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Knowledge Levels and Attitudes of Pediatric Physicians Regarding Meningococcal Infections and Vaccines: A Cross-Sectional Study

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Abstract

Objective

Invasive meningococcal disease (IMD) clinically manifests as meningitis, meningococcemia, or a combination of both. Globally, approximately 1.2 million meningococcal cases are reported annually, resulting in 135,000 deaths. Despite meningococcal infections being a significant public health concern, widespread vaccination is not commonly practiced. The aim of this study is to evaluate the knowledge levels and attitudes of pediatric specialists and assistant doctors regarding meningococcal infections and associated vaccines.

Material and Method

This descriptive cross-sectional study included pediatric specialists and assistant doctors working in Antalya. During the study period, 170 pediatricians were identified, and it was aimed to reach at least 80% of this population. A total of 150 participants, selected via snowball sampling, participated in the survey. Data collection was carried out through face-to-face interviews and online questionnaires.

Results

Of the participants, 72.7% were pediatric specialists and 27.3% were assistant doctors. The conjugate meningococcal vaccine was recommended by 68% of the participants for all patients, by 20% for high-risk patients only, while 12% did not recommend the vaccine. The primary reasons for this hesitancy included the cost of the vaccine, concerns about adverse effects, perceptions of low vaccine efficacy, and the rarity of the disease. Additionally, 47.4% of the participants suggested that the conjugate meningococcal vaccine should be included in the national immunization schedule, followed by 39.3% who recommended the rotavirus vaccine and 13.3% who recommended the human papillomavirus (HPV) vaccine.

Conclusion

Our study found that pediatric specialists and assistant doctors had sufficient knowledge and generally positive attitudes towards Neisseria meningitidis infections and vaccines. However, the most significant barriers to vaccine administration were identified as cost, concerns about adverse effects, and the perception of low vaccine efficacy. It is anticipated that improving the knowledge and awareness of pediatricians will positively influence vaccine acceptance.

Keywords: Meningococcal vaccine, pediatricians, vaccine hesitancy, attitudes

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Introduction

Invasive meningococcal disease (IMD) progresses clinically as meningitis, meningococcemia, or both. Approximately 1.2 million meningococcal cases are seen annually worldwide, and 135 thousand of them lose their lives (1). Meningitis is a globally prevalent disease, with Neisseria meningitidis serotypes and epidemiological trends varying significantly across geographic regions. The disease burden is largely due to serogroups A, B, C, W, and Y. Serogroups B (MenB) and serogroup C (MenC) account for the majority of meningitis cases in Europe and the United States (1, 2). Except for the neonatal period, the most common cause of bacterial meningitis in the 3-month-10 age group is Streptococcus pneumoniae, while the most common cause in the 10-18 age group is Neisseria meningitidis. (4). Although the agents of acute bacterial-purulent meningitis vary by geographical region and year, Streptococcus pneumoniae and Neisseria meningitidis are among the most common meningitis agents worldwide (5). For treatment, there are five licensed conjugate meningococcal vaccines in Turkey: MenACWY-TT (NimenrixTM), MenACWY-DT (MenactraTM), MenACWY-CRM (MenveoTM), MenQuadfi (MenACWY-TT) containing the ACYW serotype and MenB-4C (Bexero) containing the meningococcal B serotype (3, 4). Although menin-gococcal infections are a significant public health problem, vaccination is not widely practiced (5). Studies have shown that there is a lack of knowledge among parents about IMD vaccines and the vaccination status of their children (6-11). When parents are given accurate information, they are generally willing to have their children vaccinated (6, 10, 12, 13). Often, however, inadequate recommendations from family physicians and pediatricians contributes to many parents not getting their children vaccinated (6). Previous studies have shown a strong relationship between healthcare professionals' knowledge and attitudes about vaccines, their frequency of recommending vaccines to their patients, and the rate at which their patients get vaccinated (14).

In order to understand inadequate vaccination rates and to find solutions, it is of great importance to identify the barriers to vaccination at the level of healthcare professionals and healthcare institutions. In this context, the evaluation of the knowledge and attitudes of healthcare professionals, especially pediatricians regarding IMD and vaccines, plays a critical role in preventing and reducing the spread of meningococcal infections. This study aimed to determine the knowledge and opinions of pediatricians and pediatric residents regarding meningococcal infections and related vaccines.

