



## ARTICLE

### KNOWLEDGE LEVEL AND BELIEFS OF MOTHERS OF CHILDREN UNDER 5 YEARS OF AGE ABOUT CHILDHOOD VACCINATIONS

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#### ABSTRACT

Vaccination prevents infectious diseases and mother's consent is key to increasing childhood vaccination rates. The aim of this study was to assess mothers' knowledge, and beliefs about childhood vaccinations, as well as the impact of these factors on their vaccination behaviors. A descriptive cross-sectional study of 320 mothers was conducted. The data were collected using a questionnaire form. Most of mothers (98.4%) have their children fully vaccinated through the Extended Immunization Program (EIP), 96.6% of cases support vaccines necessity. Vaccine hesitancy was 7.8%, vaccine refusal was 1.6%. The majority of mothers believe that the most common side effects of vaccines are fever (53.4%). Mothers were not adequately informed about EIP were 42.2%, and 57.5% of them had not received non-EIP vaccines, and 33.1% cited lack of knowledge as the reason. The majority of cases (73.7%) received information about EIP from a doctor. Parents' educational status, higher family income, and having more than three children significantly increased non-EIP vaccination rates but had no significant effect on EIP vaccination ( $p < 0.05$ ). Mothers still support EIP, but vaccine hesitancy is growing due to a lack of information. It is critical to assess mothers' knowledge and beliefs about vaccination, and social awareness is also required.

**Keywords:** Childhood Vaccination; Beliefs; Knowledge; Mothers; Vaccine Hesitancy; Vaccine Refusal

#### АБСТРАКТ

Вакцинация предотвращает инфекционные заболевания, и согласие матери является ключевым фактором для повышения уровня вакцинации детей. Целью данного исследования было оценить знания и убеждения матерей о детских прививках, а также влияние этих факторов на их поведение при вакцинации. Было проведено описательное перекрестное исследование 320 матерей. Сбор данных осуществлялся с помощью анкеты. Большинство матерей (98,4%) полностью вакцинировали своих детей в рамках Расширенной программы иммунизации (РПИ), 96,6% случаев поддерживают необходимость вакцин. Колебания по поводу вакцин составили 7,8 %, отказ от вакцин - 1,6 %. Большинство матерей считают, что наиболее распространенным побочным эффектом вакцин является лихорадка (53,4%). 42,2% матерей были недостаточно информированы об ЭИП, 57,5% из них не получали вакцин, не относящихся к ЭИП, а 33,1% назвали причиной недостаток знаний. В большинстве случаев (73,7%) информацию о ЕИП получали от врача. Образовательный статус родителей, более высокий доход семьи и наличие более трех детей значительно повысили уровень вакцинации, не связанной с ЭПИ, но не оказали существенного влияния на вакцинацию ЭПИ ( $p < 0,05$ ). Матери по-прежнему поддерживают ЭИП, но нерешительность в отношении вакцинации растет из-за недостатка информации. Крайне важно оценить знания и убеждения матерей о вакцинации, а также провести социальную пропаганду.

**Ключевые слова:** Детская Вакцинация; Убеждения; Знания; Матери; Нерешительность; Отказ От Вакцинации

## INTRODUCTION

Vaccines are biologic substances that stimulate the body's immunity to defend against diseases, and they play an important role in preventing and controlling epidemics. To keep infections from causing epidemics, the total number of immunization recipients should not exceed the population's social immunity thresholds. By 2022, 20.5 million children had not been vaccinated. Additionally, the total amount of children who didn't get any vaccines rose by 1.4 million from 2019.<sup>1</sup> The World Health Organization's Global Vaccine Action Plan intends to increase vaccination protection to over 90 percent across all national vaccination programs in all countries.<sup>2</sup>

The Extended Vaccine Program in Turkey aims to eradicate diseases like pertussis, diphtheria, tetanus, measles, rubella, mumps, tuberculosis, poliomyelitis, hepatitis B, and H. Influenza by vaccinating naive age groups. All children are currently vaccinated free of charge. Successful vaccination programs have cleared poliomyelitis in 2002 and eliminated neonatal tetanus in 2009. The term of "vaccine hesitancy-refusal" first emerged 20 years ago, resulting in an increase in vaccine refusal cases and a decrease in vaccination rates.<sup>3</sup>

