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Determining Knowledge, Attitudes, Behaviors, and Educational Needs Regarding Childhood Vaccines: A Case Study of Healthcare Workers

Çocukluk Çağı Aşı Bilgi, Tutum, Davranışları ve Eğitim İhtiyaçlarının Belirlenmesi: Sağlık Çalışanları Örneği

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Abstract

Objective: Immunization is the most effective public health service after providing clean water for community health. However, vaccine hesitancy causes delays in vaccine acceptance, and this has been identified as a global health threat by the World Health Organization. Misinformation and misleading content increase vaccine skepticism. Healthcare workers need to guide families with complete and accurate vaccine information. Evaluating the knowledge and attitudes of healthcare workers about vaccines is crucial for developing strategies to address vaccine hesitancy.

Material and Methods: A survey was prepared to assess knowledge, attitudes, and behaviors regarding childhood vaccines. The study sample consisted of 1.314 healthcare workers from seven provinces.

Results: The majority of healthcare workers are knowledgeable about the necessity and side effects of childhood vaccines. Female healthcare workers have significantly higher vaccine knowledge scores compared to males.

Conclusion: Healthcare workers' knowledge of childhood vaccines is generally good, and it should be supported through immunization and training activities, especially in primary healthcare services.

Keywords: Vaccine, immunization, healthcare worker, knowledge, attitude

Öz

Giriş: Toplum sağlığı için bağışıklama, temiz sudan sonra en etkili halk sağlığı hizmetidir. Ancak aşı tereddütü, aşıların kabulünde gecikmelere yol açmakta ve bu durum Dünya Sağlık Örgütü tarafından küresel sağlık tehdidi olarak tanımlanmaktadır. Bilgi kirliliği ve yanlış yönlendirmeler aşı şüpheciliğini arttırmaktadır. Sağlık çalışanlarının tam ve doğru aşı bilgisi ile ailelere rehberlik etmesi önemlidir. Sağlık çalışanlarının aşı bilgisi ve tutumlarının değerlendirilmesi, aşı kararsızlığına yönelik stratejilerin geliştirilmesi için kritik bir öneme sahiptir.

Gereç ve Yöntemler: Bu çalışmada çocukluk çağı aşıları hakkında bilgi, tutum ve davranışları üzerine araştırmacılar tarafından anket hazırlanmıştır. Çalışmanın örneklemini yedi ilden 1.314 sağlık çalışanı oluşturmuştur.

Bulgular: Sağlık çalışanlarının çoğunluğu çocukluk çağı aşılarının gerekliliği ve yan etkileri hakkında bilgi sahibidir. Kadın sağlık çalışanlarının aşı bilgi puanları, erkeklere göre anlamlı derecede daha yüksektir.

Sonuç: Sağlık çalışanlarının çocukluk çağı aşıları konusundaki bilgi düzeyi genel olarak iyi bir seviyededir. Ancak birinci basamak sağlık hizmetlerinde bağışıklama ve eğitim faaliyetleriyle desteklenmesi gerekmektedir.

Anahtar Kelimeler: Aşı, bağışıklama, sağlık çalışanı, bilgi, tutum

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Introduction

After the provision of clean water, the most useful and effective public health service is immunization. Especially since 1974, 154 million deaths have been prevented with the success of the expanded immunization program. For every death prevented, an average of 66 years of healthy life have been gained. In addition, a 40% reduction in global infant mortality rates has been found by increasing social immunity (1). Despite these positive results, it is thought that hesitation about vaccines is increasing among parents. Vaccine hesitancy is defined as a delay in the acceptance or rejection of the vaccination service despite its provision (2). In 2019, the process of vaccine hesitancy was identified by World Health Organization (WHO) as one of the 10 major threats to global health (3).

In today's world where information dissemination is very fast, a skeptical perspective towards vaccines and vaccination practices that is not based on realistic or scientific data has started to develop with the widespread sharing and emergence of inaccurate and misleading content (4,5). However, during the coronavirus disease 2019 (COVID-19) pandemic, vaccines and vaccine-preventable diseases came to the agenda more frequently. Due to many factors such as differences in personal opinions, education levels, social environment, misdirection of beliefs, information sources, especially on social media, have increased to create a skeptical perspective against vaccines (6,7).

In order for the family to make the right choice due to the information asymmetry in healthcare services, the healthcare worker should have complete vaccine and immunization knowledge and should be able to answer questions completely and accurately (8).

The vaccination schedule established within the scope of the childhood vaccination program in our country was last updated by the Ministry of Health in 2020. All vaccines included in the expanded immunization program are voluntary and free of charge. It is imperative that the health worker who provides and administers the necessary vaccination information to parents has complete vaccination knowledge. The family is expected to access the information they need through the communication skills of the healthcare professional who constitutes a reliable source (9). Health professionals should be the most reliable and effective source of information about the vaccine, its content, storage conditions, undesirable effects, and the process and complications that may occur if it is not administered (10,11).

Based on the studies, it was aimed to evaluate the knowledge and attitudes of healthcare workers, especially family physicians and healthcare personnel working in primary healthcare organizations where vaccination services are provided. In addition, it is very important to measure the level of vaccine knowledge and attitudes of healthcare workers towards vaccination to develop strategies for vaccine hesitancy.

Materials and Methods

Research Design

The research is descriptive and correlational.

Ethical Aspects of the Research

It was determined that the implementation of the study was ethically appropriate with the permission document dated 22.11.2023 and numbered E2-23-5687 from the Ankara Bilkent City Hospital Clinical Research Ethics Committee No. 2.

Place and Time of the Study

The research was conducted in seven provinces in Türkiye, namely Trabzon, Van, Bursa, Antalya, Burdur, Kocaeli and Kırıkkale between November and December 2023.

Population and Sample of the Study

In this descriptive study, the sample was not selected, and the population of the study consisted of family physicians who participated in rational antibiotic use training in seven provinces in Türkiye between November-December 2023 and health personnel who took part in these trainings for different purposes. For the study, a survey was offered to 1502 healthcare professionals who participated in these trainings. A total of 1314 health workers who agreed to participate in the survey were included in the study.

While being a healthcare worker who participated in rational antibiotic use trainings in the provinces where the study was conducted was the inclusion criterion, healthcare personnel other than those who participated in these trainings were excluded from the study.

Data Collection

Healthcare workers who agreed to participate in the study were asked by the researchers face-to-face, by asking the survey questions to the participant or by giving the questionnaire form to the volunteers and filling it out by being present with them.

Data Collection Tools and Data Evaluation

The questionnaire used in the study consists of questions structured by the researchers and no validity and reliability analysis was conducted.