Material and Method

This cross-sectional-descriptive study consists of pediatric specialists and pediatric residents working in various hospitals in Antalya. During the period when the study was conducted, it was determined that a total of 170 pediatric specialists and pediatric residents were working in Antalya. We aimed to reach at least 80% of the healthcare providers in the area, which provides an acceptable representative power in terms of epidemiological studies. Snowball sampling technique, one of the non-probability sampling methods, was used to determine the participants. The data collection process was carried out online through face-to-face interviews and Google Forms between September 10, 2022 and May 10, 2023. A total of 150 participants were enrolled in the study.

Statistical Analysis

Statistical analysis was analyzed using SPSS 22 program. Descriptive statistics were presented as numbers and percentages. Chi-square tests were used to compare categorical variables in independent groups. A p-value of less than 0.05 was considered statistically significant.

Results

The sociodemographic characteristics of the participants are presented in Table 1. Twenty-eight percent (n=42) of the participants were less than 30 years old, 58.7% (n=88) were female, 78% (n=117) were married, and 62.7% (n=94) had children. Seventy-two-point seven percent (n=109) of the participants were pediatricians and 34% (n=51) worked in a private hospital.

Among the most common causes of bacterial meningitis, 52% of the participants stated meningococcus (N. meningitidis) and 39.3% stated pneumococcus (S. pneumoniae). Regarding the transmission route of meningococcal meningitis, 97.3% of the participants stated that transmission occurs via droplets, and 79.3% stated that the only reservoir is humans. When asked about risk factors for meningococcal infection, immunodeficiency was stated as 97.3%, travel to risky areas as 96%, splenectomy as 94.7%, under the age of two as 86.7%, overcrowding as 69.3%, having had a viral upper respiratory tract infection as 22.7%, smoking as 22.7% and adolescent age group as 22% (Table 2).

Table 1 Sociodemographic characteristics of participants.

Sociodemographic Characteristics	n	%
Age		
≥ 30 years	42	28.0
31-40 Years	34	22.7
41-50 Years	35	23.3
51-60 Years	25	16.7
≤ 61 years	14	9.3
Gender		
Male	62	41.3
Female	88	58.7
Marital Status		
Married	117	78.0
Single	33	22.0
Having Children		
Has Children	94	62.7
No Children	56	37.3
Hospital Where Worked		
State Hospital	30	20.0
University	69	46.0
Private Hospital/Examination	51	34.0
Experience		
Specialist	109	72.7
Resident	41	27.3

When asked which strains cause IMD in our country, 94% of the participants responded as serotype W, 78% as serotype A, 77.3% as serotype B and Y, and 22.7% as serotype X. When asked about the age of administration of conjugate pneumococcal vaccines, 80.7% of the participants responded as 2 months, and 10.7% as 2 years. When asked whether polysaccharide meningococcal vaccines should be administered to children under the age of 2, 59.3% of the participants responded as no. When asked about the contents of conjugate meningococcal vaccines, 98.7% of the participants stated that the vaccine had 4 components (A, C, Y, W), and 80% stated that it had a single component (B). When asked about protection methods against IMD, 98.7% of the participants responded with vaccination and 67.3% responded with post-exposure chemoprophylaxis. When asked whether lifelong immunity is formed after meningococcal infection, 80% of the participants responded with no. When asked about the most common sequela after IMD, 89.3% of the participants responded with hearing loss (Table 2).

Sixty-eight percent of participants recommended conjugated meningococcal vaccine to all patients and 20.0% to risky patients, while 12.0% stated that they did not recommend meningococcal vaccine. The most frequently stated reason for not recommending meningococcal vaccine was cost (27.3%). The rate of participants wanting their own children to have conjugated meningococcal vaccine was 94.6%. When the actual vaccination status was evaluated, 60.7% of the participants stated that they had their children vaccinated, while 10.0% stated that they had not. It was determined that 98.7% of the participants viewed meningococcal vaccine positively, and recommended

