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Original Article

Vaccine Hesitancy Regarding Childhood Vaccinations Among Parents

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ABSTRACT

Aim: In Türkiye, vaccine hesitancy has been increasing, with a growing number of parents refusing childhood vaccinations. Understanding the underlying factors of this issue is essential for designing effective interventions. This study aimed to investigate the reasons underlying childhood vaccine hesitancy among parents in Antalya, Türkiye.

Materials and Methods: This cross-sectional study included 172 parents in Antalya who refused at least one childhood vaccine in 2023. Data were collected using a structured questionnaire administered via phone interviews. Descriptive statistics and chi-square tests were performed. In addition, responses to open-ended questions about their reasons for refusal were grouped thematically.

Results: Among the participants, 59.9% had a university-level education, and 69.8% of respondents were mothers. The most common themes influencing hesitancy included perceived adverse events following vaccination, misinformation from social media, and distrust in vaccine contents. A significant proportion (87.8%) stated that the coronavirus disease-2019 (COVID-19) period negatively affected their trust in vaccines. Mothers were significantly more resistant to positive change compared to fathers (p=0.015). Parents aged 34 years and younger were also more resistant to positive change than older parents (p=0.044).

Conclusion: This study highlights that vaccine hesitancy in Antalya is strongly influenced by misinterpretations of adverse events, misinformation originating from social media, and distrust regarding vaccine components. Targeted education on vaccine safety, efforts to address COVID-19 related misinformation, and greater involvement of the fathers in vaccination decisions may help reduce hesitancy. Importantly, while social media is a major driver of misinformation, it may also serve as a powerful tool to strengthen public health communication and awareness.

Keywords: Vaccines, vaccination, vaccine hesitancy, parents, child health, COVID-19, social media

Introduction

Immunization services are essential primary healthcare practices implemented to protect infants, children, and adults from infectious diseases by vaccinating them before the period in which their risk of infection is highest (1). Immunization efforts have prevented 154 million deaths worldwide over the past 50 years. Among those whose lives were saved through immunization, 101 million were infants, and vaccines represent the most important health service for infant health (2). In Türkiye, the primary objective of the Expanded Program on Immunization is to ensure that every newborn is immunized in accordance with the national vaccination schedule against pertussis, diphtheria, tetanus, measles, rubella, mumps, tuberculosis, poliomyelitis, hepatitis B, *haemophilus influenzae* type B, pneumococcus, hepatitis A, and varicella (1).

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The World Health Organization (WHO) defines vaccine hesitancy as "a delay in acceptance or refusal of safe vaccines despite the availability of vaccination services." Vaccine hesitancy is a complex concept and varies depending on time, location, and vaccine type (3). It is an increasingly important public health problem; indeed, in 2019, the WHO listed vaccine hesitancy among the ten global threats to health (4). In Türkiye as well, vaccine hesitancy appears to be rising as a public health concern (5). While the global rate of vaccine hesitancy has been estimated to be 21.1%, this rate has been calculated as being 13% in Türkiye (6).

Antalya, the fifth-largest city in Türkiye, is home to approximately 500,000 children aged 13 years and under. The aim of this study was to identify the reasons for vaccine hesitancy among parents in Antalya and to shed light on possible interventions in order to address this issue.

Materials and Methods

This cross-sectional study included all parents in Antalya in 2023 who refused at least one vaccine dose. In 2023, a total of 971 parents refused at least one childhood vaccine. The sample size was calculated using G*Power; assuming a medium effect size, an alpha error of 0.05, and a statistical power of 0.90, the minimum required sample size was determined to be 143. From among the 971 parents who refused at least one vaccine dose, 216 parents were randomly selected to account for the possibility of refusal to participate.

These parents were contacted using the phone numbers recorded in the national health information systems. It was not known beforehand whether the phone number belonged to the mother or the father. The first number was called initially, and if necessary, the second number was attempted. The parent reached by phone was first informed about the study, and if they agreed to participate, the questions in the structured questionnaire developed by the researchers were administered.

