7
Marital status		
Married	2310	98.3
Single	40	1.7
Level of education		
Secondary school	40	1.7
High school	120	5.1
Undergraduate and higher	2190	93.2
Number of children		
1	2250	95.7
2	90	3.8
3	10	0.5
Having the children vaccinated regularly		
Yes	2270	96.6
No	80	3.4
Postponement of vaccine uptake during the pandemic		
Yes	2110	89.8
No	240	10.2
Reasons for postponement of vaccine uptake*		
Fear of going to a health institution during the pandemic	1040	44.35
Risk of transmission	660	38.15
Having had COVID-19	120	5.1
Not using public transport	150	6.4
General restrictions due to the pandemic	140	6.0

*The assessment was made only on participants who postponed vaccine uptake

TABLE 2. Parents' mean scores from the Public Attitude towards Vaccination Scale–Health Belief Model-the PAVS-HBM and the Fear of COVID-19 Scale

The PAVS-HBM	Mean ± SD	Min – Max	Median	Percentiles 25% – 75%
Perceived susceptibility	17.39 ± 2.92	4 – 20	17	15 – 20
Perceived severity	16.74 ± 3.19	4 – 20	18	16 – 20
Perceived benefits	21.10 ± 3.54	5 – 25	21	19 – 24
Perceived barriers	14.16 ± 5.08	8 – 34	13	10 – 17
Health motivation	22.07 ± 2.93	8 – 25	23	20 – 25
Fear of COVID-19 Scale	21.58 ± 5.92	7 – 35	22	18 – 26

TABLE 3. The correlation between the Public Attitude towards Vaccination Scale–Health Belief Model (The PAVS-HBM) and the Fear of COVID-19 Scale scores (N = 2,350)

The PAVS-HBM	Fear of COVID-19 Scale
Perceived susceptibility	
r	0.181**
p	0.005
Perceived severity	
r	0.148*
p	0.023
Perceived benefits	
r	0.177**
p	0.007
Perceived barriers	
r	-0.085
p	0.196
Health motivation	
r	0.155*
p	0.018

Note: Spearman correlation; * $p < 0.05$, ** $p < 0.01$

It was found that the fear of COVID-19 explained 8.3% of the variation in the perceived susceptibility score ($R^2 = 0.083$), 5.1% of the variation in the perceived severity score ($R^2 = 0.051$), 5.4% of the variation in the perceived benefit score ($R^2 = 0.054$), and 4.4% of the variation in the health motivation score ($R^2 = 0.044$) and that it variation the same variables by 14.2% ($\beta = 0.142$), 12.2% ($\beta = 0.122$), 13.9% ($\beta = 0.139$), 10.4 % ($\beta = 0.104$), respectively (Table 4).

DISCUSSION

This study, conducted to explore the impact of parent's fear of coronavirus on their attitudes toward vaccinating their children in Türkiye, yielded both promising and concerning results. The promising aspect lies in the strong scores observed in the PAVS-HBM sub-dimensions of perceived susceptibility, perceived severity, perceived benefits, and health motivation. However, it is concerning that the study group exhibited a higher-than-moderate level of fear of COVID-19, and a significant proportion of parents delayed their children's vaccinations due to this fear.

The COVID-19 pandemic has caused significant disruptions in childhood vaccination rates globally, which is consistent with the findings of this study.^{20,29,30} In this study, 96.6% of parents reported regularly vaccinating their children before the pandemic; however, this rate declined to 89.8% at the onset of the pandemic. The primary reason cited by parents for delaying vaccinations was the fear of visiting a healthcare facility during the pandemic (44.35%). This aligns with national data indicating a 2–5% decrease in vaccination rates in Ankara during the pandemic, with the most significant decline observed for vaccines administered after 18 months of age.¹⁹ The literature suggests that the primary reasons for these disruptions include public health measures aimed at controlling the COVID-19 pandemic and parental fears of infection.^{29–31} Studies from various countries reveal similar patterns. In Saudi Arabia, researchers documented a substantial drop in routine immunization rates, with one university hospital observing a reduction of over 70% in early pandemic months.^{32,33} Likewise, reports from the UK noted a marked decline in MMR vaccine administration,³⁴ while in Brazil, childhood vaccination rates dropped by approximately 20% during the pandemic.³⁵ For instance, a study at a university hospital reported that routine childhood immunization visits dropped by more than 70% in the early months of the pandemic compared to previous years.³² Similarly, a report from the UK highlighted a substantial reduction in the administration of the MMR vaccine since the onset of the pandemic.³⁴ In Brazil, Silveira *et al.* found that the pandemic was associated with approximately a 20% decrease in childhood vaccination rates.³⁵ Globally, the WHO pointed out that over 30 measles vaccination campaigns were postponed during the pandemic, posing a risk for future outbreaks.³⁶ A report from the United States noted a significant decrease in pediatric vaccinations between January 6, 2020, and April 19, 2020, compared to the same period in 2019.³¹ Additionally, an alarming statistic indicates that 80 million children under the age of one in 68 countries are at risk due to setbacks in vaccination during the COVID-19 pandemic.³⁷ This study underscores the need to address pandemic-driven fears that disrupt essential healthcare practices, such as immunization, and highlights the importance of strengthening public health messaging to maintain trust in healthcare services during crisis periods.

