

Parental Vaccine Hesitancy, Awareness, and Attitudes Toward Childhood Vaccination in Saudi Arabia

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Objective: This study aims to measure vaccine hesitancy, awareness and attitude towards vaccination among parents in Saudi Arabia.

Methods: This was a cross-sectional study, using a self-administered online questionnaire distributed within different social media platforms in Saudi Arabia. The study sample included both mothers and fathers residing in Saudi Arabia with children aged 2 months to 7 years. The questionnaire included demographic information, a five-item awareness scale, parental attitudes toward vaccination, and a culturally adapted version of the World Health Organization's Vaccine Hesitancy Scale (VHS). Internal consistency was assessed using Cronbach's alpha. Descriptive statistics were used to describe the study sample as inferential tests were not feasible. All statistical analysis was performed using PSPP.

Results: A total of 233 parents participated. While most parents exhibited high awareness of vaccine benefits and effectiveness, 9% reported delaying vaccination, and a small proportion expressed vaccine hesitancy. Common reasons for hesitancy included fear of new vaccines compared to older vaccines (44%), concerns about serious side effects of vaccines (51%), and concerns about administering multiple vaccines simultaneously (44%). The adapted VHS demonstrated good internal reliability (Cronbach's $\alpha = 0.88$).

Conclusion: Although vaccine acceptance remains high among Saudi parents, a subset still delays or questions vaccines due to safety concerns and misinformation. Tailored public health messaging and healthcare provider engagement are needed to address specific parental concerns and reinforce trust in vaccination program.

Keywords: vaccination, awareness, attitude, hesitancy, childhood

Introduction

Vaccination strategies are among the most effective public health interventions for preventing, controlling and eliminating infectious diseases globally. Childhood vaccination, in particular, has significantly contributed to reducing mortality and morbidity from vaccine-preventable diseases, notably leading to the eradication of smallpox in 1980, as declared by the World Health Assembly.¹ Globally, vaccinations prevent about 4 million deaths worldwide yearly, and projections indicate that by 2030, vaccines could save more than 50 million lives.² Despite robust scientific evidence supporting the safety and efficacy of vaccines, vaccine hesitancy persists as a critical barrier to achieving optimal immunization coverage.

The World Health Organization characterizes vaccine hesitancy as the "people's unwillingness or refusal to vaccinate or delay vaccination of themselves or their children despite the availability of vaccines".³ Recent data highlights a disturbing trend: in 2023, more than 14 million children worldwide missed essential vaccinations, predominantly in low-income regions such as Africa and Southeast Asia.⁴ This figure represents an increase of nearly three million unvaccinated children compared to pre-pandemic figures from 2019, underscoring the severe disruption caused by the COVID-19 pandemic on immunization programs. Such declines in global vaccination rates raise concerns about the

outbreaks of vaccine-preventable diseases, imposing significant public health and economic burden. For instance, in the United States, researchers found that even a modest 5% decline in MMR vaccination could result in a threefold increase in annual measles cases, resulting in additional healthcare costs estimated at US\$2.1 million annually.⁵

Vaccine hesitancy remains highly prevalent globally. In Malaysia, vaccine hesitancy among parents was reported at 11.6%, influenced by socioeconomic status.⁶ In Italy, parental vaccine hesitancy was estimated at 15%, primarily driven by safety concerns and inconsistent advice from healthcare providers.⁷ A study in Quebec, Canada, revealed that approximately 40% of parents experienced vaccine hesitancy at some point.⁸ Moreover, a study involving multiple European Union countries found that 44.3% of participants expressed varying degrees of vaccine hesitancy, categorized into subgroups such as self-hesitant, social-hesitant, illiterate-hesitant, and uninformed anti-vaccinators.⁹ Collectively, these findings emphasize that vaccine hesitancy is not limited to a particular region but reflects diverse cultural, informational, and systemic influences.

