

# Maternal Perception, Hesitancy, and Satisfaction Toward Childhood Immunization in Primary Health Centers, Hafr Al-Batin: A Multicenter Cross-Sectional Study from Eastern Saudi Arabia

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**Background:** Consumer perception of and satisfaction with vaccination services is a critical and commonly used indicator for evaluating the quality of services provided by concerned authorities. The present survey assessed maternal perceptions, hesitancy, satisfaction, and factors associated with childhood immunization services provided at the primary health centers (PHCs) of eastern Saudi Arabia.

**Methods:** The current analytical cross-sectional study included mothers of childhood vaccine beneficiaries attending PHCs in Hafr Al-Batin. We collected data related to mothers' perceptions, hesitancy, and satisfaction using a validated Arabic version of the data collection tool. Factors associated with low and high satisfaction with the immunization services were evaluated using logistic regression analysis. We performed Spearman correlation test to identify the correlation between the perception and satisfaction scores.

**Results:** Of the 675 participants, 87.4% were satisfied with the immunization services provided at the PHCs. The participants' satisfaction was significantly associated with the immunized child's age group (adjusted odds ratio [AOR] = 1.89, 95% CI = 1.39–2.89,  $p = 0.037$ ) and occupation status (AOR = 1.42, 95% CI = 1.17–1.74,  $p = 0.024$ ). Vaccine hesitancy was significantly associated with the mother's age group (AOR = 1.89, 95% CI of AR = 1.35–3.39,  $P = 0.003$ ) and number of children (AOR = 1.42, 95% CI of AR = 1.17–1.74,  $P = 0.024$ ). Additionally, we found a significant positive correlation (Spearman's  $\rho = 0.207$ ,  $p < 0.001$ ) between perception and satisfaction scores.

**Conclusion:** We recommend targeted health education programs for mothers to improve their perceptions and the importance of all recommended childhood vaccines. Additionally, we suggest continuing maternal satisfaction assessments to enhance and maintain the quality of vaccination services.

**Keywords:** childhood vaccines, adverse effect, satisfaction, hesitancy, perception, Saudi Arabia

## Introduction

Immunization is one of the critical advancements in international health and development, saving millions of children worldwide.<sup>1,2</sup> Currently, more than 20 serious diseases are under control due to immunization, enabling children and adults to live healthier and more productive lives.<sup>1,3</sup> According to the United Nations Children's Fund (UNICEF), immunizations has prevented over five deaths per minute and saved up to 3 million daily deaths, even before the COVID-19 pandemic.<sup>3</sup>

Childhood vaccinations are essential for protecting children against serious vaccine-preventable diseases, including measles, mumps, rubella, polio, diphtheria, pertussis, and tetanus. Childhood vaccination protects children and also helps in protecting other vulnerable groups.<sup>4</sup>

Despite the proven benefits of vaccination and the general acceptance of its efficacy, a small proportion of individuals refuse or delay vaccinations. Vaccine hesitancy can manifest as complete refusal, delayed acceptance, or acceptance accompanied by doubts about the process, influenced by factors such as decreased confidence in the vaccination process, underestimation of the risks associated with vaccine-preventable diseases, and limited accessibility and quality of services.<sup>5</sup> A survey conducted by Lakunina in 2021 reported that more than 50% of parents were adequately informed about immunization. Parents often withhold vaccination due to concerns about potential behavioral and neurological issues emerging in children after vaccination.<sup>6</sup> Similarly, a community-based survey conducted by GebreEyesus et al in 2020 using a cluster sampling method found that nearly one-third (68.2%) of mothers expressed satisfaction with childhood immunization services. They also found maternal satisfaction with childhood immunization services was significantly associated with education status, being divorced, and favorable health care providers.<sup>7</sup> Another survey conducted in Egypt that evaluated maternal satisfaction with pediatric immunization services provided at primary health centers (PHCs) reported that most mothers had insufficient knowledge of childhood vaccination, but this was not statistically significant. The study recommended that clients' needs are ever changing, and ongoing assessments of clients' satisfaction are essential to improving childhood vaccination services.<sup>8</sup>