TABLE 4. The effect of parents' fear of COVID-19 levels on their vaccination attitudes

The PAVS-HBM	Fear of COVID-19					
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	β	β	β	β	β	β
Perceived susceptibility	0.142					
Perceived severity		0.122				
Perceived benefits			0.139			
Perceived barriers				-0.107		
Health motivation					0.104	
R ²	0.083	0.051	0.054	0.016	0.044	0.177
p	0.000*	0.000*	0.000*	0.056	0.001*	0.000*
Durbin-Watson (1.5-2.5)	1.989	2.050	1.979	1.839	1.754	2.054

*Significant at the $p < 0.05$ level

In Türkiye, a study of 1,425 children aged 0–2 years registered with 11 family physicians found that while vaccination rates slightly decreased in March and April, this decline was not statistically significant.³⁸ However, notable reductions in child health monitoring and vaccination rates were observed, especially among socioeconomically disadvantaged and less-educated populations, potentially leading to long-term health impacts. Similarly, a study from India reported a substantial 70% decrease in vaccination rates across all age groups.³⁹ Another study in Türkiye revealed that between March and June 2020, 13.5% of children aged 0–24 months experienced delays in health follow-ups and vaccinations.⁴⁰ These findings highlight the pandemic's critical impact on vaccination rates and underline the urgent need for strategies to address these declines, ensuring children receive essential vaccinations to prevent outbreaks of vaccine-preventable diseases. Addressing parental fears and implementing health policies to promote vaccination are essential measures. The WHO also recommends that vaccination providers identify children who missed doses, maintain lists of unvaccinated individuals, and organize special catch-up campaigns, as routine immunization services may be disrupted during pandemics.⁴¹

The COVID-19 pandemic represents a significant public health crisis, affecting multiple aspects of healthcare systems worldwide, including routine childhood immunization schedules.^{10,11} Despite these disruptions, vaccines and routine immunization programs remain fundamental to primary healthcare, effectively preventing diseases, improving health outcomes, and reducing mortality rates globally.^{30,42} The WHO warns that even brief interruptions in primary healthcare services, like routine vaccinations, can lead to secondary health crises, such as measles outbreaks, during or after the pandemic's recovery phase. Such setbacks could exacerbate the economic impact, morbidity, and mortality associated with the pandemic, underscoring the importance of sustaining immunization services without interruption.⁴¹

In the present study, it was observed that the Fear of COVID-19 positively influenced the sub-dimensions of perceived susceptibility, perceived severity, perceived benefits, and health motivation in the PAVS-HBM. Although parents' attitudes toward vaccination were positively impacted, the fact that most participants delayed their children's vaccinations indicates that these positive attitudes did not necessarily translate into action. Media coverage highlighting the importance of immunization during the COVID-19 pandemic, along with news related to vaccines, may have contributed to the positive shift in vaccination attitudes. The positive influence of media on attitudes suggests that it could also play a crucial role in converting these attitudes into actual behavior. In a press release, the WHO and the United Nations Children's Fund highlighted the importance of maintaining routine immunization services during the COVID-19 pandemic.¹¹ As a result, the WHO urged coordinated efforts to prevent disruptions to immunization services at the pandemic's onset and issued guidelines to support vaccination programs.¹⁰ Media coverage of these statements, discussions about COVID-19, and assurances that safety measures are in place for routine immunizations could aid in translating positive attitudes into actual vaccination actions, promoting continuity in immunization practices even during crisis periods.