Among the factors contributing to vaccine hesitancy, parental awareness and attitudes toward vaccination play a pivotal role. Awareness reflects parents' understanding of vaccine safety, effectiveness, and national immunization guidelines,¹⁰ whereas attitudes encompass their beliefs, perceptions, and emotional responses toward childhood vaccination.^{10,11} Although related, these constructs are conceptually distinct from hesitancy itself. They align with the World Health Organization's "3C" model—confidence (trust in vaccines and healthcare systems), complacency (perceived necessity of vaccination), and convenience (accessibility and ease of obtaining vaccines).^{12,13} Awareness primarily informs confidence and complacency, whereas attitudes influence confidence and perceived necessity. Anchoring these constructs within the 3C framework helps delineate their domains and reduces conceptual overlap with hesitancy, providing a clearer understanding of how knowledge and beliefs translate into vaccination behaviors.

In Saudi Arabia, existing studies reveal mixed findings regarding parental vaccine hesitancy. Alamir et al (2024) in their narrative review of 18 studies found that parental vaccine hesitancy in Saudi Arabia ranged widely from 3.1% to 72.2%, with the most common concerns being vaccine side effects, safety, and efficacy.¹⁴ This review highlights that despite broad recognition of vaccine benefits, hesitancy was fueled by misinformation, demographic factors, and heightened fears during the COVID-19 pandemic. A systematic review by Alfaleh et al (2022) reported vaccine hesitancy rates ranging from 7.1% to 72.2% across Saudi studies, with contributing factors including fear of side effects, misinformation, and limited trust in healthcare providers.¹⁵

Alaamri et al (2022) conducted a study involving healthcare professionals, parents, and caregivers, observing relatively low vaccine hesitancy and generally favorable attitudes towards immunization.¹⁶ Conversely, a study focusing specifically on mothers during the COVID-19 pandemic indicated that 24.3% were hesitant about routine childhood immunizations.¹⁷ Another study found that while most parents vaccinated their children, nearly one-third expressed vaccine hesitancy due to safety concerns and vaccine availability.¹⁸

In contrast to previous studies that primarily focused on mothers or healthcare professionals, this study included a broader demographic of parents across Saudi regions, thereby providing a more comprehensive picture of vaccine perceptions within households. Moreover, the present study expands the World Health Organization's Vaccine Hesitancy Scale by incorporating culturally tailored items specific to the Saudi context, including parental concerns about the age appropriateness of the national immunization schedule, simultaneous vaccine administration, and adherence to Ministry of Health guidelines. These additions were informed by recurrent themes in Saudi and regional debates, where concerns about "vaccine overload", vaccine timing, and the safety of newer vaccines have been frequently reported. This adaptation allows for a more contextually relevant understanding of the drivers of hesitancy in Saudi Arabia beyond what has been captured in earlier systematic reviews and national surveys.

Methods

Study Design and Population

This is an observational, cross-sectional study, using a self-administered online questionnaire. The data collection was conducted from 1st of Jan 2025 until 16th of April 2025. The study included parents living in Saudi Arabia with one or more children aged between of 2 months to 7 years. A sample size of 240 parents was estimated using an online

calculator, assuming a 95% confidence interval and a 5% significance level. Sampling approach (purposive via social media) was employed, targeting parents residing in the regions of Saudi Arabia.

Ethical Considerations and Consent to Participate

This study was approved by the King Saud University Institutional Review Board (IRB No. 25–035) on 18 January 2025 and conducted in accordance with the ethical principles of the Declaration of Helsinki. Informed consent was obtained from participants, which indicated the objectives of the study and the right of the study participants to withdraw at any time before submitting and completing the anonymous survey. Participants' data confidentiality was warranted, and no patient identifiers were collected in the survey data.