Ethical approval for this study was obtained from the Clinical Research Ethics Committee of Antalya Training and Research Hospital (approval number: 19/13, date: 05.12.2024).

Statistical Analysis

Data were analyzed using IBM SPSS Statistics for Windows, Version 27.0 (IBM Corp., Armonk, NY, USA). Descriptive findings are presented as numbers, percentages, means, and medians. The chi-square test was used for group comparisons, and $p<0.05$ was considered statistically significant. In addition, open-ended questions about the reasons for vaccine hesitancy were asked, and the responses were coded and grouped thematically. The thematic grouping was first conducted independently by the researchers and then finalized together.

Results

A total of 216 parents were initially included in this study. This study was completed with 172 parents. Among the 44 parents who did not participate, 23 (52.3%) could not be reached, 10 (22.7%) refused participation, 7 (15.9%) had initially refused vaccination but were later found to have completed the vaccinations, 2 (4.5%) had language barriers, and 2 (4.5%) had other reasons for non-participation.

Among the children included in this study, 72 (41.9%) were girls and 100 (58.1%) were boys. A total of 169 children (98.3%) were citizens of the Republic of Türkiye, while 2 (1.2%) were citizens of Russia and 1 (0.6%) was a citizen of Germany. The parent interviewed was the mother in 69.8% of cases. In total, 59.9% of the parents had completed a university degree or higher. More than half of the parents had one or two children. The median age of the children was 39.5 months, while the median age of the parents was 35 years (Table I).

Table I. Descriptive characteristics of children and parents

	n	%
Child's gender		
Female	72	41.9
Male	100	58.1
Total	172	100.0
Child's nationality		
Republic of Türkiye	169	98.3
Russia	2	1.2
Germany	1	0.6
Total	172	100.0
Interviewed parent		
Mother	120	69.8
Father	52	30.2
Total	172	100.0
Parental education level		
Literate	1	0.6
Primary school	12	7.0
Middle school	16	9.3
High school	40	23.3
University or above	103	59.9
Total	172	100.0

Table I. Continued		
	n	**%**
Number of children		
1	48	27.9
2	63	36.6
3	49	28.5
4	11	6.4
5	1	0.6
Total	172	100.0
Child's age (months)		
Mean (SD)	51.17 (37.01)	
Median	39.50	
Minimum	19.00	
Maximum	183.00	
IQR	35.75	
Parent's age		
Mean (SD)	35.35 (6.53)	
Median	35.00	
Minimum	22	
Maximum	58	
IQR	8	
SD: Standard deviation, IQR: Interquartile range		

Among the vaccines, the most frequently administered was the 3rd dose of the conjugated pneumococcal vaccine, followed by the 1st dose of the hepatitis B vaccine. The least frequently administered vaccine was the 2nd dose of the oral polio vaccine, followed by the 1st dose of the hepatitis A vaccine (Table II).

In addition, the number of children who received only the hepatitis B vaccine at birth (1st dose of hepatitis B) was 33 (19.2%), while the number of children who had received no vaccination at all was 46 (26.7%).

Table III presents the distribution of responses given to the questions regarding the reasons for vaccine refusal.

Among the responses to the question "Are there any vaccines you particularly do not trust, and if so, which ones?", the most common answer was "all vaccines"; the second most frequent was "combined vaccines", and the third was "COVID-19 vaccines" (Table IV).

The responses of parents who answered "Yes" to the question "Did your concerns about vaccines arise after listening to a particular person/share or after an event?" were categorized into thematic groups. The most frequently recurring theme was "incidents interpreted as adverse events following vaccination by parents" (Table V).