Table 2 Knowledge levels about meningococcal vaccine

	n	%
The Most Common Cause of Bacterial Meningitis		
Meningococcus	78	52.0
Pneumococcus*	59	39.3
Hib	13	8.7
Meningococcus Meningitis Transmission Modes		
Droplet*	146	97.3
Contact Route	3	2.0
Contaminated Food and Water	1	0.7
Meningococcal Infection Host		
Only Human*	119	79.3
Human. mammals	30	20.0
Human. poultry	1	0.7
Human. cold-blooded animals	0	0.0
Meningococcal Infection Risk Factors**		
Splenectomy*	142	94.7
Immunodeficiency*	145	97.3
Travel to Risky Areas*	144	96.0
Under 2 Years of Age*	130	86.7
Overcrowding*	104	69.3
Having Viral Upper Respiratory Tract Infection*	34	22.7
Smoking*	34	22.7
Adolescent Age Group*	33	22.0
Meningococcal Strains That Cause Invasive Meningococcal Disease**		
A*	117	78.0
X	34	22.7
B*	116	77.3
C*	108	72.0
Y*	116	77.3
W*	141	94.0
Age at which conjugated meningococcal vaccines can be administered		
2 months*	121	80.7
1 year	5	3.3
9 months	8	5.3
2 years	16	10.7
Can polysaccharide meningococcal vaccines be administered to children under 2 years of age?		
Yes	61	40.7
No*	89	59.3
Invasive Meningococcal Infection Agents**		
4 Components (A, C, Y, W)*	148	98.7
Single Component (B)*	120	80.0
Single Component (C)	5	3.3
Single Component (X)	1	0.7
Invasive Meningococcal Disease Prevention Methods**		
Vaccination*	148	98.7
Droplet Isolation*	78	52.0
Contact Isolation	63	42.0
Post-Contact Chemoprophylaxis*	101	67.3
Provides Lifelong Immunity After Meningococcal Infection		
Yes	30	20.0
No*	120	80.0
The Most Common Sequelae After Invasive Meningococcal Infection		
Hearing Loss*	134	89.3
Convulsion	5	3.3
Extremity Amputation	8	5.3
Mental Retardation	3	2.0

* Correct Answer; ** More than one option is marked

Table 3 Participants' attitudes about meningococcal vaccine

	n	%
Recommend Meningococcal Vaccine		
Recommend to All Patients	102	68.0
Recommend to Risky Patients	30	20.0
Do Not Recommend18 12.0	18	12.0
Reasons for Not Recommending Meningococcal Vaccine*		
Cost	41	27.3
Infrequency of Disease	11	7.3
Unwanted Effect	13	8.7
Low Effectiveness of Vaccine	13	8.7
Wanting to Have Meningococcal Vaccine for Your Child		
Yes	142	94.6
No	8	5.3
Status of Having Meningococcal Vaccine for Your Child		
Yes	91	60.7
No	15	10.0
I Don't Have a Child	44	29.3
Wanting Meningococcal Vaccine to Be Included in the National Vaccination Scheme		
Yes	148	98.7
No	2	1.3
Vaccine Desired to Be Included in the National Immunization Scheme as a Priority		
Conjugated Meningococcal Vaccines	71	47.4
Rota Virus Vaccine	59	39.3
Human Papilloma Virus Vaccine	20	13.3

* More than one option is marked

it to be included in the national vaccination schedule. Among the vaccines that the participants wanted to be included in the national immunization schedule as a priority, 47.4% responded as conjugated meningococcal vaccines and 39.3% as rotavirus vaccine (Table 3).

The comparison of the participants' attitudes towards meningococcal vaccine with the institution they work for is given in Table 4. Of the physicians working in private hospitals, 76.4% recommend the vaccine to all patients, while 26.1% of the physicians working in university recommend it only to risky patients. Those working in state hospitals (16.7%) did not recommend the vaccine. There was no significant difference in the status of recommending the vaccine according to the institution they work in (p=0.335). Among the reasons for not recommending the meningococcal vaccine, 39.1% of the physicians working in university cited the cost, while 16.7% of the physicians working in private and state hospitals put forward the undesirable effects (p=0.011). All the physicians working in public hospitals and 96.1% of the physicians working in private hospitals responded positively to the request to have their children vaccinated with conjugated meningococcal vaccine (p=0.179). Of physicians working in private hospitals, 88.9% had their children vaccinated against meningococcus, while university and state hospital physicians were 82.8% 80%, respectively (p=0.593). There was no significant difference in terms of the

Table 4 Evaluation of participants' attitudes towards meningococcal vaccine according to the institution they work for.