Questionnaire Development and Validation

The study questionnaire was developed following review of the relevant literature ([Appendix A](#)). It comprised four parts: 1) Parents' socio-demographic characteristics included age, gender, nationality, region of residence, marital status, education level, income, employment status, occupation, and number of children; 2) Parents' awareness toward vaccination was measured by five items assessing awareness about vaccine safety, effectiveness, and guidelines, rated on a 5-point Likert scale ranging from "Strongly disagree" to "Strongly agree"; 3) Parents' attitudes toward vaccination were operationalized through both behavioral and belief-based components. Behaviorally, attitude included whether parents had ever delayed their children's vaccination, which was captured as a dichotomous variable (yes/no). In addition, open-ended questions explored belief-related aspects, including the number, age, and gender of children; reasons for vaccination; prior experiences that created uncertainty about vaccination; and whether parents knew anyone who had been harmed by vaccines, along with descriptions of those experiences. 4) Parents' vaccine hesitancy was measured using the adopted Vaccine Hesitancy Scale (VHS) developed by the WHO Strategic Advisory Group on Experts (SAGE).¹⁹

The conceptual framework guiding this study was informed by the World Health Organization's "3C" model of confidence, complacency, and convenience, which provides a theoretical foundation for understanding vaccine behavior. Accordingly, each construct in the questionnaire was designed to capture a distinct domain: Awareness items assessed parents' cognitive understanding of vaccine benefits, safety, and guidelines, reflecting the confidence component of the model. Attitudes explored parents' affective and perceptual orientations toward vaccination, including their level of trust, perceived risks, and emotional responses to vaccine-related experiences, corresponding primarily to confidence and complacency dimensions. Hesitancy captured the behavioral manifestation of delay or reluctance in vaccine acceptance despite availability, representing outcomes influenced by deficits in confidence or complacency. This conceptual delineation ensured that each domain was measured distinctly while remaining theoretically coherent with global vaccine hesitancy frameworks.

The questionnaire content was reviewed by the study investigators (MA, NA, MS, NH) to ensure content and face validity. The survey was translated into Arabic ([Appendix B](#)) and pilot tested among 25 parents to ensure the appropriateness for the target population. Adjustments were made based on the participants' feedback; data collected in the pilot phase was excluded from the final analysis. The questionnaire was tested for both validity and reliability, results showed Cronbach's alpha = 0.75 for awareness, and 0.88 for VHS, indicating good internal consistency.

Data Collection

The questionnaire was administered online via Microsoft Forms and shared through social media platforms, including Twitter and WhatsApp. A cover letter accompanied the survey link, outlining the study's purpose. Participants were required to review and agree to an informed consent form, which explained the study's objectives and emphasized voluntary participation, before anonymously completing the survey.

Variables

The outcome variable is parental hesitancy to vaccinate their child. We used 10-item Vaccine Hesitancy Scale (VHS), a common diagnostic tool, developed by the WHO SAGE with items scored on a 5-point Likert scale.¹⁹ Seven items

evaluated positive vaccine attitudes and three addressed parental concerns about vaccines and vaccinations. In addition, three items added by the research team to the VHS to reflect cultural context, these include: “the age in the governmental vaccinations schedule is appropriate”; “The number of vaccines child gets at one time can impact my child health”; and “It is important for all the children to follow the ministry of health vaccination schedule”. The overall VHS score was calculated by averaging responses to thirteen items (10 original items plus 3 additional ones). The Vaccine Hesitancy Scale (VHS) consists of 13 items, of which items 5, 9, 10, and 12 are reverse-coded. Total scores are calculated by summing all items, with a possible range of 13 to 65, where higher scores indicate greater hesitancy. Similarly, the 5-item awareness scale ranges from 5 to 25, with higher scores indicating greater awareness.

The validity and reliability of the VHS were previously established in different population such as Gentile et al²⁰ and were validated by our study after the addition of three items.

Other variables included parents’ age, gender, nationality, region of residence, marital status, educational level, income, education level, occupation (healthcare provider vs non-healthcare provider), number of children, awareness about vaccination, and attitudes towards vaccination.

Statistical Analysis

Descriptive statistics were used to summarize the study sample. Mean and standard deviation were used to describe continuous variables and number and percentage were used to describe the categorical variables. Reliability of Awareness and Vaccine Hesitancy Scale was measured by internal consistency using Cronbach’s alpha (0.70 will be considered acceptable). All analyses were performed using GNU PSPP (version 2.0.1).