In part I, where sociodemographic characteristics were defined, a frequency table was created for six items: sex, age, occupation, years of experience in occupation, health education level, presence of children, number of children and age of the youngest child.

For the childhood vaccination schedule, in part II, five questions were asked to be answered according to the five-point Likert system (strongly disagree-strongly agree). In scoring, five points were given for correct answers, and 0 points were given for undecided and incorrect answers. For vaccine types, in part III; 11 questions were asked to answer live, inactive, toxoid options. Those who answered correctly were given five points and those who answered incorrectly were given 0 points.

For vaccine content knowledge, in part IV; there were six questions and in part V; there were eight questions about general vaccines. Five points were given to the correct answer, and 0 points were given to those who gave the wrong answer and those who had no idea.

In part VI of the vaccine attitude assessment, eigth questions were asked on a five-point Likert scale (strongly disagree-strongly agree), with five points given for correct answers and 0 points given for undecided and incorrect answers.

In addition, in part VII of the questionnaire; whether the participants were parents or not was questioned and the vaccination behaviors of those who had children were given five points to those who answered correctly from the six questions yes and no options and 0 points to those who answered incorrectly.

In the eighth part; the influence of Twitter (X), Youtube, Facebook, TikTok, Instagram, television and radio, which are defined as information sources or content providers that parents can access for vaccines, the propositions were grouped according to the answers given to four items and three reasons for vaccine hesitation and vaccine opposition, and frequency analysis was performed. There are six items to determine the training needs of the participants on the topics of vaccine content, vaccine disease, unwanted side effects after vaccination, vaccine storage, vaccine administration, vaccine communication from no knowledge to quite good five-point likert options from no knowledge to quite good, 0 points for no knowledge and incomplete knowledge, five points for adequate, good and quite good.

In addition, in the scoring system, in cases where the participants answered only one question and did not answer the other questions, 0 points were given for the unanswered questions in order to avoid missing values.

Data were analyzed with SPSS 27.0 (IBM SPSS Statistics) package program. Categorical variables are given as numbers and percentages.

The results were evaluated at 95% confidence interval and significance at $p< 0.05$ level.

Results

A total of 1502 healthcare professionals from Trabzon, Van, Bursa, Burdur, Antalya, Kocaeli, and Kırıkkale participated in the rational drug use training. The purpose of the study was explained to all participants, and they were offered to participate in the survey. A total of 1314 healthcare personnel in seven provinces agreed to participate in the study. The highest rate of participation in the survey was 83.9% in Kırıkkale province. In Burdur province, it was 77.1%, in Kocaeli province 74.9%, in Trabzon province 74.2%, in Bursa province 65.5%, in Antalya province 64% and in Van province 48.4% (Table 1).

Of the participants, 53.6% were females, 45.6% were males and 0.8% did not want to specify their sex.

When the distribution of age groups was analyzed, 1297 people indicated their age, with the age group 25-29 (n= 253) having the highest rate of 19.5%.

When education levels were analyzed, master's degree graduation (n= 1113) had the highest rate of 84.7% (Table 2).

Of the healthcare workers, 59.3% (n= 779) were parents, and among the health care workers with children, 50.2% (n= 389) had two children (Table 3).

Among the healthcare professionals, 76.7% were family physicians (n= 998), 10.2% were general practitioners, 5.3% were health service personnel, 4.4% were pediatricians, 2.2% were pharmacists and 1.2% were dentists. In terms of years of professional experience, 26 years and above was the group with the highest number of participants with 21.6% (n= 283) (Table 4).

Table 1. Provinces where the study was conducted and number of participants

Provinces (n= 1502)	Proposed to Participate in The Survey-Number (n= 1502)	Who Agreed to Participate in The Survey-Number (n= 1314)	Who Agreed to Participate in The Survey %
Trabzon	272	202	74.2
Van	357	173	48.4
Bursa	389	255	65.5
Antalya	487	312	64
Burdur	140	108	77.1
Kocaeli	263	197	74.9
Kırıkkale	81	68	83.9

Table 2. Sociodemographic characteristics of the participants

Sociodemographic Characteristics	Number	%
Sex (n= 1314)		
Male	599	45.6
Female	704	53.6
I do not want to specify	11	0.8
Age group (years) (n= 1297)		
Under 25	78	6.0
25-29	253	19.5
30-34	211	16.3
35-39	149	11.5
40-44	125	9.6
45-49	159	12.3
50-54	146	11.3
55-59	122	9.4
60-64	45	3.5
65-69	4	0.3
Education level (n= 1300)		
Associate degree	8	0.6
Undergraduate degree	93	7.1
Master's degree	1113	84.7
PhD	86	6.5

Table 3. Participants' parenthood status

Presence of Children (n= 1314)	Number	%
Yes	779	59.3
No	535	40.7
Number of children (n= 775)		
1	274	35.4
2	389	50.2
3	83	10.7
4	22	2.8
5	5	0.6
6	2	0.3
Youngest child age group (n= 704)		
15 years and under	481	68.3
Over 15 years old	223	31.7
Youngest child age group (n= 704)		
Under two years old	60	8.5
2-5 years	161	22.9
6-12 years old	166	23.6
12 years and older	317	45.0

For hepatitis A and hepatitis B vaccines, 83.6% responded that their vaccines were inactivated vaccines. 20.8% of all participants answered all 11 vaccines correctly.

Table 4. Participants' professional characteristics and professional experience

Occupational Characteristics	Number	%
Occupation (n= 1301)		
Family physician	998	76.7
General practitioner Dr.	133	10.2
Pharmacist	28	2.2
non-Physician healthcare workers	69	5.3
Dentist	16	1.2
Pediatrics specialist	57	4.4
Professional experience (years) (n= 1311)		
Under one year	163	12.4
1-5	234	17.8
6-10	193	14.7
11-15	162	12.4
16-20	96	7.3
21-25	180	13.7
26 and above	283	21.6

In the evaluation by sex, female participants scored significantly higher than male participants in terms of vaccination schedule knowledge score, vaccine types knowledge score and number of correct vaccine types ($p< 0.001$). On the other hand, there was no statistically significant difference between the sexes in terms of vaccine content knowledge score and general vaccines knowledge score ($p= 0.553$ and $p= 0.343$, respectively). These findings suggest that sex may affect the level of knowledge in some vaccine knowledge categories, but this effect is not statistically significant for each category (Table 5).

When the mean ± standard deviation (mean ± SD) values of the knowledge scores of the participants according to age groups were examined; there were statistically significant differences between the age groups in vaccine types knowledge score, vaccine types correct number, vaccine content knowledge score and general vaccines knowledge score. Younger age groups (25 and below) generally had higher knowledge scores, while some knowledge scores decreased with increasing age.