Table II. Vaccination status by vaccine type

Vaccine-dose	Administered (n/%)	Not administered (n/%)	Not due yet (n/%)	Postponed (n/%)	Total (n/%)
Hep B-1	123 (71.5)	49 (28.5)	-	-	172 (100.0)
Hep B-2	83 (48.3)	89 (51.7)	-	-	172 (100.0)
Hep B-3	62 (36.0)	110 (64.0)	-	-	172 (100.0)
BCG	62 (36.0)	110 (64.0)	-	-	172 (100.0)
DaBT-IPV-Hib-1	76 (44.2)	96 (55.8)	-	-	172 (100.0)
DaBT-IPV-Hib-2	67 (39.0)	105 (61.0)	-	-	172 (100.0)
DaBT-IPV-Hib-3	60 (34.9)	112 (65.1)	-	-	172 (100.0)
PCV-1	67 (39.0)	105 (61.0)	-	-	172 (100.0)
PCV-2	58 (33.7)	114 (66.3)	-	-	172 (100.0)
PCV-3	11 (78.6)	3 (21.4)	-	-	14 (100.0)
PCV booster	48 (27.9)	124 (72.1)	-	-	172 (100.0)
MMR-1	49 (28.5)	123 (71.5)	-	-	172 (100.0)
MMR-2	3 (1.7)	80 (46.5)	88 (51.2)	1 (0.6)	172 (100.0)
DaBT-IPV	2 (1.2)	76 (44.2)	93 (54.1)	1 (0.6)	172 (100.0)
OPV-1	53 (30.8)	119 (69.2)	-	-	172 (100.0)
OPV-2	31 (18.0)	141 (82.0)	-	-	172 (100.0)
Hep A-1	30 (18.6)	130 (80.7)	1 (0.6)	-	161 (100.0)
Hep A-2	22 (13.7)	126 (78.3)	11 (6.8)	2 (1.2)	161 (100.0)
Varicella	42 (26.1)	119 (73.9)	-	-	161 (100.0)
Td-booster	-	11 (6.4)	161 (93.6)	-	172 (100.0)

Table III. Responses to questions regarding reasons for vaccine refusal			
Question	**Yes (n/%)**	**No (n/%)**	**Unsure (n/%)**
Do you think the contents of vaccines are safe?	16 (9.3)	140 (81.4)	16 (9.3)
Do you think vaccines are beneficial for your child's health?	19 (11.0)	125 (72.7)	28 (16.3)
Do you think vaccines are effective in preventing diseases?	31 (18.0)	117 (68.0)	24 (14.0)
Do you think vaccines are harmful for your child's health?	121 (70.8)	22 (12.9)	28 (16.4)
Are there any vaccines you particularly do not trust?	52 (30.2)	107 (62.2)	13 (7.6)
Do you trust healthcare professionals who recommend vaccination?	86 (50.6)	57 (33.5)	27 (15.9)
Do you trust politicians who recommend vaccination?	11 (6.6)	137 (82.5)	18 (10.8)
Were your religious beliefs influential in not vaccinating your child?	15 (8.8)	152 (89.4)	3 (1.8)
Has social media (Instagram, X, Facebook, etc.) increased your concerns about vaccines?	53 (31.0)	117 (68.4)	1 (0.6)
Did your concerns about vaccines arise after listening to a specific person/share or after an event?	61 (35.7)	108 (63.2)	2 (1.2)
Did COVID-19 vaccines negatively affect your trust in vaccines?	151 (87.8)	20 (11.6)	1 (0.6)
As mother and father, do you share the same opinion about not vaccinating?	157 (91.3)	13 (7.6)	2 (1.2)
If the unadministered vaccine was a Td booster dose, was it the child's decision not to be vaccinated?	3 (27.3)	8 (72.7)	0 (0.0)
Do you receive sufficient information about vaccines from healthcare professionals?	137 (79.7)	31 (18.0)	4 (2.3)
When you need information about vaccines, can you access healthcare professionals to ask questions?	160 (93.0)	8 (4.7)	4 (2.3)
Can your concerns about vaccines change positively?	41 (24.1)	116 (68.2)	13 (7.6)

