ORIGINAL ARTICLE ÖZGÜN ARAŞTIRMA

Frequency of Vaccine Hesitancy and Its Determinants in Northeastern Türkiye: A Hospital-based Cross-sectional Study

Kuzeydoğu Türkiye'de Aşı Tereddütünün Sıklığı ve Belirleyicileri: Hastane Tabanlı Kesitsel Bir Araştırma

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Abstract

Introduction: The World Health Organization has recognized vaccine hesitancy as one of the top ten threats to global health. Consequently, it is imperative to investigate vaccine hesitancy both between and within countries. The aim of this study was to determine the prevalence of vaccine hesitancy among mothers of children aged five years and under in northeastern Turkey and to identify the factors associated with vaccine hesitancy.

Materials and Methods: This cross-sectional study was conducted with mothers presenting to the pediatric outpatient clinic of a public hospital. Maternal reluctance toward vaccination was evaluated using the Parents' Attitudes about Childhood Vaccines (PACV) scale. Data were analyzed by chi-square and logistic regression analysis.

Results: Of the participating mothers, 27.4% exhibited vaccine hesitancy. Independent predictors of vaccine hesitancy were having a male child, active use of social media, and the father's attainment of a university degree.

Conclusion: In this study, vaccine hesitancy was found to be considerably higher compared to other studies conducted in Turkey. Therefore, further research on vaccine hesitancy should be conducted at the national level, considering different communities and cultures, and local health policies should be developed to address the identified risk factors.

Keywords
Vaccine hesitancy, vaccine refusal, parents' attitudes about childhood vaccines scale, PACV, children under 5 years of age, Türkiye

Öz

Giriş: Dünya Sağlık Örgütü, aşı tereddütünü küresel sağlık için en büyük on tehditten biri olarak kabul etmiştir. Dolayısıyla, ülkeler arasında ve ülkeler içinde aşı tereddütünün araştırılması zorunludur. Bu çalışmanın amacı, Türkiye'nin kuzeydoğusunda beş yaş ve altı çocukların anneleri arasında aşı tereddütünün yaygınlığını belirlemek ve aşı tereddütüyle ilişkili faktörleri belirlemektir.

Gereç ve Yöntem: Bu kesitsel çalışma, bir kamu hastanesinin çocuk polikliniğine başvuran annelerle gerçekleştirildi. Annelerin aşıya karşı isteksizliği, Ebeveynlerin Çocukluk Çağı Aşılarına İlişkin Tutumları (PACV) ölçeği kullanılarak değerlendirildi. Veriler ki-kare ve lojistik regresyon analizi ile analiz edildi.

Bulgular: Katılımcı annelerin %27,4'ünde aşı tereddütü saptanmıştır. Aşı tereddütü ile anlamlı biçimde ilişkili bağımsız değişkenler; erkek çocuğa sahip olma, sosyal medyayı aktif kullanma ve babanın üniversite mezunu olması olarak belirlenmiştir.

Sonuç: Bu çalışmada, aşı tereddütünün Türkiye'de yapılan diğer çalışmalara kıyasla önemli ölçüde yüksek olduğu bulunmuştur. Bu nedenle, farklı toplumlar ve kültürler göz önünde bulundurularak ulusal düzeyde aşı tereddütü üzerine daha fazla araştırma yapılmalı ve belirlenen risk faktörlerini ele almak için yerel sağlık politikaları geliştirilmelidir.

Anahtar kelimeler
Aşı tereddütü, aşı reddi, ebeveynlerin çocukluk çağı aşılarına ilişkin tutumları ölçeği, 5 yaş altı çocuklar, Türkiye

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Introduction

Vaccines currently prevent more than 30 life-threatening diseases and infections, saving millions of lives annually and constituting a hallmark achievement in global public health (1). Childhood immunization programs, in particular, have driven substantial reductions in morbidity and mortality among children under five years of age (2). Nevertheless, the rising phenomenon of vaccine hesitancy—globally and regionally—now threatens to undermine these gains (3). Accordingly, the World Health Organization (WHO) has designated vaccine hesitancy as one of the ten greatest threats to global health.

WHO defines vaccine hesitancy as the reluctance or refusal to vaccinate despite the availability of vaccination services (4). As incidences of vaccine-preventable diseases decline, public confidence in the necessity and safety of vaccines has been increasingly questioned, leading some individuals to delay or completely forego recommended immunizations.

Vaccine hesitancy cannot be explained by a single cause; it stems from a multifaceted interplay of social, psychological, cultural, political, and personal factors. Vaccine hesitancy and related behaviors are further exacerbated by social media platforms (5). Social media platforms facilitate the rapid spread of misinformation, particularly among those with limited health literacy, leading to negative attitudes.