These results show that younger age groups have more knowledge about vaccines, but this knowledge decreases with increasing age. However, an increase in the general vaccine knowledge score was again observed in the age group of 65 years and over. This suggests that the experienced group may be more aware of general vaccination knowledge (Table 6).

The highest percentage of correct answers was 93.7% (n= 1212) who thought that the vaccines in the childhood vaccination schedule were useful for disease prevention. The natural immunity of children would not be sufficient, 92.2%

Table 5. Mean ± standard deviation values of participants' knowledge scores by gender

	Gender	Mean ± Standard Deviation	p
Vaccination schedule knowledge score	Male	22.1 ± 6.6	<0.001
	Female	23.4 ± 4.6	
Vaccine types knowledge score	Male	39.7 ± 12.7	<0.001
	Female	42.8 ± 11.7	
Vaccine types number of correct	Male	7.9 ± 2.5	<0.001
	Female	8.6 ± 2.3	
Vaccine content knowledge score	Male	15.1 ± 7.6	0.553
	Female	15.4 ± 7.7	
General vaccines knowledge score	Male	30.0 ± 6.3	0.343
	Female	29.7 ± 6.1	

(n= 1193) thought that breastfed children should be vaccinated, 90.3% (n= 1168) thought that vaccination was necessary, and 89.6% (n= 1160) thought that children should be vaccinated even if the children around them were vaccinated.

The question about adjuvant in vaccine content increases the effectiveness of the vaccine was answered correctly by 84.4% (n= 1030). The lowest percentage of correct answers were 23.4% (n= 285) that thiomersal is an organic component and 25.1% (n= 306) that it is digested and excreted from the body within one week.

Although polio is not seen in our country, 92.1% (n= 1167) agreed that vaccination is still necessary. 91.0% (n= 1153) stated that vaccines have side effects and 26.3% (n= 333) stated that vaccination should be postponed if the child's body temperature is high.

When the mean ± SD values of the knowledge scores of the participants according to the presence of children were examined, the vaccination schedule knowledge score was 22.5 ± 6.0 points on average, while participants without children scored 23.0 ± 5.4 points on average. As a result of statistical analysis, this difference was found to be significant (p= 0.015). Participants who had children (n= 1201) scored 39.7 ± 12.7 points on average, while participants who did not have children scored 42.8 ± 11.7 points on average. This difference was statistically significant (p< 0.001). The number of correct answers for vaccine types was 8.2 ± 2.4 on average, while participants who did not have children gave an average of 8.2 ± 2.5 correct answers. As a result of statistical analysis, this difference was not significant (p= 0.442). The vaccine content knowledge score was 15.8 ± 8.0 points on average, while participants without children scored 14.3 ± 7.0 points on average. This difference was statistically significant (p< 0.001). The mean score for general vaccines knowledge was 30.1 ± 6.3 points, while participants without children scored 29.6 ± 6.1 points. This difference was not statistically significant (p= 0.587).

It was found that having children led to differences in certain vaccine knowledge scores, but this difference was not statistically significant in every knowledge category. In particular, those who did not have children had higher vaccine schedule and vaccine types knowledge scores, while those who had children had higher vaccine content knowledge scores. No significant difference was found in the correct number of vaccine types and general vaccines knowledge scores (Table 7).

In response to the attitude questions of healthcare professionals; 90.4% (n= 1138) stated that they recommend childhood vaccines to their patients, 52.1% stated that they would recommend vaccines when they trust the company producing the vaccine, and 80.5% stated that healthcare professionals should be vaccine advocates to protect themselves and their environment. In addition, 89.7%, 90.2%, 91.2%, 91.2%, 91.5%, and 91.5% of movie artists, politicians, social media influencers, and voice artists, respectively, do not influence their decisions regarding the side effects of childhood vaccines.

Among the healthcare workers with children, 98.2% (n= 712) stated that they had their children vaccinated with all vaccines included in the vaccination calendar of the Ministry of Health, and 80.6% (n= 584) stated that they had their children vaccinated with paid vaccines. 88.7% (n= 643) stated that the number of vaccines in the childhood vaccination calendar was prepared in accordance with the needs, 74.9% (n= 543) stated that they would have that vaccine even if the vaccine had side effects, 23.9% (n= 173) stated that vaccines that are available on the market for a longer period of time are more reliable (Table 8).

Of the healthcare workers, 47.0% (n= 564) answered adequate, good and quite good for vaccine content information, 81.8% (n= 981) answered adequate, good and quite good for vaccine-disease relationship, and 74.8% (n= 897) answered adequate, good and quite good for vaccine communication.

Table 6. Mean ± standard deviation values of knowledge scores of participants according to age groups

	Mean ± Standard Deviation	p
Vaccination schedule knowledge score		
Age group (years) (n= 1278)		0.086
25 and below	24.1 ± 3.3	
25-34	22.8 ± 5.9	
35-44	22.0 ± 6.4	
45-54	22.8 ± 5.7	
55-64	22.9 ± 5.2	
65 and over	25.0 ± 0.0	
Vaccine types knowledge score		
Age group (years) (n= 1189)		0.007
25 and below	45.0 ± 9.1	
25-34	41.6 ± 12.6	
35-44	41.1 ± 12.4	
45-54	40.9 ± 12.2	
55-64	38.3 ± 12.8	
Vaccine types number of correct		
Age group (years) (n= 1189)		0.007
25 and below	9.0 ± 1.8	
25-34	8.3 ± 2.5	
35-44	8.2 ± 2.4	
45-54	8.1 ± 2.4	
55-64	7.7 ± 2.5	
65 and over	8.0 ± 1.8	
Vaccine content knowledge score		
Age group (years) (n= 1206)		**<0.001**
25 and below	13.0 ± 6.6	
25-34	14.5 ± 7.3	
35-44	15.4 ±7.5	
45-54	16.2 ± 8.2	
55-64	16.4 ± 7.3	
65 and over	9.2 ± 8.8	
General vaccines knowledge score		
Age group (years) (n= 1252)		**<0.001**
25 and below	31.6 ± 5.5	
25-34	28.7 ± 6.1	
35-44	29.9 ± 6.5	
45-54	30.8 ± 6.6	
55-64	30.8 ± 6.6	
65 and over	33.1 ± 7.0	