In the Kingdom of Saudi Arabia (KSA), PHCs are the first line of contact for the community in delivering healthcare services, including childhood immunizations, and are divided into two sections (one for men and the other for women).<sup>9,10</sup> The immunization services are provided in the women's section, where men are not allowed due to sociocultural restrictions implemented in the KSA. Consumer satisfaction with healthcare services serves as a crucial and commonly used indicator for evaluating the quality of services provided by relevant authorities, potentially influencing attitudes toward vaccination.<sup>11,12</sup> This approach can also help policymakers gain insights into various domains of care and plan for necessary changes.<sup>13–15</sup> In the KSA, a survey conducted by Alshammari TM et al assessed Saudi parents' perceptions regarding childhood vaccinations. They revealed that most parents possessed a sound understanding of childhood vaccines, completed immunization as per the schedule for their children for up to five years and had easy accessibility to vaccine-related services.<sup>16</sup>

Despite these findings, a study from Saudi Arabia reported a 20% of vaccine hesitancy among parents.<sup>17</sup> Decisions regarding vaccines include a complex array of elements that encompass emotional, cultural, social, spiritual and political domains.<sup>18</sup> Considering the broad sociocultural diversity across different regions of the KSA, these findings cannot be generalized to the entire population. Continuous evaluation is imperative, especially given the changing epidemiological landscape related to vaccines, particularly post-pandemic.<sup>19,20</sup> Furthermore, there exists a pressing need for region-specific data on this intricate subject to facilitate essential policy changes. Therefore, the present study aimed to assess the perceptions and hesitancy toward childhood immunization among mothers attending immunization services at Hafr Al-Batin, Saudi Arabia and to identify their satisfaction with the childhood immunization services provided at PHCs. Furthermore, we evaluated the correlation between maternal perceptions and satisfaction with the immunization services provided.

## Materials and Methods

### Research Design and Setting

This analytical cross-sectional study was conducted from June 2022 to January 2023. We included mothers of childhood vaccine beneficiaries attending all PHCs in Hafr Al-Batin, which is situated in the Eastern province of the KSA. There are 73 PHCs in this region, serving approximately 600,000 people across 34 areas. The present study included mothers of childhood immunization beneficiaries (up to 6 years of age) and excluded participants other than mothers (relatives and caregivers).

### Sampling Strategy

In this analytical cross-sectional study, we estimated the minimum number of vaccination beneficiaries (mothers) using Cochran's formula ( $n = z^2 pq / e^2$ ). Given the wide range of satisfaction and hesitancy levels reported in previous studies, we

considered 50% as the expected proportion ( $p$ ). This choice aimed to provide the maximum number of required participants. Therefore, with an expected proportion of 50% at a 95% confidence interval (CI) and 5% margin of error, the measured sample size (minimum required) was 384, rounded to 390. However, the research team aimed to collect the data until reaching the minimum necessary sample size or the maximum duration allowed by the institutional review board, which resulted in data collection from 675 mothers who attended the PHCs of Hafr Al-Batin, KSA. Using consecutive sampling methods, all the mothers were invited to participate in the survey after their children got immunized at the PHCs. To ensure recruitment of participants over the study period, we limited the number of participants from each center to a maximum of 10 mothers per day.