	State Hospital n (%)	University Hospital n (%)	Private Hospital n (%)	p*
Recommend Meningococcal Vaccine				
To All Patients	19 (63.3)	44 (63.8)	39 (76.4)	0.335
To Risk Patients	6 (20.0)	18 (26.1)	6 (11.8)	
I Do Not Recommend	5 (16.7)	7 (10.1)	6 (11.8)	
Reasons for Not Recommending Meningococcal Vaccine				
Cost	5 (16.7)	27 (39.1)	9 (16.7)	**0.011**
Infrequency of Disease	1 (3.3)	8 (11.6)	2 (3.9)	0.181
Unwanted Effect	5 (16.7)	8 (11.6)	0 (0.0)	**0.018**
Low Effectiveness of Vaccine	2 (6.7)	9 (13.0)	2 (3.9)	0.195
Willingness to Have Meningococcal Vaccine for Your Child				
Yes	30 (100.0)	63 (91.3)	49 (96.1)	0.179
No	0 (0.0)	6 (8.7)	2 (3.9)	
Status of Having Meningococcal Vaccine for Your Child				
Yes	16 (80.0)	24 (82.8)	40 (88.9)	0.593
No	4 (20.0)	5 (17.2)	5 (11.1)	
Willing Meningococcal Vaccine to Be Included in the National Immunization Scheme				
Yes	30 (100.0)	68 (98.6)	50 (98.0)	0.754
No	0 (0.0)	1 (1.4)	1 (2.0)	
Vaccine Desired to Be Included in the National Immunization Scheme as a Priority				
Conjugated Meningococcal Vaccines	17 (56.7)	33 (47.8)	21 (41.2)	0.218
Rota Virus Vaccine	9 (30.0)	24 (34.8)	26 (51.0)	
Human Papilloma Virus Vaccine	4 (13.3)	12 (17.4)	4 (7.8)	

institutions worked with and the non-routine vaccines that were requested to be included in the national vaccination program (p=0.218).

The comparison of the participants' professional experience and their attitudes towards meningococcal vaccination is presented in Table 5. Specialist physicians (71.6%) recommended conjugate meningococcal vaccine to all patients, while 29.3% of resident physicians recommended it only to risky patients. Resident physicians (12.2%) stated that they did not recommend the vaccine (p=0.205). Among the reasons for not recommending conjugate meningococcal vaccine, the cost of the vaccine was observed to be the most common reason for 25.7% of specialist physicians and 31.7% of resident physicians (p=0.595). Specialist physicians (95.4%) and resident physicians (92.7%) gave a positive answer to the question of whether they would have their children vaccinated with meningococcal vaccine (p=0.684). It was observed that 85.7% of specialists and 80% of resident physicians administer meningococcal vaccine to their children (p=1.000). In the evaluation of non-routine vaccines recommended to be included in the national immunization schedule, it was observed that conjugate meningococcal vaccine was recommended by 48.6% of specialists and 43.9% of resident physicians. Interestingly, rotavirus vaccine was supported by 42.2% of specialists and 31.7% of resident physicians, while HPV vaccine was recommended by 9.2% of specialists and 24.4% of resident physicians (p=0.046) (Table 5).

Table 5 Evaluation of participants' attitudes towards meningococcal vaccine according to their professional experience.

	Specialist n (%)	Resident n (%)	p*
Recommend Meningococcal Vaccine			
To All Patients	78 (71.6)	24 (58.5)	0.205
To Risk Patients	18 (16.5)	12 (29.3)	
I Do Not Recommend	13 (11.9)	5 (12.2)	
Reasons for Not Recommending Meningococcal Vaccine			
Cost	28 (25.7)	13 (31.7)	0.595
Infrequency of Disease	5 (4.6)	6 (14.6)	0.071
Unwanted Effect	7 (6.4)	6 (14.6)	0.188
Low Effectiveness of Vaccine	7 (6.4)	6 (14.6)	0.188
Willingness to Have Meningococcal Vaccine for Your Child			
Yes	104 (95.4)	38 (92.7)	0.684
No	5 (4.6)	3 (7.3)	
Status of Having Meningococcal Vaccine for Your Child			
Yes	72 (85.7)	8 (80.0)	0.641
No	12 (14.3)	2 (20.0)	
Willing Meningococcal Vaccine to Be Included in the National Immunization Scheme			
Yes	107 (98.2)	41 (100.0)	1.000
No	2 (1.8)	0 (0.0)	
Vaccine Desired to Be Included in the National Immunization Scheme as a Priority			
Conjugated Meningococcal Vaccines	53 (48.6)	18 (43.9)	**0.046**
Rota Virus Vaccine	46 (42.2)	13 (31.7)	
Human Papilloma Virus Vaccine	10 (9.2)	10 (24.4)	

Discussion

In this study, the knowledge and opinions of pediatric specialists and residents about meningococcal infections and vaccines were evaluated. The findings contributed to determining the vaccine awareness and attitudes of healthcare professionals and paved the way for the development of strategic recommendations to improve the current situation regarding meningococcal vaccination.