The table shows the mean and standard deviation values of each professional group in different categories of knowledge scores. It is seen that each occupational group has different levels of knowledge about vaccine knowledge and some groups have higher or lower scores in certain categories than other occupational groups. Vaccine schedule knowledge score: The highest scores were observed in pediatric specialists (23.3%) and the lowest scores were observed in

Table 7. Participants' knowledge scores according to the presence of children

	Mean ± Standard Deviation	p
Vaccination schedule knowledge score (n= 1294)		0.015
Yes	22.5 ± 6.0	
No	23.0 ± 5.4	
Vaccine types knowledge score (n= 1201)		**<0.001**
Yes	39.7 ± 12.7	
No	42.8 ± 11.7	
Vaccine types number of correct (n= 1201)		0.442
Yes	8.2 ± 2.4	
No	8.2 ± 2.5	
Vaccine content knowledge score (n= 1218)		**<0.001**
Yes	15.8 ± 8.0	
No	14.3 ± 7.0	
General vaccines knowledge score (n= 1267)		0.587
Yes	30.1 ± 6.3	
No	29.6 ± 6.1	

health service personnel (20.1%). Vaccine types knowledge score: Pediatricians (43.9%) and family medicine specialists (42.1%) received the highest scores, while pharmacists (27.2%) received the lowest score. Correct number of vaccine types: This is the highest score that can be obtained by answering all 11 questions correctly. Pediatricians (8.8%) had the highest number of correct answers, while pharmacists (5.4%) had the lowest number of correct answers. Vaccine content knowledge score: The highest scores were obtained by family physician specialists (15.8%) and pediatricians (15.7%). Health service personnel (10.2%) had the lowest score. In the general vaccines knowledge score: Pediatricians (31.6%) had the highest score, while health service personnel (23.0%) had the lowest score. These data show that there are significant differences between occupational groups and that some groups are more knowledgeable about vaccines than others. These statistically significant differences ($p< 0.001$) indicate that there are significant differences between the levels of vaccination knowledge of occupational groups (Table 9,10).

Healthcare workers reported that the families were informed about the vaccine and the disease it protects against before vaccination (80%), the families were informed about the undesirable side effects of vaccines before vaccination (80%), and for the parents who were hesitant about vaccination, they spent significant time to provide information (90%). Healthcare workers reported that they encountered 10% vaccine hesitant and 5% anti-vaccine parents in their service area (Table 11).

According to healthcare professionals, when asked about the three most common reasons for parents to be hesitant or against vaccination from their own experiences and from their patients, 30.8% (n= 405) answered side effects of vaccination. Social media was 26.8% (n= 352), lack of information about vaccination was 26.4% (n= 347), religious reasons was 18.6% (n= 245), vaccine content was 15.3% (n= 201), mistrust of vaccine was 14.9% (n= 196), autism was 13.6% (n= 179), and infertility was 11.3% (n= 148). When other reasons are examined, the following were among such reasons: sensitivity

Table 8. Average knowledge and attitude scores of health workers

	Mean ± Standard Deviation	Hydrangea (Smallest-Largest)
Vaccination schedule knowledge score (n= 1294)	22.7 ± 5.8	25 (0-25)
Vaccine types knowledge score (n= 1201)	41.2 ± 12.3	45 (0-55)
Vaccine ingredients knowledge score (n= 1218)	15.2 ± 7.6	15 (0-30)
Overall vaccine knowledge score (n= 1267)	29.9 ± 6.2	30 (0-40)
Vaccination attitude score towards the childhood vaccination schedule (n= 1259)	30.4 ± 7.8	30 (0-40)
Vaccination behavior attitude score of those with children (n= 725)	22.0 ± 5.7	25 (0-30)

Table 9. Mean ± standard deviation values of vaccine knowledge scores in occupational distribution

Profession Group	Vaccination Schedule Knowledge Score	Vaccine Types Knowledge Score	Vaccine Types Number of Correct	Vaccine Content Knowledge Score	General Vaccines Knowledge Score
Family medicine specialist	22.9 ± 5.5	41.8 ± 12.0	8.4 ± 2.4	15.8 ± 7.4	30.5 ± 6.0
General practitioner	22.7 ± 6.3	42.1 ± 11.1	8.4 ± 2.2	13.5 ± 7.1	29.8 ± 5.4
Pharmacist	20.7 ± 6.2	27.2 ± 12.1	5.4 ± 2.4	12.6 ± 8.2	24.7 ± 4.5
Health service personnel	20.1 ± 7.4	32.1 ± 14.0	6.4 ± 2.8	10.2 ± 8.6	23.0 ± 8.0
Dentist	21.6 ± 6.5	31.8 ± 15.3	6.4 ± 3.0	13.6 ± 8.6	27.9 ± 6.1
Specialist physician	23.3 ± 5.5	43.9 ± 10.7	8.8 ± 2.1	15.7 ± 7.0	31.6 ± 5.2

Table 10. Individual self-assessment of health workers on vaccination and immunization

	No Information		My Knowledge is Incomplete		Adequate		Good		Pretty Good	
Information on Individual Vaccination	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Vaccine content knowledge (n= 1197)	47	3.9	586	49.0	359	30.0	158	13.2	47	3.9
Vaccine disease association (n= 1196)	4	0.3	211	17.6	510	42.6	309	25.8	162	13.5
Unintended side effect after vaccination (n= 1194)	5	0.4	240	20.1	492	41.2	321	26.9	136	11.4
Vaccine storage (n= 1191)	19	1.6	249	20.9	418	35.1	279	23.4	226	19.0
Vaccination (n= 1187)	15	1.3	206	17.4	443	37.3	301	25.4	222	18.7
Vaccine communication (n= 1185)	27	2.3	261	22.0	414	34.9	297	25.1	186	15.7

Table 11. Percentage responses of health workers regarding the information and service they provide to the people they serve in their daily practices

	Mean ± Standard Deviation	Hydrangea	Minimum-Maximum
What percentage of families are informed about the vaccine and the disease it protects against before vaccination? (n= 1044)	64.7 ± 38.9	80	0-100
What percentage of families are informed about the adverse effects of vaccines before vaccination? (n= 1030)	64.1 ± 39.4	80	0-100
What percentage of parents spend significant time providing information about vaccines and vaccine safety to parents who are uncertain about vaccination? (n= 1031)	65.1 ± 40.0	90	0-100
Percentage of families you serve who are hesitant or opposed to vaccination			
Families with vaccine hesitation % (n= 1029)	17.4 ± 20.0	10	0-100
Families opposed to vaccination % (n= 1024)	9.9 ± 13.4	5	0-95