## Data Collection Procedure

The research team initiated the data collection process after getting ethical clearance from Hafr Al-Batin Health Affairs, KSA (Approval no:082, Dated: 21.06.22) and other necessary approvals from relevant health center officials. All participating mothers provided informed consent in line with the Declaration of Helsinki. The research team developed the data collection proforma based on the existing literature from PubMed, Web of Sciences, and other major databases and from the field of experts from pediatrics, public health, and family medicine.<sup>7,8,11,13,21</sup> The prepared questionnaire was translated into Arabic, and the research team followed all the standard protocols during the translation process.<sup>22,23</sup> Prior to the main data collection, a survey questionnaire was administered to 30 mothers who attended immunization session for their children. All the participated mothers gave feedback that the questionnaire was in simple language, clear, and easy to understand. The Cronbach's alpha values for the perception and satisfaction sections were 0.78 and 0.91, respectively. All mothers communicated through a Google link by using the pretested and structured questionnaire. The data collection tool consists of three parts (refer to [Appendix 1](#), data collection form, for detailed content). The first part included inquiries about sociodemographic characteristics such as the mother's age, education, occupation, and residential status), and the second consists of 10 questions about the mother's perception and hesitancy towards childhood vaccination. This section was based on the WHO vaccine hesitancy scale (VHS), commonly used in various sociocultural settings to assess participants' perceptions and attitudes toward childhood vaccines that contribute to vaccine hesitancy.<sup>24–26</sup> These 10 items were further divided into two domains that evaluated participants' perceptions of vaccine efficacy and confidence in vaccine effects (Domain 1: Items 1, 2, 3, 4, 6, 7, and 8) and perceptions of vaccine risks (Domain 2: Items 5, 9, and 10).<sup>26,27</sup> Higher scores in the domains and overall indicated lower hesitancy toward childhood vaccines. The final section comprised of 10 items related to participants' satisfaction with the immunization services provided at the PHCs. The mothers responded on a 5-point Likert scale for both the perception and satisfaction sections. These 10 items evaluated the participants' satisfaction related to immunization services regarding registration, healthcare providers' role in care, and follow-up advice. The responses in the perception section ranged from strongly agree to strongly disagree, and we marked the score as 5 to 1. A reverse score (1 to 5) was assigned to the negative questions (Items 5, 7, 9, and 10). The responses in the satisfaction category ranged from very much satisfied to very much dissatisfied, and we marked the score from 5 to 1. We summed up all the responses scores to calculate the total scores.

## Statistical Analysis

Descriptive data on background characteristics, perceptions, hesitancy, and satisfaction levels are presented as frequencies and proportions. The quantitative data, such as total scores, are presented as mean and standard deviation. We performed the Shapiro–Wilk normality test, and neither the satisfaction nor hesitancy scores met the normality assumption. Furthermore, we categorized the satisfaction scores into low and high using the demarcation threshold equation:  $(\text{total highest score} - \text{total lowest score}) / 2 + \text{Total lowest scores}$ .<sup>12,28,29</sup> Using values from the present study, the cut-off value was set at 30 for satisfaction scores, categorizing them as low ( $\leq 30$ ) and high ( $> 30$ ). The median value of the vaccine hesitancy scores assessed by the WHO-VHS was 37. We categorized them into less vaccine hesitancy ( $> 37$ ) and high vaccine hesitancy ( $\leq 37$ ) groups based on the median value from this study. The associated factors for the low and high satisfaction with the immunization services and factors linked to low and high vaccine hesitancy were evaluated using binomial logistic regression analysis. Finally, we performed Spearman correlation test to identify the correlation between perception and satisfaction scores.

## Results

Among the 675 participating mothers, the majority (48.3%) belonged to the age group of 25 to 35 years, and their immunized child age group was less than 12 months (45.0%). Furthermore, most mothers had an education level above high school (70.5%) and are currently married (96.1%). Concerning the source of information received about childhood vaccines, more than half (54.4%) of them received information from the Ministry of Health, KSA activities, and 24.4% received the same from media platforms (such as social media, TV, and radio) (Table 1).

Mothers' perceptions regarding childhood vaccines and immunization services are detailed in Table 2. The majority of the mothers agreed that childhood vaccines are essential for their child's health (91.3%) and prevent severe illness (87.4%) and having their child vaccinated is necessary for the health of others in the community (91.4%). Notably, approximately 36% of participants believed that newly approved vaccines carry more risk than older vaccines, and 35% were concerned about the adverse effects of childhood vaccines.