Given the significant contribution of vaccine hesitancy to declining vaccination rates, a comprehensive understanding of vaccine hesitancy is vital for developing strategies aimed at increasing childhood immunization rates (6). Therefore, the aim of this study was to determine the frequency of vaccine hesitancy among mothers of children aged 0–59 months old in Northeast Turkey and to identify causal factors related to vaccine hesitancy.

Materials and Methods

Study Setting: This study was conducted at the largest public hospital in northeastern Turkey, a region bordering Georgia, Armenia, the Nakhchivan Autonomous Republic (Azerbaijan), and Iran (7).

Economically, this area falls below the national average, and its health indicators rank lowest in Turkey. The number of healthcare personnel per 1,000 people is below the Turkish average. Both the infant mortality rate (11.2 per 1,000 live births) and maternal mortality rate (24.5 per 100,000 live births) are above the Turkish average. Additionally, the region has the lowest vaccination rates in Turkey (7).

Study Design: This research was designed as a cross-sectional observational study.

Study Population: The study population consisted of mothers of children aged 0–59 months who presented to the pediatric outpatient clinics of a public hospital in Northeastern Turkey. During the planning phase of the study, it was anticipated that data would be collected during the months of April, May, and June 2024. Therefore, the number of children aged 0–59 months who presented to the pediatric outpatient clinic in April, May, and June of the previous year (2023) was accepted as the study population. Accordingly, the population was determined as 1,813 eligible mother–child dyads.

Study Sample: The required sample size was calculated using the formula: $n = Nt^2\ p\ q/d^2\ (N - 1) + t^2\ p\ q$. Here, N is the number of individuals in the population, n is the number of individuals to be sampled, p is the prevalence (probability) of the event under investigation, q is the prevalence (probability) of the event not occurring; t is the theoretical value from the table at a specific degree of freedom and the determined margin of error, and d is the desired ± deviation relative to the prevalence of the event (8). Accordingly, with p = 0.50, q = 0.50, t = 1.96, and d = 0.05, the sample size was determined to be 317 individuals.

Dependent Variable: Vaccine hesitancy.

Independent Variables: Social and demographic characteristics related to the family, mother, and child.

Preparation of the Data Collection Form: The data collection form consisted of two main parts. The first part comprised questions regarding the sociodemographic characteristics of the child and family, and the second part consisted of the Parents' Attitudes Towards Childhood Vaccines Scale (PACV) questions. The PACV scale is a valid and reliable scale adapted for the Turkish population. Responses that indicate vaccine hesitancy are scored 2 points, responses that indicate non-hesitancy are scored 0 points, and responses indicating indecision are scored 1 point. The total scale score ranges from 0 to 30. For items with missing data, the total raw scores are recalculated using a simple linear calculation method to fit a scale ranging from 0 to 100 thus obtaining a transformed score. A transformed PACV score of <50 indicates no vaccine hesitancy, whereas a score ≥50 indicates vaccine hesitancy (9).

Pilot Study: Prior to data collection, the data collection form was tested on 6 mothers, and necessary corrections were made.

Ethical Considerations: Prior to the commencement of the study, ethical approval was obtained from the Clinical Research Ethics Committee of Kafkas University Faculty of Medicine with the (approval number: 80576354-050-99/556, date: 30.10.2024). All parents participating in the study were given detailed information about the purpose, scope, and confidentiality principles of the study, and written informed consent was obtained from those who agreed to participate voluntarily. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Data Collection: Data were collected by a pediatrician during face-to-face interviews with mothers who brought their children to the pediatric outpatient clinic for examination and volunteered to participate in the study.

Exclusion Criteria: Mothers of children with contraindications to vaccination, and parents or caregivers other than the child's mother who brought the child to the hospital were not included in the study.

Statistical Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) software, version 20.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were presented as frequencies and percentages. Chi-square tests were used for pairwise comparisons, and Backward Likelihood Ratio (LR) logistic regression analysis was performed to determine causal relationships. A p-value of <0.05 was considered statistically significant.

Results

In this study, the prevalence of maternal vaccine hesitancy was 27.4%.

In pairwise analyses, significant associations were observed between vaccine hesitancy and the following factors: child's gender (p = 0.007), following vaccine-related content on social media (p = 0.022), mother's education level (p = 0.036), father's education level (p = 0.007), mother's health insurance status (p = 0.035), and family income (p = 0.024) (Table 1).

Logistic regression analysis was performed to identify independent risk factors. Mothers of male children had 1.95-times higher odds (95% CI: 1.165–3.274), mothers who followed vaccine information on social media had 1.93-times higher odds (95% CI: 1.020–3.650), and those whose partners held a university degree had 1.75-times higher odds (95% CI: 1.034–2.956) of exhibiting vaccine hesitancy (Table 2).