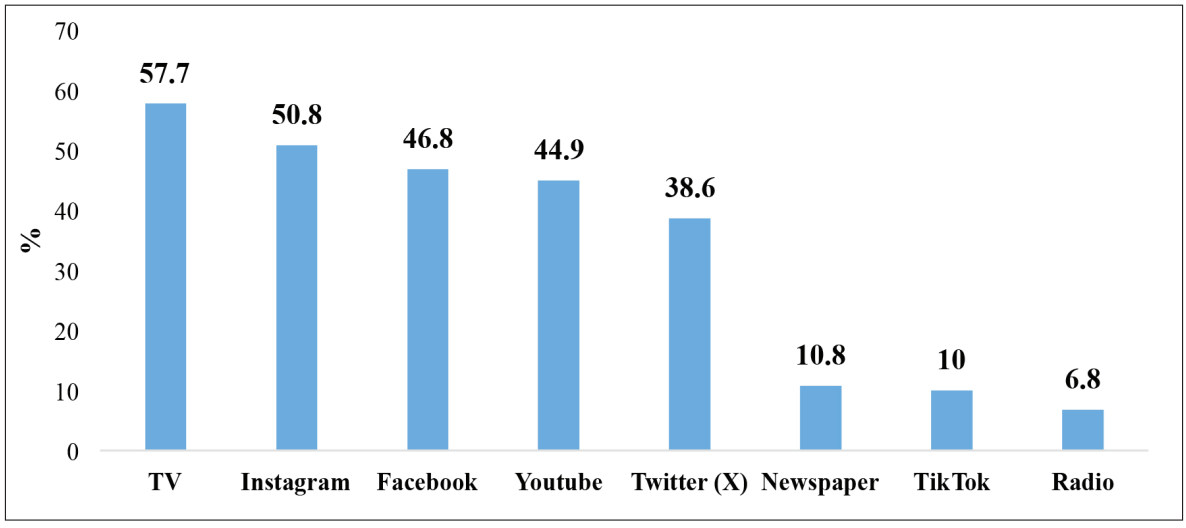
towards vaccines after the COVID-19 pandemic and the idea that the pandemic is a trap of foreign powers, the idea that they can protect their children with natural methods or opposition to vaccines without specifying the reason. Expressions such as political reasons, imported products, implantation of a chip, distrust in pharmaceutical companies, not being able to see the disease were also given (Table 12).

Table 12. Reasons for opposition to vaccination by parents to whom health workers provide services

Parents' Vaccine Hesitancy and Reasons for Opposition to Vaccination	**n**	**%**
Vaccine side effect	405	**30.8**
Social media	352	**26.8**
Lack of vaccine information	347	**26.4**
Religious reasons	245	**18.6**
Vaccine content	201	**15.3**
Mistrust of vaccines	196	**14.9**
Autism	179	**13.6**
Infertility	148	**11.3**
External forces	58	4.4
Coronavirus disease-19	52	4.0
Natural methods	35	2.7
Vaccine opposition	35	2.7
Political causes	29	2.2
Imported product	27	2.1
Chip implantation	23	1.8
Distrust in pharmaceutical companies	22	1.7
Absence of disease	3	0.2

Table 13. Direction of predominant influence of content providers on parents' knowledge about vaccination from the perspective of health workers

Content Providers	No Opinion		Negative		Neutral		Supportive	
	n	%	n	%	n	%	n	%
Twitter (X) (n= 1092)	341	31.2	458	**41.9**	151	13.8	142	13
Youtube (n= 1108)	274	24.7	451	**40.7**	213	19.2	170	15.3
Facebook (n= 1105)	257	23.3	593	**53.7**	129	11.7	126	11.4
TikTok (n= 1074)	375	34.9	517	**48.1**	108	10.1	74	6.9
Instagram (n= 1094)	269	24.6	515	**47.1**	157	14.4	153	14.0
TV (n= 1120)	200	17.9	236	21.1	215	19.2	469	**41.9**
Newspaper (n= 1079)	292	27.1	173	16	261	24.2	353	**32.7**
Radio (n= 1071)	339	31.7	151	14.1	206	24.3	312	**30.0**



Graphic 1. Content providers used by parents as a source of information about vaccines.

According to the healthcare professionals, the way in which content providers affect parents' attitudes negatively is Facebook with 53.7% (n= 593), TikTok with 48.1% (n= 517), Instagram with 47.1% (n= 515), Twitter (X) with 41.9% (n= 458) and Youtube with 0.7% (n= 451), respectively. According to health professionals, the way content providers influence parents' attitudes in a supportive way is television with 41.9% (n= 469), newspaper with 32.7% (n= 353) and radio with 30.0% (n= 312) (Table 13).

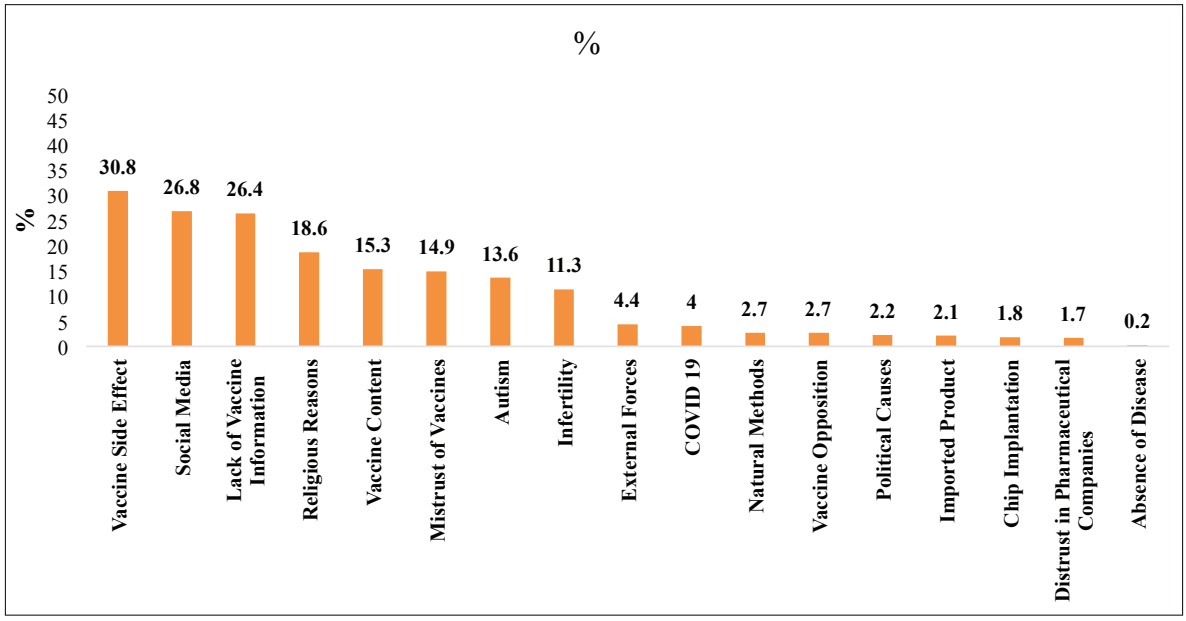
When health workers were asked to indicate three of the content providers that parents use as a source of information, television ranked in the top three with 57.7%, Instagram 50.8% and Facebook 46.8% (Graphic 1).