In our study, the awareness of the participants regarding the bacterial meningitis agents was examined and the most frequently reported pathogens were determined as Neisseria meningitidis (52%) and Streptococcus pneumoniae (39.3%). With the widespread use of Haemophilus influenzae type b (Hib) and 13-valent pneumococcal conjugate vaccines in children, a general decrease in bacterial meningitis cases was observed. However, Streptococcus pneumoniae still remains one of the leading causes of meningitis in children. In addition, it was reported that the frequency of Neisseria meningitidis infections caused by Serogroup W and Serogroup B increased. The participants were aware of the bacterial meningitis agents and their frequency (15-17).

Participants' knowledge about the transmission routes and risk factors of meningococcal infections was also evaluated. Participants (79.3%) reported that humans are the only reservoir for meningococcal infections, and 97.3% reported that transmission occurs via

droplets. Among the risk factors, immunodeficiency (97.3%), splenectomy (94.7%), travel to risky areas (96%), and children under the age of two (86.7%) were frequently mentioned. However, 78% of the participants did not consider respiratory tract infection, crowded environments, smoking or exposure, and the adolescent age group as risk factors. These findings indicate a lack of awareness that respiratory tract infections, smoking exposure, and crowded environments are important risk factors for meningococcal infections (18).

When asked whether permanent immunity can develop after meningococcal infections, 80% of participants correctly answered no. This shows that the knowledge that meningococcal infections can be recurrent and that protection with vaccination should be continued is widespread among healthcare workers. This information is of great importance for the continuity of vaccination strategies.

In our study, participants stated that the serotypes causing IMD in our country were 94% W serotype, 78% A serotype, 77.3% Y and B serotypes, and 72% C serotype. In the study conducted by Ceyhan et al., the most common serogroup was W between 2009-2016, while serogroup B was detected at the highest rate in the latest data from 2017. (15). In the study conducted by Güldemir et al., N. meningitidis serogroup B was identified as the most common causative agent (19). Our physicians were aware of the serogroups commonly seen in our country.

When participants were asked about the serotypes included in conjugated meningococcal vaccines in Turkey, 98.7% correctly identified the four-component vaccine containing ACYW serotypes, while 80% correctly identified the single-component vaccine containing serotype B. In addition, 80.7% of participants correctly answered the age at which conjugated meningococcal vaccines should be administered, while 19.3% were unaware that the vaccine could be administered from two months of age onwards. In a cross-sectional study conducted in Italy among 200 pediatricians, only 28% of participants were aware of the vaccination program for children aged two and under (20). This situation shows that awareness of vaccination programs needs to be increased.

In our study, it was determined that 68% of the participants recommended conjugate meningococcal vaccines to all patients, while 20% recommended them only to risky patients. In the study conducted by Dinleyici et al. with pediatricians and pediatric infectious disease subspecialists, it was stated that 56.3% of the participants recommended conjugate meningococcal vaccination in their daily practice. When all participants were asked about their views on risk groups and routine use of meningococcal vaccines, the majority considered all children between the ages of 0-18 as a risk group. In Turkey, the vast majority of pediatricians recommend conjugate meningococcal vaccines in their daily practice. (16).

In our study, it was determined that 12% of the participants did not recommend meningococcal vaccination. The reasons for this reluctance of physicians were the cost of the vaccine, its undesirable effects, the perception that it is low effective and the rarity of the disease. In a study conducted in Latin America, it was determined that the biggest obstacles to not getting vaccinated were low education level, lack of awareness about diseases and vaccines, religious and cultural beliefs and negative socioeconomic factors. (21). Parental barriers to IMD vaccination include lack of knowledge, low perceived value of vaccines, and misperceptions about the health threats posed by vaccine-preventable diseases (8, 9, 11). In addition, the fact that IMD vaccines are not included in the national vaccination schedule may lead parents to consider these vaccines as less important (6). Such perceptions contribute to lower vaccination rates by reducing parents' trust in vaccines for their children. According to the World Health Organization (WHO), vaccine hesitancy is considered one of the top 10 threats to global health (22). In Turkey, the vaccine refusal rate in children under 2 years of age was determined as 5.9 per thousand in 2017, a 1.7-fold increase compared to 2016 (23-25). The WHO's vaccine advisory group has identified complacency, difficulties in accessing vaccines and lack of trust as the main reasons behind this hesitancy (22). Vaccination hesitancy must be addressed. Because studies have shown that the majority of parents primarily seek information and advice about vaccine-preventable diseases, vaccines, and recommended vaccination schedules from their children's healthcare providers (26, 27). The primary care physician's recommendation, the effectiveness of the vaccine, and its cost are important factors in the decision to vaccinate. When healthcare providers can effectively communicate with parents about the benefits, risks, value and necessity of vaccines, and vaccine safety, parents appear to be more confident in their decisions (28).