Results

Characteristics of the Study Sample

The majority of parents who participated were between 31 and 40 years old (42%) (Table 1). Around 65% of participants were women, and 92% were Saudi nationals. Most resided in the middle region of Saudi Arabia (78%), were married (95%), and held a bachelor’s degree (64%). Regarding income, 45% reported earning between 5,001 and 15,000 SAR per month. In terms of employment, 43% were working in non-healthcare fields, and 52% had three or more children.

Table 2 displays the mean scores for awareness toward vaccination and vaccine hesitancy. The mean awareness score toward vaccination was 19, while the mean vaccine hesitancy score was 50, with a standard deviation of 5.6.

Parents’ Awareness Toward Vaccination

Vaccine awareness scale showed a Cronbach’s alpha of 0.75, indicating acceptable internal consistency. Table 3 shows that most participants either agreed (approximately 50%) or strongly agreed (15–30%) with statements regarding vaccines. Participants recognized that usual side effects, such as fever and injection site swelling, are expected. They also aware that vaccines are developed according to unified global guidelines, have contributed to the eradication of diseases worldwide, and protect against serious infectious diseases.

Parents’ Attitude Toward Vaccination – Vaccination Delay and Parental Concerns

Parents were asked if they have ever delayed their children’s vaccination; twenty-one parents answered positively (N=21). These parents have different numbers of children, age between 10 months and 7 years old, indicated that they either delay or un-vaccinate their children. Several reasons were reported by parents (Table 4). Fear of vaccines side effects, doubts and mistrusting vaccines were the most reported reasons. Four of these parents had previous experience made them take this decision of delay or unvaccinated their child.

One female parent believed vaccines caused frequent infections and fevers in children and claimed COVID-19 vaccines led to cognitive decline and psychological issues. She also associated vaccines with dermatologic conditions and autism in children. Another female parent attributed shoulder stiffness in herself and ten others to the COVID-19 vaccine. A male parent believed his first child developed autism following vaccination, and another female parent said that vaccine-related fevers made her hesitant.

Table 1 Characteristics of Parents Participating in the Vaccine Hesitancy Study, Saudi Arabia, 2025

Variable	N	%
Total	233	100.0
Parent Age		
18-30	42	18.0
31-40	97	41.6
41-50	72	30.9
≥51	22	9.4
Gender		
Male	82	35.2
Female	151	64.8
Nationality		
Non-Saudi	19	8.2
Saudi	214	91.8
Region		
East	16	6.9
Middle	181	77.7
North	8	3.4
South	9	3.9
West	19	8.2
Marital status		
Married	220	94.4
Divorced/Widowed	13	5.6
Education		
High school	33	14.2
Bachelor	149	63.9
Graduate degree	51	21.9
Income		
<5000 SR	48	20.6
5000-15,000	105	45.1
>15,000	80	34.3
Occupation		
Employed non-HCP	100	42.9
Employed HCP	53	22.7
Unemployed	80	34.3
Number of Kids		
1 Child	52	22.3
2 Children	61	26.2
3 or more Children	120	51.5

Table 2 Mean Awareness and Vaccine Hesitancy Scores Among Parents, Saudi Arabia, 2025

	Mean	Standard Deviation	Minimum	Maximum
Awareness toward vaccination	19.2	3.3	6	25
Vaccine Hesitancy Scale	48.8	7.5	21	65

Parents' Vaccine Hesitancy

Vaccine hesitancy scale showed a Cronbach's alpha of 0.88, indicating good internal consistency. The vaccine hesitancy scale indicated that 40–90% of participants agreed or strongly agreed with key pro-vaccination statements (Table 5). These included the importance and effectiveness of childhood vaccines, the role of vaccination in protecting individual

Table 3 Distribution of Parents' Responses to Awareness Statements Toward Childhood Vaccination, Saudi Arabia, 2025

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Vaccines may cause side effect such as fever, swelling and redness	9 (3.9)	18 (17.7)	36 (15.5)	131 (56.2)	39 (16.7)
Vaccines eradicated worldwide diseases	7 (3.0)	13 (5.6)	37 (15.9)	116 (49.8)	60 (25.8)
Vaccines prevent and protect against many serious infectious diseases	6 (2.6)	6 (2.6)	32 (13.7)	118 (50.6)	71 (30.5)
Vaccines are developed based on unified global guidelines	7 (3.0)	11 (4.7)	49 (21.0)	114 (48.9)	52 (22.3)
The benefits of vaccines outweigh the risks	11 (4.7)	10 (4.3)	50 (21.5)	110 (47.2)	52 (22.3)

Note: Values are presented as numbers and (%).