When the reasons for hesitation were analyzed in our study, side effects, social media, lack of information and religious reasons etc. (Graphic 2).

A large proportion of Facebook (54%), Instagram (47%) and TikTok (48%) users find content about childhood vaccines supportive. The wide reach of these platforms plays an important role in raising vaccine awareness. While supportive attitudes were observed among television (42%), newspaper (33%) and radio (31%) users, the proportions of those with no opinion and negative attitudes were also noteworthy. This may indicate that traditional media is not effective enough in conveying information. In addition, social media creates more positive attitudes about childhood vaccinations, while neutral and negative attitudes are more prevalent in traditional media, suggesting that information and education campaigns should be intensified on social media (Graphic 3).

Discussion

In this study, the sociodemographic characteristics of healthcare workers were examined and the possible effects of these characteristics on their knowledge levels and attitudes were evaluated. A total of 1314 healthcare workers in seven cities in Türkiye participated. Of the healthcare workers, 53.6% were females, 45.6% were male sand 0.8% did not want to specify their sex. This sex distribution shows that women have a significant representation in the health sector. In particular, the high knowledge scores of female health workers can be explained by the fact that they are supported with vocational



Graphic 2. Reasons for parents' vaccine hesitation and opposition to vaccination.

education and continuous in-service training and play an active role in public health. According to the results of the study, it was observed that the knowledge scores of female healthcare workers were higher than those of male healthcare workers. This result can be attributed to the fact that female health workers are more involved in the health sector and have higher opportunities for professional training, responsibility and access to information.

When the age groups were analyzed, it was determined that participants between the ages of 25-29 (n= 253) had the highest rate with 19.5%. The fact that this age group has the highest rate indicates that young healthcare workers are active in access to professional knowledge and training processes and have more access to up-to-date information.

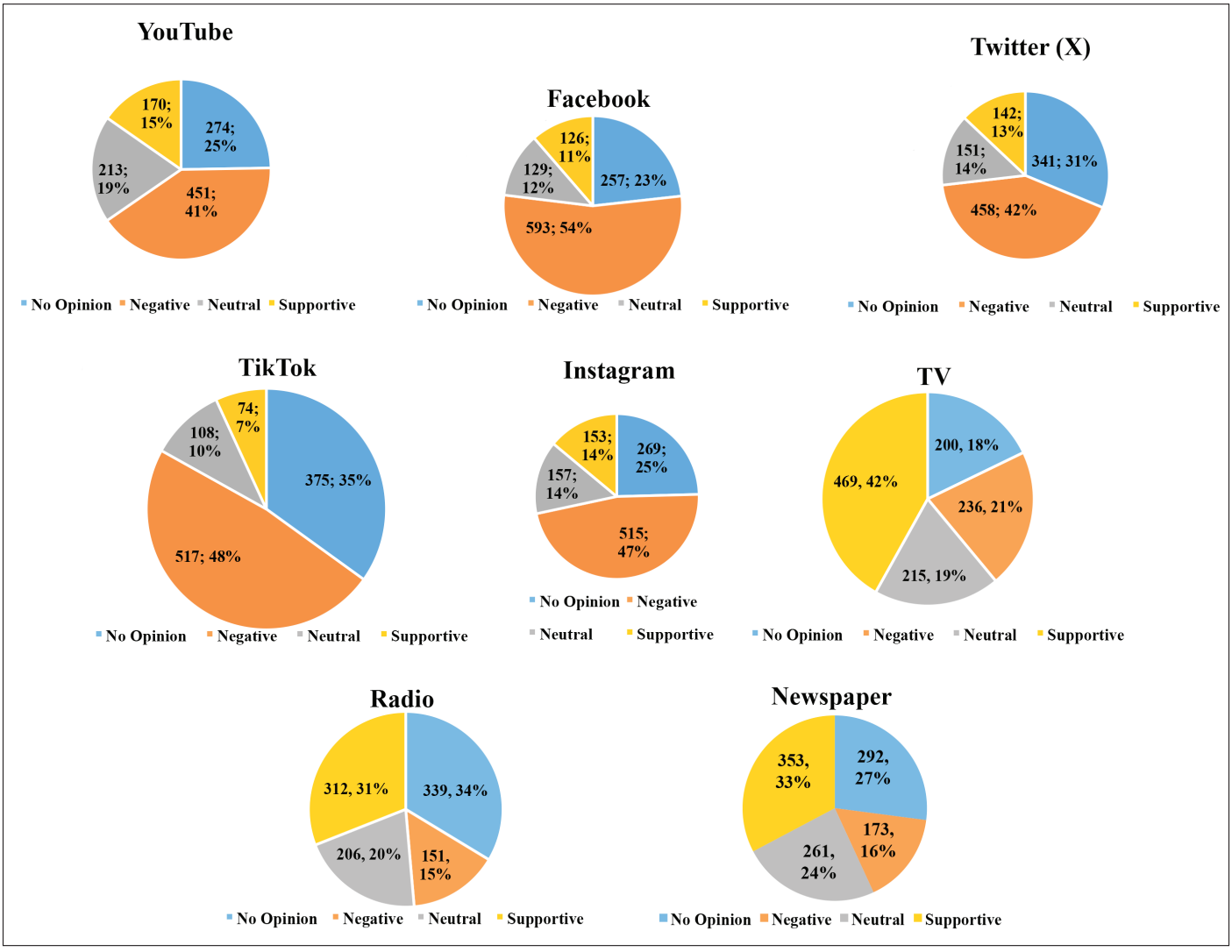
Among healthcare workers who were parents, 59.3% (n= 779) had children, and 50.2% (n= 389) of these had two children. Being a parent may increase the knowledge and awareness of healthcare workers about child health and vaccines. This may contribute to health care workers being more aware of preventive health measures for their children and having a high level of knowledge.

Looking at the years of professional experience, it was seen that those with 26 years of experience and above constituted the highest group of participants with 21.6% (n= 283). It can be said that the experience and knowledge accumulation of individuals working in the health sector for many years have a positive effect on their knowledge scores. Experienced healthcare professionals have developed their professional knowledge and skills over the years and have reached high levels of knowledge by blending these accumulations with current knowledge.