Various measures like restriction of elective hospital consultation, curfew for individuals under 18 and over 65 years old, closures of public areas, and schools have been implemented in Turkey during the pandemic, which affected vaccination efforts.^{43,44} In particular, travel restrictions may have limited parents' access to healthcare services. For families living in rural or remote areas, securing vaccination appointments and getting their children vaccinated became increasingly challenging. Additionally, curfews imposed on individuals under the age of 20 and over 65, as part of the "Stay at Home Türkiye" initiative, may have reduced opportunities for parents to have their children vaccinated and restricted access to healthcare services. These restrictions could have made it difficult for parents to schedule

vaccination appointments. The closure of schools also disrupted family routines and may have led some parents to view vaccinations as a less urgent need. Parents may feel less motivated to keep track of vaccination schedules for their children who are not attending school. Moreover, the misinterpretation of public health messages, such as the "Life Fits into Home" campaign⁴⁴ may have heightened stress and risk perception among parents, causing some to avoid or hesitate in seeking healthcare services during the pandemic.⁴⁵ While the "Stay at Home Türkiye" campaign was initiated to protect public health, it may have suggested to parents that routine vaccinations should be postponed.⁴⁴

In conclusion, the pandemic-related measures in Türkiye^{44,46} likely contributed to delayed vaccinations among children and increased COVID-19-related fears, fostering uncertainty around vaccination. These restrictions may have impacted parents' healthcare access and attitudes toward vaccination. Moving forward, addressing these challenges through clear communication and improved access to supportive healthcare services will be essential to rebuild trust and commitment in vaccination programs.

This study has several limitations. As data were collected through an online questionnaire, individuals who did not meet the inclusion criteria—specifically those without internet access or who did not use social media—were excluded from participation. Consequently, the findings may not fully represent individuals with limited digital access. Additionally, the study relies on self-reported data, which may introduce response bias. The results are specific to the sample group and, therefore, cannot be generalized to the broader population. Furthermore, while online data collection facilitated widespread participation, it may have influenced the demographic composition of the sample, particularly in terms of gender distribution. The majority of participants were mothers, likely reflecting the socio-cultural context of Türkiye, where mothers are typically the primary caregivers responsible for children's healthcare decisions, including vaccination. This may have led to their greater engagement with online parenting communities and higher participation in the study.

Future research should implement targeted recruitment strategies to ensure a more balanced representation of fathers and other underrepresented groups. Another notable limitation is the lack of participant identity verification during data collection via Google Forms. Since the survey did not request email addresses or names and did not track IP addresses, it was not possible to confirm whether the same individual submitted multiple responses. While these measures ensured participant anonymity and confidentiality, they also limited the ability to prevent duplicate submissions. Despite these limitations, the study provides valuable insights into the impact of COVID-19-related fears on parental vaccination decisions. Future studies should consider mixed methods

of approaches or longitudinal designs to enhance the validity, depth, and generalizability of these findings. Additionally, implementing alternative data collection methods, such as unique participation codes or controlled survey distribution, could improve data integrity while maintaining ethical research standards.

Understanding parents' decisions to delay vaccinations during COVID-19 provides valuable insights for future global or national health crises. These insights highlight the importance of clear communication and proactive preparedness to address factors affecting parental adherence to vaccination schedules during contagious disease outbreaks. To mitigate the impact of fear-driven vaccine hesitancy in future crises, targeted strategies should be developed. Implementing real-time digital communication strategies is essential to counter misinformation and provide accurate, evidence-based information. Additionally, tailored counseling by healthcare professionals, particularly nurses, can help address individual concerns and reinforce trust in vaccination. Furthermore, ensuring equitable access to vaccination services, even during lockdown periods, is crucial to maintaining immunization coverage and preventing delays in childhood vaccinations. Public health messages, such as "Stay at Home," should integrate guidance on maintaining access to crucial health services, like childhood vaccinations. Ensuring the resilience of vaccination services in healthcare facilities during extraordinary circumstances, such as pandemics, requires adequate personnel, robust logistical support, and effective supply chain management. Establishing mobile vaccination units can enhance access to immunization services, particularly in areas with limited transportation infrastructure. To address misinformation, collaboration between health ministries and non-governmental organizations is essential to disseminate accurate and evidence-based information through digital platforms. Additionally, implementing "catch-up vaccination days" can help mitigate the disruptions in immunization coverage caused by public health emergencies.

CONCLUSIONS

The study demonstrated that fear of COVID-19 positively influenced parental attitudes toward vaccination; however, it also contributed to delays in childhood immunizations. Additionally, parents with higher levels of fear regarding COVID-19 exhibited stronger perceptions of the benefits of vaccination and greater health motivation. Furthermore, the findings highlighted the critical role of healthcare professionals, particularly nurses, in ensuring that these positive attitudes are effectively translated into timely vaccination behaviors. Strengthening international cooperation is also crucial for integrating global vaccination strategies and ensuring the continuity of immunization programs during crises. Additionally, further research is essential to bridge the gap between

positive vaccination attitudes and actual practices, helping to improve vaccination coverage and strengthen healthcare systems' resilience in maintaining preventive services during future pandemics. Future research can explore longitudinal patterns of vaccine hesitancy beyond the COVID-19 pandemic to determine whether such fears have long-term implications on routine immunization behaviors.

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CONFLICT OF INTEREST

None declared.

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