It was determined that 94.6% of the participants were willing to vaccinate their children and 60% had vaccinated their children. Thirty-three-point six percent of family physicians vaccinated their children with

conjugated meningococcal vaccine, and it was found that pediatricians had a higher rate of vaccinating their children than other physicians (5).

In our study, 98.7% of the participants recommended that conjugate meningococcal vaccines be included in the national immunization schedule. In the study conducted by Özdemir et al., 81.7% of the participants, in the study conducted by Duygu et al., 69.4% of the participants, and in the study conducted by Dinleyici et al., 67% of the participants stated that meningitis vaccines should be included in the national immunization schedule (5, 16, 29).

In our study, 47.4% of the participants stated that conjugate meningococcal vaccine, 39.3% rotavirus vaccine and 13.3% HPV vaccine are non-routine vaccines that should be included in the national immunization schedule as a priority. It was determined that physicians administer rotavirus and meningococcal vaccines to their children most frequently and it was observed that this situation is consistent with the recommendations of physicians (30). Unlike our study, in the study conducted by Özdemir et al., 79.3% of pediatricians recommended the inclusion of rotavirus vaccine and 68.9% of pediatricians recommended the inclusion of conjugate meningococcal vaccine in the national immunization schedule (29).

When the attitudes of physicians towards meningococcal vaccine were evaluated according to the institution they worked in, no statistically significant difference was found between physicians working in university, public hospitals and private hospitals. However, the highest rate of recommending conjugate meningococcal vaccine was observed among physicians working in private hospitals; this group was followed by physicians working in university and public hospitals, respectively. The reasons for not recommending meningococcal vaccine by physicians working in university and public hospitals were cost and undesirable side effects. The better financial situation of the patient profile in private hospitals may explain why physicians working in these hospitals recommend the vaccine more often. Similar findings were also revealed in a study conducted in Italy. The socioeconomic determinants of vaccine hesitancy and refusal were examined and it was concluded that the economic difficulties experienced by families were one of the determining factors of vaccine hesitancy (31).

When the attitudes towards conjugated meningococcal vaccines were examined according to the experience level of the participants, no significant difference was found between pediatric specialists and pediatric residents. Pediatric specialists (71.6%) and pediatric residents (58.5%) stated that they recommend the vaccine to all patients. Although the frequency of recommending the vaccine was higher in the specialist group, the reason why a statistically significant difference could not be determined may be that the number of resident physicians included in the study was lower than that of specialist physicians. However, statistically significant differences were observed in the responses given to the question of non-routine vaccines that should be added to the national immunization schedule. While pediatric specialists recommended conjugated pneumococcal vaccine and rotavirus vaccine as the priority, pediatric residents recommended HPV vaccine as the first priority.

Conclusion

Our study revealed that pediatricians and pediatric residents have sufficient knowledge about N. meningitidis infections and related vaccines and generally have a positive attitude. However, lack of awareness of some risk factors and inadequate knowledge about the vaccine administration schedule were striking findings. In addition, cost and inadequate physician recommendations were found to be the most important barriers to vaccine administration. These findings indicate that training programs for healthcare professionals should be strengthened and vaccination awareness should be increased. In addition, the inclusion of conjugated meningococcal vaccines in the national immunization schedule will increase vaccine acceptance rates. It has been demonstrated that healthcare professionals' knowledge levels and positive attitudes towards vaccination are important factors in increasing vaccine acceptance in society.

Conflict of Interest Statement
There is no conflict of interest among the authors.

Ethical Approval
Approval for the study was obtained from the Antalya Education and Research Hospital Non-Interventional Clinical Research Ethics Committee (date: 29/09/2022, decision no: 18/21). Written consent was obtained from the participants and the study was conducted in accordance with the Declaration of Helsinki.

Consent to Participate and Publish
Informed consent and written permission to publish the data were obtained from all individuals involved in the study.

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Availability of Data and Materials
Data can be requested from the authors.

Authors Contributions
HA: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Validation; Visualization; Writing-original draft; Resources; Supervision; Writing-review & editing.

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