Table 1. Effects of independent variables on the dependent variable (Northeastern Türkiye. 2024)

Independent variables		Vaccine hesitancy		Total	χ^2	P
		Yes	No			
		Number (%)*	Number (%)*	Number (%)**		
Place of residence	Urban	73 (29.8)	172 (70.2)	245 (77.3)	2.994	0.084
	Rural	14 (19.4)	58 (80.6)	72 (22.7)		
Number of children	Only child	57 (28.9)	140 (71.1)	197 (62.1)	0.580	0.446
	≥2 children	30 (25.0)	90 (75.0)	120 (37.9)		
Pregnancy order	First pregnancy	29 (32.2)	61 (67.8)	90 (28.4)	1.441	0.230
	Subsequent pregnancy	58 (25.6)	169 (74.4)	227 (71.6)		
Sex of the child	Male	54 (34.2)	104 (65.8)	158 (49.8)	7.170	0.007
	Female	33 (20.8)	126 (79.2)	159 (50.2)		
Social media use on vaccine content	Yes	21 (40.4)	31 (59.6)	52 (16.4)	5.231	0.022
	No	66 (24.9)	199 (75.1)	265 (83.6)		
Mother's parity	1	29 (31.9)	62 (68.1)	91 (28.7)	2.107	0.349
	2	29 (28.7)	72 (71.3)	101 (31.9)		
	3 and above	29 (23.2)	96 (76.8)	125 (39.4)		
Median age of mother	≤34 years	55 (28.5)	138 (71.5)	193 (60.9)	0.275	0.600
	≥35 years	32 (25.8)	92 (74.2)	124 (39.1)		
Mother's education	University graduate	41 (34.2)	79 (65.8)	120 (37.9)	4.382	0.036
	High school or lower	46 (23.4)	151 (76.6)	197 (62.1)		

Table 1. Continued						
Independent variables		Vaccine hesitancy		Total	χ^2	P
		Yes	No			
		Number (%)*	Number (%)*	Number (%)**		
Father's education	University graduate	43 (36.1)	76 (63.9)	119 (37.5)	7.225	0.007
	High school or lower	44 (22.2)	154 (77.8)	198 (62.5)		
Mother's employment status	Income generating	24 (28.2)	61 (71.8)	85 (26.8)	0.036	0.849
	Housewife	63 (27.2)	169 (72.8)	232 (73.2)		
Mother's health insurance status	SSI	82 (29.4)	197 (70.6)	279 (88.0)	4.426	0.035
	Green Card	5 (13.2)	33 (86.8)	38 (12.0)		
Father's employment status	Employed	80 (28.3)	203 (71.7)	283 (89.3)	0.899	0.343
	Unemployed	7 (20.6)	27 (79.4)	34 (10.7)		
Consanguineous marriage	Yes	16 (28.6)	40 (71.4)	56 (17.7)	0.043	0.835
	No	71 (27.2)	190 (72.8)	261 (82.3)		
Family type	Extended	26 (28.0)	67 (72.0)	93 (29.3)	0.017	0.895
	Nuclear	61 (27.2)	163 (72.8)	224 (70.7)		
Family income status	Income higher than expenses	26 (38.2)	42 (61.8)	68 (21.5)	5.062	0.024
	Income lower than expenses	61 (24.5)	188 (75.5)	249 (78.5)		
Primary decision-maker	Both parents	51 (28.7)	127 (71.3)	178 (56.2)	0.303	0.859
	Father	16 (26.2)	45 (73.8)	61 (19.2)		
	Mother	20 (25.6)	58 (74.4)	78 (24.6)		
Total		87 (27.4)	230 (72.6)	317 (100.0)		

*Row percentage, **Column percentage, SSI: Social Security Institution

Table 2. Results of logistic regression analysis (Northeastern Türkiye, 2024)							
Dependent variable: Vaccine hesitancy							
Independent variables		B	SE	Wald	P	Odds ratio	95% CI (min-max)
Sex of the child	Male	0.669	0.264	6.448	0.011	1.95	1.165-3.274
	Female					1	
Social media use on vaccines	Yes	0.657	0.325	4.079	0.043	1.93	1.020-3.650
	No					1	
Father's education	University graduate	0.559	0.268	4.344	0.037	1.75	1.034-2.956
	High school or lower					1	

Discussion

Numerous studies have quantitatively assessed parental attitudes and beliefs toward childhood vaccination in various countries. However, most studies did not employ a validated questionnaire. Furthermore, there were substantial differences in how questionnaires were developed and which items were included; creating challenges in comparing the findings (10).