Regarding participants' satisfaction with immunization services, the highest satisfaction level (very much satisfied and satisfied) was observed in ease of registration and scheduling (85.9%), followed by the time spent by the healthcare providers upon my child having vaccinated (83.4%), and waiting time before getting vaccine services by the healthcare providers

**Table 1** Sociodemographic Characteristics of the Mothers (n = 675)

Characteristics	Frequency	Proportion
Mothers' age group (years)		
Less than 25	197	29.2
25–35	326	48.3
More than 35	152	22.5
Child age group (months)		
Less than 12	304	45.0
12 to 24	232	34.4
More than 24	139	20.6
Number of children		
Up to 2	274	40.6
3–4	331	49.0
More than 4	70	10.4
Education status		
Up to high school	199	29.5
Above high school	476	70.5
Marital status		
Married	649	96.1
Divorced / widowed	26	3.9
Occupation		
Government job	328	48.6
Private sector and business	170	25.1
Unemployed	177	26.2
Monthly family income (Saudi Riyals -SAR)		
Less than 5000	83	12.3
5000 to 7000	144	21.3
More than 7000	448	66.4
Source of information regarding childhood vaccines		
Friends and families	142	21.0
Ministry of health activities	368	54.5
Medias (social media, TV, radio etc)	165	24.4

**Table 2** Participants' Perception and Hesitancy Towards Childhood Vaccines Provided at the Primary Health Centers (PHCs) of Hafr Al Batin (n = 675)

S. No	Indicator	Strongly Agree n (%)	Agree n (%)	Neutral n (%)	Disagree n (%)	Strongly Disagree n (%)
1	Childhood vaccines are important for my child's health	402 (59.6)	214 (31.7)	31 (4.6)	11 (1.6)	17 (2.5)
2	Many of the illness that vaccine prevent are severe (childhood vaccines are effective)	288 (42.7)	302 (44.7)	52 (7.7)	16 (2.4)	17 (2.5)
3	Having my child vaccinated is important for the health of others in my community	336 (49.8)	281 (41.6)	28 (4.1)	17 (2.5)	13 (1.9)
4	All childhood vaccines offered by the government program in my community are beneficial.	360 (53.3)	266 (39.4)	27 (4.0)	12 (1.8)	10 (1.5)
5	Newly approved vaccines carry more risks than older vaccines*	88 (13.0)	153 (22.7)	244 (36.1)	115 (17.0)	75 (11.1)
6	The information I receive about vaccines from the vaccine program is reliable and trustworthy.	214 (31.7)	346 (51.3)	86 (12.7)	16 (2.4)	13 (1.9)
7	It is better for a child to develop immunity by getting sick than to get a vaccine*	54 (8.0)	127 (18.8)	138 (20.4)	216 (32.0)	140 (20.7)
8	Generally, I do what my doctor or health care provider recommends about vaccines for my child/children.	259 (38.4)	357 (52.9)	37 (5.5)	13 (1.9)	9 (1.3)
9	I am concerned about adverse effects of vaccines*	60 (8.9)	176 (26.1)	169 (25.0)	196 (29.0)	74 (11.0)
10	My child does not need vaccines for diseases that are not common anymore*	54 (8.0)	97 (14.4)	129 (19.1)	239 (35.4)	156 (23.1)

Note: \*Reverse scoring.

(79.8%). Conversely, the lowest satisfaction level was noted in follow-up advice on potential adverse effects and their management (64.3%) and the healthcare providers' consideration of my concerns about vaccination (66.4%) (Table 3).

Categorizing vaccine hesitancy based on the study's median score, 357 participants (52.9%) demonstrated less hesitancy, while 318 (47.1%) displayed high hesitancy. The binomial logistic regression, adjusted for the covariables of this survey, revealed a significant association between participants' vaccine hesitancy and the mother's age group

**Table 3** Participants' Satisfaction with Immunization Services Provided at the PHCs of Hafr Al Batin (n = 675)

S. No	Indicator	Very much Satisfied n (%)	Satisfied n (%)	Neutral n (%)	Dissatisfied n (%)	Very much Dissatisfied n (%)
1	Ease of registration and scheduling at the healthcare facility	262 (38.8)	318 (47.1)	57 (8.4)	25 (3.7)	13 (1.9)
2	Waiting time before getting vaccine services by the healthcare providers	192 (28.4)	347 (51.4)	78 (11.6)	46 (6.8)	12 (1.8)
3	What is your satisfaction level on facilities such as waiting area, examination room etc?	163 (24.1)	354 (52.4)	88 (13.0)	53 (7.9)	17 (2.5)
4	Healthcare providers explanation on different childhood vaccination and importance of getting vaccinated	153 (22.7)	337 (49.9)	114 (16.9)	44 (6.5)	27 (4.0)