Table IV. Vaccines that parents particularly distrust	
Vaccine	**Total number**
All	37
Combined vaccines	6
COVID-19 vaccines	4
Vaccines under 1 year of age	3
Measles/MMR vaccine	3
Hepatitis vaccine	3
Tetanus vaccine	3
Varicella vaccine	2
Meningitis vaccine	1
Influenza vaccine	1
HPV vaccine	1
Rotavirus vaccine	1
COVID-19: Coronavirus disease-2019, MMR: Measles-mumps-rubella, HPV: Human papillomavirus	

When the parents' answers to the question "Can your concerns about vaccines change positively?" were compared, it was found that mothers, when compared to fathers, statistically significantly more often answered "No" (p=0.015). When divided into two age groups, parents aged 34 and under were statistically significantly more likely to answer "No" when compared to older parents (p=0.044). Those parents whose child had received zero vaccines (i.e., refused all vaccines) were also statistically significantly more likely to answer "No" when compared to the others (p=0.005), while parental education levels did not create a significant difference (p=0.382) (Table VI).

Table V. Parents' responses to the open-ended question "Which event/person/post increased your concerns about vaccines?"

Theme	Total number of responses	Illustrative quotations
Incidents interpreted as adverse events following vaccination by parents	43	"Epilepsy was diagnosed after the combined vaccine administered to my daughter, who is now 8 years old, when she was 18 months old." (F, 36) "Cystic fibrosis developed after the first dose of hepatitis B." (F, 35) "In my first child, autism, valve laxity in the heart, and the prominence of arm veins occurred." (F, 44)
Research, books, articles, scientific sources	34	"I decided on vaccine refusal as a result of expert opinions and my own research." (F, 40) "I researched on the World Health Organization's website and decided not to vaccinate." (F, 54)
Influence of family and social contacts	17	"The neighbor's child contracted the disease despite being vaccinated." (F, 35) "My siblings are healthcare workers; I was influenced by what I heard from them and the people around me, and decided not to vaccinate." (M, 41)
Social media posts	14	"Social media increased my vaccine refusal." (F, 28) "Seeing children who died because of vaccines on social media influenced me." (F, 45)
COVID-19 related experiences	11	"After the COVID-19 vaccines, I lost my trust in vaccines." (F, 44) "COVID-19 vaccines helped us open our eyes more." (F, 22)
Vaccine contents	10	"Due to the mercury in vaccines, they create a perception to force people into vaccination; instead, I prefer cupping therapy." (M, 40)
Distrust in healthcare professionals and physicians	10	"Healthcare professionals are uneducated and cannot provide sufficient information about vaccines. Doctors buy diplomas from other countries." (M, 34)
Personal health experiences	9	"I have regrets from the past. I do not want to listen to healthcare professionals." (F, 39)
Anti-vaccine figures, sources, and conspiracy theories	6	"Yağmur İbiç, Sait Ercan, a professor from a university in Samsun." (M, 34) "I read Soner Yalçın's book Black Box. Rockefeller and Bill Gates cannot know my child's health better than I do." (M, 34)
Distrust in politicians and politics	4	"In general, shares about vaccines supported my vaccine refusal. Politicians do not create trust at all." (M, 46)
Preference for domestic vaccines/distrust in imported vaccines	3	"I do not trust vaccines imported from abroad." (F, 29) "If domestic vaccines are produced and proven reliable, my opinion may change positively." (M, 37)

COVID-19: Coronavirus disease-2019

Table VI. Comparison of parents based on response to the question: "Can your concerns about vaccines change positively?"