Vaccine hesitancy is a significant issue affecting vaccination coverage, with increasing cases leading to decreased vaccination rates and increased vaccine-preventable disease frequency. The WHO warns that vaccine hesitancy could reverse progress in managing these diseases. In 2011, there were 183 families who refused to vaccinate their children. This number increased to 23,000 in 2018.<sup>4</sup> Turkey's increasing number of parents concerned about childhood vaccines could lead to a drop in vaccination coverage to 80% within five years, potentially causing disease recurrence.<sup>5</sup> World Health Organization established the "Vaccine Hesitancy Working Group" in 2012 to address "vaccine hesitancy", which refers to delayed or refused vaccination of certain vaccines, despite possible accessibility. "Vaccine refusal" is the state of not immunizing children with the intention of

rejecting all vaccines. The World Health Organization has identified vaccine refusal as one of its top global health issues to address in 2019, following a surge in cases.<sup>2</sup>

According to the World Health Organization, sociodemographic factors such as age, education, income, and health coverage all contribute to vaccine hesitancy and refusal. Rural areas with low socioeconomic status have lower access to immunization services, resulting in higher vaccine hesitancy.<sup>6</sup> Lack of trust, insufficient information, and worry about side effects, incorrect beliefs, religious reasons, and limited access to services, cultural differences, and negative media coverage are all other frequent causes of vaccine hesitancy.<sup>7,8</sup> According to recent studies, the primary cause of a decrease in vaccination rates is parents' refusal or reluctance to get involved in the vaccination program.<sup>9,10</sup> Obtaining parental consent is critical for childhood vaccination rates because their knowledge, opinions, and attitudes have an immediate effect on vaccination rates.

Effective vaccine hesitancy can be addressed through good communication, trust between healthcare providers and parents, and using mass and social media to educate about vaccine research outcomes. Recognizing parents' beliefs, including their worries, opinions, and vaccination behaviors, is critical for preserving and improving childhood vaccination prevalence.<sup>10,11</sup> The increase in parental knowledge has resulted in a more positive attitude towards vaccines. Mothers play a crucial role in implementing vaccination schedules, as their knowledge and understanding of childhood vaccinations significantly increase vaccination rates.

The purpose of this study was to determine knowledge, and beliefs of mothers about childhood vaccinations, as well as the impact of sociodemographic factors on their vaccination practices.

## MATERIAL AND METHODS

A cross-sectional, descriptive, study was conducted at a tertiary hospital's Family Medicine polyclinics between July and

November 2018. The sample size was determined to be 301 mothers,  $\alpha = 0.05$ , power 0.80, the G power program was used. The approval was received from the local ethics committee with decision number and dated 51/14, 11.06.2018. Written informed consent was obtained from the mothers who agreed to participate in the study. A survey was administered to 320 mothers with children under the age of five who did not have any mental, physical, or conversation difficulties. The study utilized a literature review-developed survey form with 31 questions to analyze socio-demographic characteristics, vaccination attitudes, healthcare personnel's informing status, and vaccination status of children.

Statistical analysis. For statistical analysis, the IBM SPSS 22 (USA) program was used. Among continuous data, those that follow a normal distribution are given as Mean

Standard Deviation; those that do not comply are given as median value (minimum-maximum). Categorical data are expressed as a percentage (%). The Kolmogorov-Smirnov test was used to ensure that the data followed a normal distribution. Mann Whitney U test is used to compare two groups of data that do not conform to normal distribution between independent groups; the Student's t test was used to compare normally distributed data. The Chi-square test was also used to compare two or more independent categorical groups, with  $p < 0.05$  considered statistically significant.

## RESULT

The mean age of the mothers were  $32.9 \pm 5.2$  years (min 19-max 48), and the mean age of the children was  $3.05 \pm 1.4$  years (min 0.5-max 5). Demographic characteristics of the participants were shown in Table 1.

**Table 1.** Demographic characteristics of parents

	Mothers (n=320)	Fathers (320)
<b>Age</b>		
<35 years	194 (60.6%)	127 (39.7%)
$\geq 35$ years	126 (39.4%)	193 (60.3%)
<b>Education</b>		
$\leq$ High school	125 (39.1%)	116 (36.2%)
$\geq$ University	195 (60.9%)	204 (63.8%)
<b>Employed</b>		
Yes	175 (54.7%)	315 (98.4%)
No	145 (45.3%)	5 (1.6%)
<b>Family Income</b>		
0-17000 TL	38 (11.9%)	
17000TL $\leq$	282 (88.1%)	
<b>Number of children</b>		
1 $\leq$	196 (61.3%)	
2 $\geq$	124 (38.7%)	
<b>Which child is this?</b>		
2 $\leq$	275 (85.9%)	
3 $\geq$	45 (14.1%)	