(Continued)

**Table 3** (Continued).

S. No	Indicator	Very much Satisfied n (%)	Satisfied n (%)	Neutral n (%)	Dissatisfied n (%)	Very much Dissatisfied n (%)
5	The time spent by the healthcare providers to upon my child having vaccinated	171 (25.3)	392 (58.1)	65 (9.6)	36 (5.3)	11 (1.6)
6	Advice from the healthcare providers, upon my having vaccinated	165 (24.4)	353 (52.3)	106 (15.7)	34 (5.0)	17 (2.5)
7	Briefing given to me on the dose and route of vaccine administration	163 (24.1)	340 (50.4)	100 (14.8)	44 (6.5)	28 (4.1)
8	The healthcare providers consideration on my concerns about vaccination	131 (19.4)	332 (49.2)	136 (20.1)	54 (8.0)	22 (3.3)
9	Follow up advice regarding possible adverse effect and its management	117 (17.3)	317 (47.0)	176 (26.1)	46 (6.8)	19 (2.8)
10	Follow up advice regarding next vaccine and compliance on taking on scheduled date	181 (26.8)	354 (52.4)	106 (15.7)	20 (3.0)	14 (2.1)

(adjusted odds ratio [AOR] = 1.89, 95% CI of AR = 1.35–3.39,  $p = 0.003$ ), number of children (AOR = 1.42, 95% CI of AR = 1.17–1.74,  $p = 0.024$ ), education status (AOR = 1.71, 95% CI of AR = 1.23–2.94,  $p = 0.001$ ), and source of information about immunization (AOR = 2.41, 95% CI of AR = 1.39–3.86,  $p = 0.004$ ; [Table 4](#)).

Among the participants, 590 (87.4%) expressed satisfaction with the immunization services at the PHCs of Hafr Al-Batin, KSA. The binomial logistic regression, after adjusting with the covariables of this survey, we found that participants' satisfaction was significantly associated with the immunized child age group AOR = 1.89, 95% CI of AR = 1.39–2.89,  $p = 0.037$  and occupation status (AOR = 1.42, 95% CI of AR = 1.17–1.74,  $p = 0.024$ ) ([Table 5](#)).

Since neither the perception (test value = 0.931,  $p < 0.05$ ) nor satisfaction (test value = 0.919,  $p < 0.05$ ) scores met the normality assumption through the Shapiro–Wilk test. Hence, we executed the Spearman correlation test, and it revealed a significant positive correlation (Spearman's rho = 0.207,  $p < 0.001$ ) between perception and satisfaction scores ([Table 6](#)).

**Table 4** The Associated Factors for the Vaccine Hesitancy Among the Mothers Attending PHCs of Hafr Al Batin (n = 675)

Variables	Total n (675)	Hesitancy Category (Based on Above or Below Median Score)		Logistic Regression Findings	
		Higher Hesitancy (318)	Lesser n (357)	AOR (95% of OR)**	p-value
Mothers' age group (years)					
Less than 25	197	106	91	Ref	
25–35	326	148	178	1.89 (1.25–2.87)	0.003*
More than 35	152	64	88	2.09 (1.28–3.39)	0.034*
Immunized child age group (months)					
Less than 12	304	143	161	Ref	
12 to 24	232	109	123	0.94 (0.66–1.35)	0.744
More than 24	139	66	73	0.82 (0.54–1.27)	0.374

(Continued)