	Yes/unsure (n/%)	No (n/%)	Total (n/%)	p value
Parent				
Mother	31 (26.1)	88 (73.9)	119 (100.0)	p=0.015
Father	23 (45.1)	28 (54.9)	51 (100.0)	
Age of parent				
34 and under	21 (25.0)	63 (75.0)	84 (100.0)	p=0.044
35 and above	33 (38.4)	53 (61.6)	86 (100.0)	
Education of parent				
High school or lower	19 (27.9)	49 (72.1)	68 (100.0)	p=0.382
University degree or higher	35 (34.3)	67 (65.7)	102 (100.0)	
No vaccinations				
Yes	7 (15.2)	39 (94.8)	46 (100.0)	p=0.005
No	47 (37.9)	77 (62.1)	124 (100.0)	

Discussion

According to the findings of this research, the majority of participants did not consider vaccines to be safe, and a significant proportion stated that vaccines were harmful to their child's health. It was also determined that social media and the coronavirus disease-2019 (COVID-19) period increased parents' hesitations about vaccines. Incidents perceived as vaccine side effects were found to be the most common theme associated with vaccine hesitancy. It was further identified that the attitudes of female participants and younger participants regarding vaccine hesitancy were more resistant to change when compared to others.

The results of this study show that a considerable proportion of parents did not trust vaccines and believed that vaccines are harmful to their children's health. This finding is consistent with both previous studies conducted in Türkiye and international studies (5,7,8). A global systematic review and meta-analysis reported that distrust in vaccines and the belief that vaccine contents are harmful are among the most common reasons for vaccine hesitancy worldwide (9).

Through thematic analysis of the responses to the open-ended questions, the most frequently stated theme was "incidents interpreted as adverse events following vaccination by the participant." It is known that true adverse events following vaccination, as well as the misinterpretation of unrelated health conditions as vaccine side effects, contribute to vaccine hesitancy (10-12). However, this study demonstrated that parents had low levels of knowledge about vaccine side effects and considered certain health conditions, notably conditions which could not be caused by vaccines, as vaccine-related adverse effects. For example, one participant perceived their child's cystic fibrosis diagnosis as a vaccine side effect. Although the absence of any relationship between autism and vaccines has been consistently demonstrated (13,14), in this study, some parents still attributed their child's autism diagnosis to vaccines. Another study conducted in Türkiye similarly showed that parents interpreted health conditions not caused by vaccines as vaccine side effects (15). These findings highlight the importance of better informing parents about vaccine side effects. Preventing health conditions unrelated to vaccination from being perceived as side effects may reduce the proportion of parents who distrust vaccines or believe vaccine contents are harmful. In another study conducted in Türkiye, when healthcare workers were asked to propose solutions to vaccine hesitancy, the most common suggestion was "informing the public that most vaccine side effects are minor" (16).

In this study, parents were asked whether there were specific vaccines they particularly did not trust. The majority of participants stated that there was no specific vaccine they distrusted more than others. However, among those who did name particular vaccines, the most frequent responses were combined vaccines and COVID-19 vaccines. A study conducted in the United States similarly found that although most parents did not identify a specific vaccine they distrusted, combined vaccines were commonly believed to cause more side effects (8). Another study indicated that the belief that combined vaccines are harmful represents an increasing risk factor for vaccine hesitancy (17). Combined vaccines involve administering two or more vaccines in the same session. Combined vaccines enable timely immunization during the most vulnerable period of infancy and minimize the number of clinic visits needed. Thus, combined vaccines save time and cost and provide a less traumatic vaccination experience for the child. Moreover, combined vaccines have been shown to be as safe as single-dose vaccines (18). During parental education efforts, the safety of combined vaccines should be emphasized and misconceptions should be clarified.

Another prominent finding of this study was that the COVID-19 period and COVID-19 vaccines increased vaccine hesitancy. A total of 87.8% of participants stated that the COVID-19 period negatively affected their trust in vaccines. Similar findings have been reported in both national and international studies (19,20). The COVID-19 pandemic negatively affected public health practices both directly and indirectly. The unexpected and rapidly evolving nature of the pandemic, along with the infodemic which followed, negatively influenced many public health interventions, including immunization efforts. Therefore, correcting the misinformation which emerged during the COVID-19 period should be a priority for public education on immunization.