Table 4 Reported Reasons for Delaying or Refusing Child Vaccination Among Parents, Saudi Arabia, 2025

	N (%)
Fear of adverse effects.	9 (25.9)
Doubts about vaccines	5 (13.8)
Mistrust about vaccination in general	6 (16.7)
Un availability of the vaccine	4 (11.0)
Distance to primary health care center	2 (5.6)
Forgetfulness	1 (2.8)
Neglect	1 (2.8)
Father refuse	1 (2.8)
Fear of needles	2 (5.6)
Preference for other modes of prevention	1 (2.8)
Lack of knowledge/information	1 (2.8)
Influence of information on vaccination	1 (2.8)
No reason	2 (5.6)

Notes: Values are presented as numbers and (%).

Table 5 Parental Responses to Items of the Adapted Vaccine Hesitancy Scale (VHS), Saudi Arabia, 2025

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Childhood vaccines important for my child's health	1 (0.4)	4 (1.7)	14 (6.0)	105 (45.1)	109 (46.8)
Childhood vaccines are effective	1 (0.4)	1 (0.4)	26 (11.2)	107 (45.9)	98 (42.1)
Having my child vaccinated is important for the health of others in my community	3 (1.3)	6 (2.6)	21 (9.0)	113 (48.5)	90 (38.6)
All childhood vaccines offered by the government program in my community are beneficial	1 (0.4)	4 (1.7)	22 (9.4)	105 (45.1)	101 (43.3)
New vaccines carry more risks than older vaccines	12 (5.2)	42 (18.0)	77 (33.0)	63 (27.0)	39 (16.7)
The information I receive about vaccines from the vaccine program is reliable and trustworthy	6 (2.6)	16 (6.9)	58 (24.9)	107 (45.9)	46 (19.7)
Getting vaccines is a good way to protect my child/children from disease	2 (0.9)	5 (2.1)	24 (10.3)	118 (50.6)	84 (36.1)
Generally, I do what my doctor or health care provider recommends about vaccines for my child/children	3 (1.3)	4 (1.7)	21 (9.0)	120 (51.5)	85 (36.5)
I am concerned about serious adverse effects of vaccines	22 (9.4)	29 (12.4)	62 (26.6)	87 (37.3)	33 (14.2)
My child/children do not need vaccines for diseases that are not common anymore	33 (14.2)	62 (26.6)	65 (27.9)	52 (22.3)	21 (9.0)
Age in the governmental vaccinations schedule is appropriate	4 (1.7)	7 (3.0)	35 (15.0)	120 (51.5)	67 (28.8)
Number of vaccines child gets at one time can impact my child health	18 (7.7)	45 (19.3)	68 (29.2)	65 (27.9)	37 (15.9)
It is important for all the children to follow the ministry of health vaccination schedule	3 (1.3)	2 (0.9)	19 (8.2)	100 (42.9)	109 (46.8)

Notes: Values are presented as numbers and (%).

and community health, the reliability of information provided by the government vaccination program, and the appropriateness of the national vaccination schedule (including the age of vaccination). Additionally, the majority agreed that they generally follow their healthcare provider's vaccination recommendations. Regarding specific concerns, 44% concern that new vaccines carry more risks than older ones, 44% concern that receiving multiple vaccines at once could negatively impact their child's health, and 51% have concerns about serious adverse effects of vaccines.

Discussion

This study provides insights into vaccine hesitancy among parents in Saudi Arabia, highlighting generally high awareness and positive attitudes toward childhood vaccination, with limited but notable concerns driving vaccine delays or doubts. Parental attitudes were evaluated using indicators such as awareness of vaccine benefits, perceived safety, trust in the national immunization program, and willingness to vaccinate. Although overall attitudes were positive, parents expressed greater hesitation toward newly introduced vaccines, reflecting concerns about safety, limited information, and unfamiliarity with new vaccine types.