**Table 4** (Continued).

Variables	Total n (675)	Hesitancy Category (Based on Above or Below Median Score)		Logistic Regression Findings	
		Higher Hesitancy (318)	Lesser n (357)	AOR (95% of OR)**	p-value
Number of children					
Up to 2	274	124	150	Ref	
3–4	331	155	176	0.80 (0.56–1.14)	0.216
More than 4	70	39	31	0.49 (0.28–0.87)	0.016
Education status					
Up to high school	199	74	125	Ref	
Above high school	476	244	232	1.71 (1.23–2.94)	0.001*
Marital status					
Married	649	307	342	Ref	
Divorced / widowed	26	11	15	1.16 (0.51–2.62)	0.768
Occupation					
Government job	328	161	167	Ref	
Private sector and business	170	79	91	1.13 (0.77–1.68)	0.527
Unemployed	177	78	99	1.12 (0.75–1.64)	0.569
Monthly family income (Saudi Riyals -SAR)					
Less than 5000	83	36	47	Ref	
5000 to 7000	144	64	80	1.05 (0.59–1.89)	0.865
More than 7000	448	218	230	0.83 (0.48–1.44)	0.513
Source of information regarding childhood vaccines					
Friends and families	142	70	72	1.16 (0.77–1.75)	0.478
Ministry of health activities	368	176	192	2.41 (1.39–3.86)	0.004*
Medias (social media, TV, radio etc)	165	72	93	1.26 (0.78–2.23)	0.340

**Notes:** \*Significant value ( $p < 0.05$ ), \*\*Adjusted variables: Mothers' age group, immunized child age group, number of children, education status, marital status, job, monthly family income, and source of information received regarding childhood immunization.

**Table 5** The Associated Factors with the Immunization Services Provided at the PHCs of Hafr Al Batin (n = 675)

Variables	Total n (675)	Satisfaction Category		Logistic Regression Findings	
		Low n (85)	High n (590)	Adjusted OR (95% of OR)**	p-value
Mothers' age group (years)					
Less than 25	197	25	172	Ref	
25–35	326	43	283	0.89 (0.48–1.65)	0.718
More than 35	152	17	135	0.97 (0.46–2.02)	0.927
Immunized child age group (months)					
Less than 12	304	46	172	Ref	
12 to 24	232	27	283	1.40 (0.83–2.36)	0.215
More than 24	139	12	135	1.89 (1.39–2.81)	0.037*

(Continued)

**Table 5** (Continued).

Variables	Total n (675)	Satisfaction Category		Logistic Regression Findings	
		Low n (85)	High n (590)	Adjusted OR (95% of OR)**	p-value
Number of children					
Up to 2	274	33	241	Ref	
3–4	331	41	290	0.95 (0.67–1.61)	0.845
More than 4	70	11	59	0.64 (0.36–1.12)	0.247
Education status					
Up to high school	199	20	179	Ref	0.115
Above high school	476	65	411	0.64 (0.36–1.12)	
Marital status					
Married	649	82	567	Ref	0.940
Divorced / widowed	26	3	23	0.95 (0.76–1.59)	
Occupation					
Government job	328	37	291	Ref	
Private sector and business	170	15	155	1.29 (0.67–2.47)	0.444
Unemployed	177	33	177	1.42 (1.17–1.74)	0.024*
Monthly family income (Saudi Riyals -SAR)					
Less than 5000	83	11	72	Ref	
5000 to 7000	144	22	122	0.77 (0.34–1.77)	0.534
More than 7000	448	52	396	0.97 (0.43–2.18)	0.944
Source of information regarding childhood vaccines					
Friends and families	142	20	122	Ref	
Ministry of health activities	368	41	327	1.42 (0.78–2.61)	0.253
Medias (social media, TV, radio etc)	165	24	141	1.08 (0.55–2.12)	0.823

**Notes:** \*Significant value ( $p < 0.05$ ), \*\*Adjusted variables: Mothers' age group, immunized child age group, number of children, education status, marital status, job, monthly family income, and source of information received regarding childhood immunization.