In today's digital age, the ways in which individuals access health information have also changed. While social media facilitates the flow of information, it also accelerates the spread of misinformation. In this study, a significant proportion of parents stated that social media negatively influenced their views on vaccines. The role of social media in increasing vaccine hesitancy has been repeatedly demonstrated (5,7,21). Although social media contributes to the spread of false or misleading information, its wide reach also offers an opportunity to enhance public knowledge and awareness of public health issues (22). Interestingly, parents

themselves also suggested that social media should be used as a tool to counter vaccine hesitancy (19,23).

The process of vaccine hesitancy, and the thoughts, attitudes, and behaviors of parents within this process, cannot be easily defined by strict boundaries. Individuals fall along a broad continuum between fully accepting all vaccines and completely rejecting them (24). It is important to provide accurate and clear information to individuals within this "gray zone." In this study, one-third of participants answered "Yes" or "Unsure" to the question "Can your concerns about vaccines change positively?". Male participants, when compared to female participants, and participants aged 35 and above, when compared to younger participants, were more open to positive change. The literature shows that vaccine hesitancy is more common among mothers and younger parents (8,25-27). The underlying reasons why mothers and younger parents exhibit more hesitancy and less openness to change should be further explored. The fathers' views regarding vaccine hesitancy were found to be more open to positive change. Including fathers in decisions related to child health and expanding "maternal and child health" to "parental and child health" may support efforts to improve public health outcomes.

Study Limitations

This study had several strengths. The sample size was relatively large and included both mothers and fathers, allowing for a broader understanding of parental perspectives on vaccine hesitancy. The random selection of the participants from all of those parents who refused at least one childhood vaccine in 2023 strengthened the representativeness of the findings. There were also limitations. As the data were collected through phone interviews, the number of questions had to be kept to a limit, which reduced the depth of information. In addition, the thematic analysis used in this study did not constitute a full qualitative research design but was instead applied in order to organize and group open-ended responses. Although the sample was large and randomly selected, its representativeness was limited to one province and did not reflect the entire country; therefore, larger and multi-center studies are needed in order to achieve national representativeness.

Conclusion

This study was conducted with 172 mothers and fathers who had refused at least one childhood vaccine. The majority of the participants stated that they did not trust vaccine contents and that vaccine side effects were the main reason for their hesitancy. Combined vaccines and COVID-19 vaccines were specifically mentioned as the vaccines they distrusted. The COVID-19 period and social media emerged as factors which increased vaccine hesitancy. Fathers, when compared with mothers, were found to be more open to positive changes regarding vaccine hesitancy.

Providing accurate information to the public about vaccine side effects, and addressing the misinformation and misconceptions which arose during the COVID-19 period are essential steps. The influence of social media can be reversed through proper use. Increasing the fathers' involvement in the decision-making process for child immunization may also help reduce vaccine hesitancy.

Ethics

Ethics Committee Approval: Ethical approval for this study was obtained from the Clinical Research Ethics Committee of Antalya Training and Research Hospital (approval number: 19/13, date: 05.12.2024).

Informed Consent: All surgical procedures were performed with written informed consent from the legal guardians.

Footnotes

Authorship Contributions

Concept: A.G.T., H.N.Y., Ç.E.E., G.S., A.Ç., Y.U., S.Y., Ş.Y.A., Design: A.G.T., H.N.Y., Ç.E.E., G.S., A.Ç., Y.U., S.Y., Ş.Y.A., Data Collection or Processing: A.G.T., H.N.Y., Ç.E.E., G.S., A.Ç., Y.U., S.Y., Ş.Y.A., Analysis or Interpretation: A.G.T., H.N.Y., Ç.E.E., G.S., A.Ç., Y.U., S.Y., Ş.Y.A., Literature Search: A.G.T., H.N.Y., Ç.E.E., G.S., A.Ç., Y.U., S.Y., Ş.Y.A., Writing: A.G.T., H.N.Y., Ç.E.E., G.S., A.Ç., Y.U., S.Y., Ş.Y.A.

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