In the present study, the frequency of vaccine hesitancy was 27.4%. Prevalence rates for pediatric vaccine hesitancy using the PACV scale are reported to range between 5.0% and 30.0% (10). For example, prevalence of vaccine hesitancy was 24.6% among mothers of preschoolers in Italy (11), 27.9% among mothers of 0–59-month-old children in Pakistan (12), 25.9% among a similar cohort in Cameroon (13), and 15.0% among mothers of neonates in Canada (14). In Turkey, the prevalence of vaccine hesitancy was reported as 9.4% and 13.0% in two studies conducted with mothers of preschool children (5,15), 13.8% in a study conducted with pregnant women (16), and 22.5% in a study conducted with mothers

of children aged 2–6 years (17). These findings underscore substantial heterogeneity in vaccine hesitancy both between and within countries, likely driven by local cultural norms, regional socioeconomic development, and social factors.

In our multivariable model, mothers of male children had 1.95-times greater odds of exhibiting vaccine hesitancy compared to mothers of females (95% CI: 1.16–3.27). Patriarchal family structure is dominant in the region where the present study was conducted. In the patriarchal family, a woman can only consolidate her position if she gives birth to a son. Therefore, in patriarchal families, different meanings are attached to boys and girls. A male child is seen as the continuation of the lineage and the family's security in old age. In such families, the woman's status is strengthened by bearing a male child, and by giving birth to a son, the woman gains prestige in society (18). In the literature, the misconception that vaccines "cause infertility in males" is prevalent both in Turkey (19,20) and in other countries (21,22). Consequently, it can be argued that parents hesitate to vaccinate their male children to shield them from the perceived risk of infertility.

Mothers who followed anti-vaccine content on social media had 1.93-times higher odds of exhibiting vaccine hesitancy compared with those who did not (95% CI: 1.02–3.65). Social media refers to interactive communication platforms where users search, utilize, and produce content online; in other words, it enables media communication transitioning from one-way content sharing to bidirectional content exchange (e.g., applications such as Weibo, Twitter, Facebook, Instagram, LinkedIn, and Pinterest) (23-25). An "infodemic" occurs when an overabundance of information—including false or misleading content—spreads across digital and physical environments during an outbreak, leading to public confusion and risky health behaviors (26). One study estimated that the proportion of health-related misinformation on social media ranged from 0.2 % to 28.8 % (27). In a study conducted during the COVID-19 pandemic, parents who used social media as a source of vaccine information reported 5.3-times greater hesitancy toward childhood immunizations than those who did not (28). In a study conducted in Turkey, vaccine hesitancy was three times more prevalent among parents following anti-vaccine groups on social media compared with non-followers (16). Another Turkish study likewise found a significant association between social media use and vaccine hesitancy in a bivariate analysis (15). Overall, studies consistently link social media-driven disinformation campaigns with declines in average vaccination coverage (29).

When mothers whose spouses had lower educational attainment were used as the reference group, those whose partners held a university degree demonstrated 1.75-times higher odds of exhibiting vaccine hesitancy (95% CI: 1.03–2.96). A previous study on COVID-19 vaccine acceptance has reported higher hesitancy among men than women (30). However, the relationship between education level and vaccine acceptance in the literature remains ambiguous. Multiple studies indicate that parents with less formal education tend to have lower trust in the medical community, express greater concerns about vaccine safety, and exhibit lower belief in the necessity and efficacy of vaccines (31). In contrast, other literature has determined that higher education fosters a more critical perspective leading to comprehensive questioning of vaccines, noting that individuals with higher education levels are approximately four-times more likely to worry about vaccine safety compared to those with lower education (32). Thus, it can be concluded that only education level may be acting as a confounder in the overall decision-making process regarding immunization.

Study Limitations

A key strength of this study is the use of the validated PACV scale. Furthermore, this is the first study conducted in this region using the PACV scale.

However, there are certain limitations of the study. Because of the hospital-centered design, caution is warranted when generalizing findings to the broader community. Another limitation is the cross-sectional nature of the data, representing only a specific time interval.

Conclusion

In this study, vaccine hesitancy was considerably higher compared to other research conducted in Turkey. Independent risk factors included having a male child, following vaccine-related content on social media, and having a spouse with university-level education.

Recommendations

Efforts to combat negative vaccine-related information on social media should be intensified both globally and nationally. Additionally, research on vaccine hesitancy targeting diverse populations and cultures should be conducted at the national level, and local health policies addressing identified risk factors should be developed. Crucially, these policies should include enhancing healthcare workers' awareness of vaccine hesitancy issues and expanding their capacity to provide personalized counseling to parents.

Ethics

Ethical Approval: Ethical approval was obtained from the Clinical Research Ethics Committee of Kafkas University Faculty of Medicine with the (approval number: 80576354-050-99/556, date: 30.10.2024).

Footnotes

Conflict of Interest: No conflict of interest was declared by the authors.

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