**Table 6** The Correlation Between Participants' Perception and Satisfaction Scores

	Spearman's Coefficient Value (rho)	p-value
Perception - satisfaction	0.207	< 0.001*

**Note:** \*Significant p-value ( $< 0.05$ , two-tailed test).

## Discussion

Mothers' perceptions of childhood vaccines and their satisfaction with the immunization services provided by health authorities are a critical indicator for making policy decisions by the concerned authorities. In this context, we investigated Saudi mothers' perceptions, hesitancy, and satisfaction concerning the childhood immunization provided at the PHCs of Hafr Al-Batin, KSA.

Favorable maternal perception and attitude toward childhood vaccines are crucial for ensuring complete immunization in children.<sup>30,31</sup> Our study found that 91.3% of mothers agreed that childhood vaccines were vital for their child's health. A recent survey from the Riyadh region of KSA reported a slightly higher proportion (93.7%) of mothers agreeing with the same statement<sup>32</sup> which is quite similar to the findings of our the study. In contrast, a lower proportion of mothers (77.9%) reported positive perception in a recent study by Adedire et al in the Southwest Nigerian City<sup>33,34</sup> Moreover another community-based, cross-sectional study conducted in Northeast Ethiopia found that mothers'



satisfaction with child immunization services was higher than that reported in earlier surveys<sup>21</sup> However, a study in Egypt reported that most mothers had inadequate knowledge about childhood immunization, with only 0.3% reporting good knowledge.<sup>8</sup> Similarly, a study conducted in rural areas of Nigeria aimed to assess how mothers perceived recovery and satisfaction levels following the treatment of childhood febrile conditions by patent medicine dealers, although the study did not place emphasis on childhood immunization.<sup>35</sup> Therefore, it is important to note that parental education and practice play a significant role in vaccine hesitancy and acceptance.

These differences across studies could also be explained by population sociodemographic characteristics such as education and income. We found that nearly 90% of the participants believed that childhood vaccines prevent childhood diseases, especially severe illnesses. Our results are supported by studies by Kuruvilla et al in India and other authors.<sup>32,36,37</sup> On the other hand, more than one-third of participants expressed concerns about the side effects of childhood vaccines, and only 58.5% disagreed with the negative statement, “children do not need a vaccine for diseases that are not common anymore”. Some researchers have reported the re-emergence of previously controlled severe and deadly vaccine-preventable diseases, including in developed nations, where efficient vaccination facilities are available.<sup>38–40</sup> Possible reasons for this trend could include anti-vaccine beliefs, vaccine hesitancy, increased travel across countries, and varying perceptions toward vaccines.<sup>31,40,41</sup> The critical negative perception identified regarding the necessity of vaccines for well-controlled diseases could potentially lead to mothers and caretakers delaying or avoiding the vaccines against the diseases, that are not currently common in the KSA.

Our present study revealed that vaccine hesitancy was significantly associated with the mother’s age, education, and the source of immunization information received. Similar to the results of our study, Aldakhil et al reported that education was a significant predictor of vaccine hesitancy. The authors also found that the source of information was another factor associated with vaccine hesitancy. A qualitative study conducted by Dube et al in Canada reported that nearly half of the participants were hesitant about vaccines. Although they decided to proceed with their children’s vaccination according to the schedule, they continued to question the effectiveness and consequences of the vaccine.<sup>42</sup> In Singapore, the level of trust in children’s doctors was identified as the most influential factor in determining vaccine hesitancy among parents. A multinomial logistic regression model that examined variables such as sex, household income status, and vaccine history enabled the prediction of vaccine hesitancy in parents with a 70% accuracy rate, while non-vaccine hesitancy could be predicted with an accuracy rate of 92.4%.<sup>43</sup>