In this study, vaccine hesitancy refers to behavioral uncertainty or delays in accepting vaccines, even when available and recommended, whereas vaccine doubts reflect belief-based concerns about safety, efficacy, or necessity that may or may not result in delayed vaccination. While most parents expressed strong agreement with pro-vaccination statements recognizing vaccine benefits, protection against serious infectious diseases, and trust in the national immunization program, some still reported delays due to specific doubts or concerns. This distinction aligns with the WHO's broader conceptualization of hesitancy, which encompasses delay, doubt, and uncertainty rather than outright refusal, and is consistent with earlier studies reporting high vaccination coverage despite persistent concerns over vaccine safety and side effects.^{16,18,21–23}

Our findings align with Alsubaie et al,²¹ who reported a 20% vaccine hesitancy rate among Saudi parents, with safety concerns and mistrust as key factors, similar to our results. While their study highlighted a link between hesitancy and disbelief in vaccine effectiveness, we also found concerns about new vaccines and simultaneous dosing. Unlike their in-person data collection, our online approach may have allowed parents to express concerns more freely; however, this is speculative and was not directly measured. Together, these findings reinforce the need for culturally tailored efforts to build vaccine confidence in Saudi Arabia.

Interestingly, while acceptance of vaccines was high in our sample, a meaningful subset of parents reported delaying childhood immunizations. These delays were not necessarily rooted in anti-vaccine ideology but were instead linked to concerns over adverse effects, doubts about vaccine, as well as mistrust in vaccines. These nuanced expressions of hesitancy supporting the view that vaccine hesitancy is not solely about refusal but also includes delay and doubt, which aligns with the WHO's broader conceptualization. The COVID-19 pandemic also continues to cast a shadow on vaccine perceptions. While the study did not directly focus on COVID-19 vaccines, several parents cited pandemic-related events as shaping their attitudes. This underscores the lasting psychological and experiential influence of global health crises on public trust and vaccine behavior even beyond the immediate threat. Concerns about the number of vaccines administered simultaneously were cited by nearly one-third of participants. Parents often perceive "vaccine overload" as a risk to their child's immune system, despite scientific evidence to the contrary. This issue emerged strongly in our study and appears less documented in previous Saudi research, highlighting a potentially important area for targeted communication and culturally sensitive interventions. Some parents attributed conditions such as autism or cognitive decline to vaccines; these claims are not evidence-based and should be recognized as misinformation. Such beliefs, often amplified by social media, can influence parental decision-making.

Our study builds on previous national research by capturing a broader parental demographic beyond just mothers or healthcare workers. By adapting and expanding the WHO Vaccine Hesitancy Scale with culturally relevant items (eg, concerns about vaccine timing and scheduling, concerns about the number of vaccines child gets at one time), we have contextualized the hesitancy landscape more meaningfully. These culturally tailored items were specifically selected to reflect parental concerns commonly reported in Saudi and regional contexts, such as perceived risks from simultaneous vaccine administration and uncertainty regarding the timing of vaccines in the national schedule. Such issues have been central to local discussions on vaccine safety and appropriateness and are particularly relevant following the COVID-19

pandemic, which intensified public discourse about new vaccine safety and scheduling. By grounding these adaptations in documented cultural and clinical realities, this study moves beyond a descriptive assessment of hesitancy to provide an interpretive framework that captures the nuanced relationship between cultural beliefs, information sources, and vaccine decision-making among Saudi parents.

Our findings suggest that while general awareness is high, targeted communication is needed to address specific concerns such as vaccine safety and benefits that outweigh the risk. In addition, healthcare providers should be supported with training on how to counsel hesitant parents, especially those with prior negative experiences. A study in Saudi Arabia reported that while physicians frequently engage in discussions with vaccine-hesitant parents,^{24,25} many face significant barriers particularly limited consultation time and emphasized the need for enhanced training in vaccine-specific communication and counseling skills. Ensuring convenient vaccine access and minimizing scheduling burdens are also essential to prevent hesitancy translating into delayed immunization.