The majority of cases (96.6%) of cases support vaccine necessity, with 70% believing it protects children from diseases and 19.4% claiming it strengthens their health. Further 38.75% of mothers believe vaccines cause

negative side effects, including 53.4% fever, 12.9% allergies, 7.8% redness or swelling, 5.2% skin rash, 5.2% pain, 2.6% vomiting, 1.7% diarrhea, and 0.9% autism (Table 2). While 73.7% of the mothers stated that they

received information about the vaccine from a doctor, 4.6% from television, radio or newspapers, 18.1% from the internet, and 3.6% from their family and friends. Although 98.4% of the mothers had their children fully vaccinated according to the Extended Immunization Program (EIP), vaccine hesitancy was 7.8%, however vaccine refusal was 1.6%. When vaccine hesitant mothers were asked what they use as a preventative instead of vaccines; 20% of them stated that they used spring water, 20% stated that they paid attention to nutrition and hygiene, and 60% stated that they did not do anything special (Table2).

Most of mothers (80%) said that they were aware of the vaccines that are currently not involved in the EIP (i.e. influenza, meningococcal, and rotavirus), and 42.5% of mothers said they received non-EIP vaccines. The reasons why mothers who did not have non-EIP vaccines were as follows: 50% did not believe necessary, 33.1% were unaware of them, and 16.9% thought expensive (Table 2). Mothers not adequately informed about EIP were 42.2%. When it comes to protecting against infectious diseases, hygiene alone can be effective, according to 12.8% of mothers (Table 2).

**Table 2.** Mother’s knowledge and beliefs about childhood vaccination

Mothers (n=320)	
<b>When should a baby be given her first vaccination?</b>	
No idea	22 (6.9%)
First week	220 (68.8%)
First month	35 (10.9%)
First year	0 (0.0%)
<b>Is vaccination necessary?</b>	
Yes	309 (96.6%)
No	11 (3.4%)
<b>Why vaccination is necessary?</b>	
Protects from diseases	272 (70%)
Supports growth	26 (6.7%)
Strengthens health	75 (19.4%)
Threats diseases	9 (2.3%)
No idea	5 (1.3%)
<b>Do you think vaccines have side effects?</b>	
Yes	124 (38.75%)
No	196 (61.25%)
<b>What do you think are the side effects of vaccines?</b>	
Fever	62 (53.4%)
Allergy	15 (12.9%)
May be dangerous for children	11 (9.5%)
	9 (7.8%)

Redness and swelling	6 (5.2%)
Skin rash	6 (5.2%)
Pain	3 (2.6%)
Vomiting	2 (1.7%)
Diarrhea	1 (0.9%)
Autism	1 (0.9%)
Guillain-Barre Syndrome	
<b>Source of information about vaccines</b>	
Doctor	
Internet	289 (73.7%)
TV/radio/newspaper	71 (18.1%)
Friends and family	18 (4.6%)
	14 (3.6%)
<b>Vaccine hesitancy</b>	25 (7.8%)
<b>Vaccine refusal</b>	5 (1.6%)
<b>Precautions taken against un administered vaccines?</b>	
Using spring water	1 (20%)
Pay attention to nutrition and hygiene	3 (60%)
Nothing	
<b>Awareness of non-EIP vaccines</b>	
Yes	256 (80%)
No	64 (20%)
<b>Receiving non-EIP vaccines</b>	
Yes	136 (42.5%)
No	184 (57.5%)
<b>Received non-EIP vaccines</b>	
Rotavirus	115 (62.8%)
Meningococcal	62 (33.9%)
Influenza	6 (3.3%)
<b>Reasons for not receiving non-EIP vaccines</b>	
Having no information	59 (33.1%)
Expensive	30 (16.9%)
Thinking not necessary	89 (50%)
<b>Are you adequately informed before EIP?</b>	
Yes	185 (57.8%)
No	135 (42.2%)
<b>Can we be protected from diseases only by hygiene?</b>	
Yes	41 (12.8%)
No	279 (87.2%)

Responses to mother's age, education, career, and EIP immunization were similar ( $p>0.05$ ). No significant correlation between maternal age and non-EIP vaccination, while 56.4% of university-educated mothers had their children vaccinated ( $p<0.05$ ). A significant difference in non-EIP vaccination rates between families with fathers under 35 and those with a father aged 35 or older ( $p<0.05$ ). The father's educational status significantly increased non-EIP vaccination rates ( $p<0.05$ ) (Table 3). There was a substantial difference in non-EIP immunization rates between poor and high income families ( $p<0.05$ ). Table 3 shows that families with three or more children had higher non-EIP immunization rates than those with fewer than three children. The event was statistically significant ( $p<0.05$ ).