Sociodemographic characteristics of healthcare workers play an important role in the differentiation of knowledge scores. The fact that female healthcare workers have high knowledge scores is supported by professional training and continuous information updates. High level of education and long duration of professional experience also positively affect knowledge scores. These findings suggest that healthcare workers' access to education and information should be increased, and in this way, public health awareness can be increased.

Among the healthcare professionals who participated in the study, those with higher knowledge and attitude scores also had higher education levels (family physician specialist and pediatric specialist). In the study in which family physician specialists constituted 76.7%, the knowledge score of women was higher than that of men. Family physician specialists and pediatricians had a higher score in the scoring of behavioral questions that 59.3% of healthcare professionals with children answered. The findings of Mukhtar et al. are similar to our study (12). It was found that the high total score of knowledge, attitude and behavior questions was not related to the region where the study was conducted, age, number of children, age range of the youngest child and professional experience. No significant difference was observed between the knowledge levels of female healthcare workers with and without children. Similarly, in other studies, it was found that the knowledge level of female healthcare workers was higher than that of men.

After the polio vaccination campaigns, our country was certified as a polio-free country by WHO in 2002 (13). For this reason, 92.1% of the participants think that vaccination



Graphic 3. The way in which content providers' influence parents' knowledge about vaccination.

is necessary although no cases are seen today. In the study conducted by Picchio et al., 13.3% thought that unvaccinated children would not get polio. In the study, 11.94% responded that there are more vaccines than needed in the childhood vaccination calendar, while the rate of participants in our study was 9.2%. This shows confidence in the 13 vaccines in our national childhood vaccination calendar (14).

In the provinces where the study was conducted, health workers reported that the average rate of parents who were hesitant about vaccination was 10% and the average rate of parents who were against vaccination was 5%. Abenova et al. prepared a meta-analysis with data from more than 30 countries, the cumulative prevalence of parental vaccine hesitancy was 21.1%, which is considerably higher than in our country (15). The reason for the decline in vaccination rates in Türkiye is not the difficulty in accessing vaccines due to health service delivery or socioeconomic reasons. Because childhood follow-up and vaccination services in primary health care are provided free of charge by mobile health teams affiliated to the Ministry of Health. When the reasons for hesitation were analyzed in our study, results such as side effects, social media, lack of information and religious reasons were found.

It was found that 52.1% of healthcare professionals stated that when the vaccine producing company is trusted, it affects the decision to be vaccinated, while 1.7% of families experience vaccine hesitation in this regard. In the study of Özceylan et al., distrust in the vaccine company was the leading reason for hesitation, while in the study of Yörük et al., the highest rate was distrust in the vaccine with 73.25 (16,17). In our study, vaccine side effect was determined the highest as the reason for hesitation with a rate of 30.8%. In the study by Mercan et al., 77.2% of parents knew that vaccines had side effects. 94.3% of the parents reported that the agenda they heard about vaccine opposition or hesitation did not affect them (18). In the study by Çay and Göl, 74.5% of the parents stated that vaccines had side effects. In addition, 8.5% of

parents considered autism and 6.1% considered infertility as side effects of vaccines (19).

In a study by Argın et al., 19.6% of families were undecided about childhood vaccination. There is also a significant correlation between socioeconomic income levels and side effects of vaccines, the higher the income level, the higher the level of knowledge. 67.3% of parents think that vaccines have side effects. Healthcare professionals are the main source of information about vaccines. However, mass media also have a high rate (20). In the study by Yörük and Güler in which parents participated, vaccine hesitation was 13.8% and vaccine refusal was 4.8%. Vaccine hesitancy was significantly higher in mothers who did not receive training on pediatric vaccines in prenatal follow-up, who followed anti-vaccine groups on social media and who followed anti-vaccine groups. The reasons for hesitation were identified as following anti-vaccine groups in the media and being concerned about the content of the vaccine (21). Parents hesitate to vaccinate their children due to the influence of social media and inaccurate content as a result of the use of digital resources. In many studies, the effect of anti-vaccine content on social media on the increase in hesitation rates has been determined (22,23). This may be due to the fact that families can easily access information online regardless of socioeconomic status or education level with the increasing use of technology.

Primary healthcare workers are in frequent communication with parents about vaccine hesitation. Due to the basic structure of vaccine communication, the healthcare provider's correct transmission of the message about vaccination and reassurance affects parents' decision to vaccinate (24). Healthcare providers who successfully carry out vaccine communication increase confidence in vaccination (25,26). On the contrary, parents' vaccine indecision may progress to vaccine refusal due to inadequate communication (27). In our study, the level of knowledge of healthcare workers about vaccine ingredients was 25.1% that thiomersal is excreted from the body within a week and 23.4% that it is an organic component, and 44.3% correctly answered that thiomersal does not cause autism. In addition, 53.0% of healthcare professionals stated that they needed training in vaccine content knowledge scoring. The fact that healthcare professionals, who have so far created controversy on vaccines and are advocates and scientific content narrators against autism claims, could not give correct answers at the desired rate shows that vaccine communication strategies in this field need to be developed (28). Misinformation and myths disseminated by the society should be addressed (14,29). The correct information should be communicated through the appropriate channel for the education level and information needs of each parent who hesitates (30-32).

Conclusion

In this study, the knowledge, attitudes and behaviors of healthcare workers about childhood vaccines are good, especially the fact that healthcare workers who continue immunization services in primary care with vaccination and education activities constitute the majority of the study. In the interpretation of the reasons for the decrease in vaccination rates, results such as side effects, social media and lack of information have emerged. Immunization activities have been successfully managed in Türkiye for more than 30 years within the scope of primary health care services. Visual and written materials should be increased to educate healthcare professionals on vaccine content and side effects. Digital content should be created for parents and studies should be conducted on misleading content. In this way, vaccination policies will yield successful results by increasing vaccine communication.

Ethics Committe Approval: It was determined that the implementation of the study was ethically appropriate with the permission document dated 22.11.2023 and numbered E2-23-5687 from the Ankara Bilkent City Hospital Clinical Research Ethics Committee No. 2.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - KY, AK, MA; Design - KY, AK; Supervision - AK, FT, ST, MA; Resource - KY, AK, MA; Data Collection and/or Processing - KY, FT, ST, AK; Analysis and/or Interpretation - KY, FT, ST, AK; Literature Search - KY, AK; Writing - KY, AK; Critical review - All of authors.