Building on these considerations, it is also important to acknowledge that hesitancy may be influenced by broader beliefs about personal responsibility for health. While our study did not directly measure such beliefs, future research could explore the role of healthism in shaping vaccine hesitancy. Healthism emphasizes individual choice and control over one's body, sometimes prioritizing personal autonomy over collective health measures.²⁶ In the Saudi context, where vaccination is largely government-led and adherence to the national immunization schedule is expected, some parents may perceive recommendations as encroaching on their autonomy. Investigating this perspective could provide additional insight into why some parents delay or question vaccination, beyond concerns about safety or misinformation, and help design communication strategies that balance respect for individual choice with public health objectives.

Strength and Limitations

This study fills a research gap by including both parents that are involved in decision making rather than limiting the sample on mothers as seen in previous studies. Second, we developed new scale to measure awareness toward vaccination and adapted vaccine hesitancy scale by adding additional contextual culturally relevant items to the scale. This approach provided a deeper understanding of other factors (eg concerns about age-appropriateness of the schedule, simultaneous vaccine administration, and adherence to national guidelines) and was intended to enhance contextual relevance for Saudi parents. Third, the pilot testing of the survey and translation into Arabic ensure cultural and linguistic understanding of the survey.

However, the study has several limitations. First, data were self-reported through an online questionnaire, which may introduce recall bias and other self-reporting biases. Second, the sample was heavily skewed toward parents from the central region of Saudi Arabia, limiting generalizability to other regions. Third, no inferential analyses were conducted, restricting the ability to explore associations between demographic factors, awareness, attitudes, and hesitancy. Fourth, there is conceptual overlap between awareness, attitudes, and hesitancy, which may complicate interpretation of the findings. Fifth, while internal consistency of the adapted Vaccine Hesitancy Scale (VHS) was acceptable, we did not perform item-total correlation analyses, factor analysis, or subscale correlation analyses. Future research should conduct exploratory factor analysis using polychoric correlations to assess the dimensionality and structural validity of the adapted scale, and to evaluate its comparability with the canonical WHO VHS. Finally, the adaptation of the scales, while culturally relevant, may modestly limit direct comparability with international studies using the original WHO scale.

Conclusions

This study highlights that while the overall acceptance of childhood vaccines is high among parents in Saudi Arabia, vaccine hesitancy persists in a smaller segment of the population. This hesitancy is influenced by fears of adverse effects, doubts about new vaccines, and perceptions of vaccine overload. Parental attitudes toward vaccination, measured through both behavioral (delay in vaccination) and belief-based indicators derived from the adapted Vaccine Hesitancy Scale (VHS), revealed nuanced perceptions influencing vaccination decisions. Specifically, attitudes toward new vaccines were characterized by uncertainty and heightened concern about safety and simultaneous vaccine administration, reflected in responses to the added cultural items regarding the appropriateness of the vaccination schedule, the number of vaccines

administered at once, and adherence to Ministry of Health guidelines. These findings underscore that although confidence in established vaccines is generally strong, hesitancy toward newer vaccines persists due to limited information and residual doubts amplified by social media and prior experiences. Tailored public health messaging, emphasizing the safety and rigorous evaluation of new vaccines, as well as transparent communication from healthcare providers, is essential to sustain and strengthen parental trust.

Institutional Review Board Statement

This study was approved by the King Saud University Institutional Review Board (IRB No. 25-035) on 18 January 2025 and conducted in accordance with the ethical principles of the Declaration of Helsinki.

Abbreviations

IRB, Institutional Review Board; PSPP, Statistical Analysis Tool Software; SAGE, Strategic Advisory Group on Experts; US, United States; VHS, Vaccine Hesitancy Scale; WHO, World Health Organization.

Data Sharing Statement

Data access can be requested from the corresponding author.

Informed Consent Statement

Patient consent form was obtained from participants in this study.

Author Contributions

All authors made a significant contribution to the work reported, whether in the conception, study design, execution, acquisition of data, analysis and interpretation, or all these areas; took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

All authors declare that there is no conflict of interest regarding the publication of this paper.

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