**Table 3.** Comparison of non-EIP vaccination status and demographic characteristics

	Non-EIP vaccination Mother (n=320)		p	Father (n=320)		p
	Yes	No		Yes	No	
<b>Age</b>						
<35 years	76 (39.2%)	118(60.8%)	0.144	42 (32.8%)	86 (67.2%)	<b>0.003</b>
≥35 years	60 (47.6%)	66 (52.45)		94 (49%)	98 (51%)	
<b>Education</b>						
≤High school	26 (20.8%)	99 (79.2%)	<b>0.000</b>	23 (20.7%)	88 (79.3%)	<b>0.000</b>
≥University	110 (56.4%)	85 (43.6%)		113 (54.1%)	96 (46%)	
<b>Employed</b>						
Yes	100(57.1%)	75(42.9%)	<b>0.000</b>	136 (43.2%)	176(56.8%)	0.141
No	36 (24.%)	109(75.2%)		0 (0.0%)	5 (100%)	
<b>Family Income</b>						
0-17000 TL	8 (21.1%)	30 (78.9%)	<b>0.002</b>			
17000≤TL	133 (47.7%)	149(52.8%)				
<b>Number of children</b>						
1≤	92 (46.9%)	104(53.1%)	0.193			
2≥	49 (39.2%)	75(60.5%)				
<b>Which child is this?</b>						
2≤	128 (46.5%)	147(53.5%)	<b>0.027</b>			
3≥	13 (28.9%)	32(71.1%)				

## DISCUSSION

The purpose of this study was to understand mothers' perceptions of childhood vaccinations and identify the reasons behind vaccine hesitancy. Understanding vaccine hesitancy is critical for community protection and overcoming refusal. Recognizing causes can help experts make informed decisions and implement effective policies.

We found that 96.6% of our mothers believe that vaccination is necessary. Studies in Turkey, reveal that 86.5%-90% of parents believe vaccines are necessary.<sup>9,12,13</sup> A study in Georgia, USA, found that 58% of parents believe vaccines are necessary, while 73.2% in India, 78.7% in Egypt, and 95% in Saudi Arabia.<sup>14-17</sup> Individuals who do not believe in the necessity of vaccines are more likely to refuse to receive them. Factors such as a country's development level, maternal education, geographical differences, and health policies can significantly impact this situation.

Vaccine hesitancy has grown significantly over the last decade in both developed and developing countries. According to 2022 statistics, our country's vaccination rate was 95%.<sup>18</sup> We found that 98.4% of the mothers had their children fully vaccinated according to

the Extended Immunization Program (EIP), vaccine hesitancy was 7.8%, and however vaccine refusal was 1.6%. Despite the fact that our study had a small sample size, the vaccination rate was consistent with national data. Yörük et al. found that vaccine hesitancy prevalence was determined as 13.8% and vaccine refusal was 4.8%.<sup>19</sup> Mothers still consider EIP is necessary, we found an increase in opposition to EIP and hesitancy to vaccination as seen other studies from Turkey.<sup>4,5,19</sup> A study conducted in 18 European countries discovered that 12% refused of families delayed vaccination, 24% were hesitant, and 4% were extremely hesitant.<sup>20</sup> A study in the USA revealed that 15% of parents refused vaccination.<sup>21</sup> Studies show that parents' pediatric vaccine hesitancy in different countries ranges from 7-27%.<sup>19-25</sup> Our findings revealed a slightly lower incidence of vaccine hesitancy than in Malaysia (11.6%), the UAE (12%), Italy (15.6%), and Indonesia (15.9%).<sup>22-25</sup>

We found no significant difference in the responses regarding mother's age, education level, profession, and EIP vaccination while the rate of non-EIP vaccination increased as the mothers and father's education level and family income increased. The World Health