Conflict of Interest: All authors declare that they have no conflicts of interest or funding to disclose.

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Dear health worker;

First of all, thank you for your support.

As Presidency of Turkish Health Institutes (TÜSEB) Turkish Vaccine Institute (TAE) we have created the following survey in order to plan our strategic activities for the future and to shape scientific studies on vaccine ambivalence and vaccine knowledge that can be carried out within the scope of the needs of our country. Your support will be guiding in our activities to increase the health literacy of our society and at the same time to support and protect the health of our children and elders.

With our questionnaire, the following questions have been prepared to determine general vaccine knowledge, vaccine content knowledge, vaccine attitude, vaccine behavior and education needs, regardless of personal information (without the name-surname and surname of the institution you work for).

Taking part in this study is entirely voluntary. The results will be used for purely scientific purposes and your responses will be kept confidential.

Thank you

Prof. Dr. Ateş KARA

President of the Turkish Vaccine Institute

Demographic characteristics

1. Sex ☐ Female ☐ Male ☐ I do not want to specify

2. Age ……

3. Profession ……

4. Years of professional experience

☐ Below 1 ☐ 1-5 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐ 21-25 ☐ 26 years and over

5. Health education level:

6. Do you have children? ☐ Yes ☐ No

a) How many if yes?:

b) The age of your youngest child:

The next five questions are about the childhood vaccination schedule.

		Totally disagree	**Disagree**	**Undecisive**	**Agree**	**Totally agree**
		1	2	3	4	5
7	Vaccines are useful for disease prevention.					
8	Vaccination is not necessary because children have a natural immune system.					
9	Vaccination is not necessary if other children around the unvaccinated child are vaccinated.					
10	Alternative medicine such as supplements (non-drug) or herbs can replace vaccines to protect against infectious diseases.					
11	Children who are exclusively breastfed do not need to be vaccinated.					

The next 11 questions are about the types of vaccines.

		Live	Inactive	Toxoid
12	Hepatitis B vaccine			
13	BCG (Bacillus Calmette-Guérin) tuberculosis vaccine			
14	Diphtheria vaccine			
15	Tetanus vaccine			
16	Conjugated pneumococcal vaccine			
17	Acellular pertussis vaccine			
18	Oral polio vaccine			
19	*Haemophilus influenzae* type b (Hib vaccine)			
20	Measles, mumps, rubella vaccine			
21	Varicella vaccine			
22	Hepatitis A vaccine			

The next six questions are about vaccine content knowledge.

		Correct	Incorrect	No opinion
23	Adjuvant improves vaccine efficacy.			
24	Gelatin in the vaccine may be of vegetable or animal origin.			
25	Thiomersal (ethylmercury) is an organic compound.			
26	Thiomersal is digested and excreted from the body within one week.			
27	Thiomersal operate in autism.			
28	Aluminum hydroxide is an adjuvant.			

The next eight questions are about general vaccinations.

		Correct	Incorrect	No opinion
29	Polio vaccination is not necessary because polio no longer exists.			
30	Immunocompromised people can be vaccinated with any type of vaccine.			
31	Prevents deaths due to meningitis and pneumonia if *Haemophilus influenzae* type b (Hib) is administered.			
32	Measles vaccine protects against pneumonia.			
33	Pneumococcal vaccine prevents deaths due to sepsis, pneumonia, meningitis in children.			
34	Vaccines have side effects.			
35	After vaccination, mild fever, muscle pain, headache and loss of appetite may occur.			
36	Vaccination should be postponed if the child's body temperature is high.			

The next 10 questions are about your specific vaccination attitude towards the childhood vaccination schedule.

		Totally disagree	Disagree	Undecisive	Agree	Totally agree
		1	2	3	4	5
37	Whether someone I trust has a positive or negative opinion about a vaccine affects my decision about that vaccine.					
38	I strongly recommend childhood vaccinations to my patients.					
39	The fact that the vaccine is produced by a company I trust influences my decision to recommend vaccination.					
40	Having adequate equipment for emergency intervention during vaccine administration affects my decision to recommend vaccination.					
41	Movie actors' opinions on the side effects of childhood vaccinations influence my decision.					
42	Social media influencers' opinions on the side effects of childhood vaccines influence my decision.					
43	Voice artists' opinions on the side effects of childhood vaccines influence my decision.					
44	Politicians' opinions on the side effects of childhood vaccines influence my decision.					
45	I would like to be able to choose not to follow up and treat children who have not received childhood vaccinations.					
46	As a health worker, it requires me to be a vaccine advocate to protect myself, my family and my patients.					

47. List the top three content providers that parents most frequently use as a source of information about vaccines.

a) Twitter (X) …….
b) Youtube …….
c) Facebook …….
d) TikTok …….
e) Instagram …….
f) TV …….
g) Newspaper …….
h) Radio …….

48. The direction in which content providers predominantly influence parents' knowledge about vaccination.

		No opinion	Nrgative	Netral	Supportive
1	Twitter (X)				
2	Youtube				
3	Facebook				
4	TikTok				
5	Instagram				
6	TV				
7	Newspaper				
8	Radio				

If your answer to question six is yes, the next six questions are about your specific vaccination behaviors for your child regarding the childhood vaccination schedule.

		Yes	No
49	I get my child vaccinated with all vaccines included in the vaccination calendar of the Ministry of Health.		
50	I will vaccinate my child with other clinically available paid vaccines recommended by the doctor.		
51	I will take a vaccine even if it has various side effects.		
52	Vaccines that have been on the market longer are more reliable than new vaccines.		
53	Childhood vaccination schedule contains more vaccines than needed.		
54	I only vaccinate children to prevent serious diseases.		

Please write down the possible percentages for the following statements;

55. I inform ..... percent of families about the vaccine and the disease it protects against before vaccination.

56. I inform ..... percent of families about the unwanted effects of vaccines before vaccine administration.

57. I spend a significant amount of time to provide information about vaccination and vaccine safety to parents who are uncertain about vaccination ..... percentage of parents.

58. Could you please write the rate of vaccine hesitancy and opposition among the families you serve?

Vaccine hesitant family ..... %

Families opposed to vaccination ..... %

59. Please list the top three reasons for vaccine hesitancy and opposition to vaccination given by parents?

.....

.....

.....

60. How competent do you consider yourself in which of the following subjects to determine the need for training?

		I have no knowledge	I have lacking knowledge	Enough	Good	Quite good
		1	2	3	4	5
1	Vaccine content information					
2	Vaccine-disease relationship					
3	Unwanted side effects after vaccination					
4	Vaccine storage					
5	Vaccine administration					
6	Vaccine communication					