Client satisfaction is vital for the utilization of health services, including vaccination services provided at healthcare facilities. The present study found that 87.4% of the participants were satisfied with the immunization services provided at the PHCs of Hafr Al Batin, KSA. Similar to the present study, a survey conducted by El Gammal in Egypt and Schempf et al in the USA reported high levels of satisfaction.<sup>8,44</sup> However, some surveys conducted in developing and underdeveloped countries have reported lower satisfaction among beneficiaries.<sup>12,21,45</sup> Interestingly a lower proportion (75.9%) of satisfaction (partially and fully) was observed by Shati et al in 2021 among parents attending the well-baby clinic (including the immunization clinic) at the PHCs of Abha city, KSA.<sup>46</sup> We also found that participants’ satisfaction was significantly associated with the age group of immunized and the mother’s occupational status. Furthermore, we found a positive correlation with mothers’ attitude with the satisfaction score ( $p < 0.001$ ). Similar to the present study, Debela et al found that mothers with favorable attitude and perceptions demonstrated a significantly higher level of satisfaction with the immunization services provided at the PHCs.<sup>21</sup> Healthcare providers play a significant role in vaccine administration and in communicating the benefits, potential side effects, and follow-up advice for childhood vaccines, as stated by the Centers for Disease Control and Prevention, USA.<sup>47</sup> The present study found that the lowest level of satisfaction was noted for follow-up advice regarding potential adverse effects and their management by healthcare providers, as well as for healthcare providers’ consideration of mothers’ concerns about vaccination. Considering that more than half (54.5%) of the participants in our study received childhood vaccination-related information from the healthcare providers through the Ministry of Health activities, the low level of satisfaction is vital for the policymakers to consider necessary proactive measures. Our study findings are supported by a recent mixed-method survey conducted by Ebi et al in Switzerland.<sup>13</sup> Furthermore, a study found that an overwhelming majority of the participants (90%) recognized the importance of receiving the recommended vaccines for themselves and their children ( $p < 0.001$ ). Additionally, 92% expressed confidence in the safety of vaccines for their children ( $p < 0.001$ ), and 91% were willing to ensure that their newborns received all the recommended vaccine doses ( $p < 0.001$ ). Moreover, 86% of the participants welcomed

mass/school vaccination campaigns ( $p < 0.001$ ), and 81% were willing to pay for additional vaccines for both themselves and their children ( $p < 0.001$ ).<sup>18</sup> These findings are consistent with our study's findings, indicating a low level of vaccine hesitancy in Saudi Arabia, with a predominantly positive attitude toward vaccination among the participants. This study found a significant positive relationship (Spearman's  $\rho = 0.207$ ,  $p < 0.001$ ) between perception and satisfaction scores. However, 20.7% of the participants exhibited hesitancy regarding the provision of recommended childhood vaccines. Therefore, two major recommendations are emerged: to enhance communication and education efforts tailored to different age groups to bolster parental satisfaction with immunization services, and to implement targeted interventions to address vaccine hesitancy and its underlying causes, promoting informed decision-making among parents.

## Strengths and Limitations of the Study

The present study is one of the first of its kind in the eastern province of the KSA. We employed a standardized and validated data collection tool gathering insights from 675 participants to analyze and report the findings. Nonetheless, it is essential to acknowledge some limitations of this study that need to be noted while interpreting our findings. Firstly, the current satisfaction survey was conducted exclusively among mothers in the eastern province of the KSA. Therefore, it is not possible to generalize the results to the entire KSA or other middle east countries. Secondly, this cross-sectional study sought to establish associations between maternal satisfaction and other factors, not causation. Finally, the potential for biases associated with self-reported surveys cannot be overlooked.

## Conclusion

In general, mothers in eastern Saudi Arabia exhibited high levels of satisfaction with the immunization services provided at the PHCs. However, a lower level of satisfaction was observed concerning follow-up advice and concerns regarding potential side effects. Maternal perceptions regarding childhood vaccines displayed a positive correlation with the vaccination services provided at the PHCs. Notably, we identified a higher level of disagreement concerning the necessity of vaccines given by the Ministry of Health for diseases that are currently well-controlled. Hence, we recommend focused programs aimed at educating mothers about the importance of all childhood vaccines recommended by the Ministry of Health, KSA. The present survey findings underscore the necessity of regular training programs for healthcare providers operating at vaccination centers. Finally, there is a clear necessity for an exploratory, mixed-method survey focusing on childhood immunization satisfaction in other regions of the KSA.

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## Disclosure

The authors report no conflicts of interest in this work.

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