Organization highlights the role of sociocultural factors in vaccine refusal and hesitancy, including factors like age, education, poverty, religious beliefs, gender, and distance to healthcare, trust in healthcare personnel, patriarchal family structure, and cultural restrictions.<sup>26</sup> Undeveloped countries studies indicate that higher education levels increase the likelihood of a mother receiving vaccinations.<sup>15,22,27</sup> However high education in developed countries significantly influences vaccine refusal, as families often have full access but refuse due to the high vaccination rate against diseases no longer present in their countries.<sup>28</sup> We also found that non-EIP vaccination rates increased in families with three or more children. This situation enables families with numerous children to access more vaccine information and benefit from their experiences while raising their children.<sup>22,27</sup>

We found 42.2% of mothers were not adequately informed about routine vaccinations and 24.3% of participants incorrectly answered when the first vaccination should be given to a newborn baby. Parents knowledge and beliefs toward child vaccination may affect their practice, with major barriers including an incorrect of information, restricted awareness, negative views, and incorrect views about safety. The mother's age, job, level of education, and family background are all associated with increased knowledge and mindsets.<sup>29</sup> Parents knowledge and beliefs toward immunization for children may be are favorable, but gaps exist. Educational strategies are required to increase their knowledge, particularly for the less educated and residents of rural areas.<sup>12,16</sup> Studies indicate that initial vaccination side effects like fever, pain, or swelling can negatively impact parents subsequent vaccination behaviors.<sup>16,18</sup> Our study reveals that 38.7% of mothers believe vaccines may cause side effects, with fever being the most common and allergies being the second most common. Some mothers believed that vaccines may cause autism and Guillain Barre Syndrome. Alsalhi et al. found fever as the

most common believed side effect of vaccines (70%), while Vonasek et al. and Kürkütüncü et al. found allergy as the most common (66.7%).<sup>8,30,31</sup>

Within our research, it was found that 20% of moms lacked knowledge regarding non-EIP immunizations, whilst 42.5% possessed awareness of them. Among those, 62.8% received rotavirus, 33.9% meningococcal, and 3.3% influenza vaccinations. We found that 33.1% of unvaccinated individuals lack information about non-EIP vaccines, 16.9% found them expensive, and 50% don't believe they were necessary. Kürkütüncü et al.'s study revealed that 72.2% of mothers were unaware of extra vaccines, with rotavirus vaccine being the most popular with a 28.9% success rate.<sup>9</sup> This study's findings were supported by other similar studies that obtained similar results.<sup>7,8</sup> Rotavirus is the primary cause of severe diarrhea in children under five, and its vaccine is frequently recommended by doctors.

In our study, most of (95%) of the cases were informed by health personnel, 73.7% of them from doctors, 18.1% from the internet. Gençer et al. "study from Turkey found healthcare professionals as the primary source of information", while many European studies found the internet and social media as the most common sources.<sup>32-34</sup> Our study differs from international studies, as mothers in our country prefer health authorities for information, while studies Europe show internet preference. The study's findings may be influenced by various factors, such as socio-demographic variations among the groups and internet access. A study in Europe found healthcare professionals as reliable sources of vaccine information, but some doctors publicly condemned or were hesitant about vaccines.<sup>35</sup> At this time, the vaccination habits, recommendations, and coverage of patients are greatly influenced by the knowledge and practices of healthcare providers, while training increases awareness and positive attitudes. Internet searches are becoming a significant source of vaccination information; healthcare professionals must play a crucial role in enhancing the impact of online

information. Social media and internet influence vaccination decisions, spreading fake news and misinformation, leading to vaccine hesitancy and increasing refusal rates in the digital age. Before counseling families, it's crucial to understand their concerns about vaccines and reflect on their concerns as we listen.

Our study's limitations include a limited number of participating parents and a specific region's knowledge status, necessitating larger, more comprehensive studies for all new parents.

## CONCLUSION

Immunization is a crucial preventive health strategy for reducing childhood morbidity and mortality globally, and it is essential to assess mothers' knowledge and beliefs influencing vaccination behaviors. Mothers continue to believe that an EIP is required, but a lack of knowledge regarding vaccines is making people more reluctant to get vaccinated. Doctors provide most vaccine information, but comprehensive social awareness, supported by state and private organizations, social media, television, and internet, is also necessary.

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## DECLARATIONS

Author contribution: Conceived and designed the analysis; Berna Turhan, Cenk Aypak. Collected the data; Berna Turhan, Cenk Aypak. Performed the analysis; Berna Turhan and Deniz Güven. Wrote the paper; Deniz Güven.

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