

Parental Barriers towards Childhood Vaccination in Saudi Arabia: A Systematic Review

Mohamad Ahmad Alenezi ¹, Aljohara A. Alwahhabi ², RAKAN ABDULLAH MUDLAJ ALMUDLAJ ³, Raghad Fahad Alshehri ⁴, Rayan A. Alharbi ⁵, Samiyah Hamoud Alshammari ⁶, Abdullah S. Alhammad ⁷, Ali Hussain Almohammedsaleh ⁸, Ghada khalid ali Alyahya ⁹, Lama Turkey Rashed Alanazi ¹⁰

- 1- Public Health Department, Maternity and Children Hospital-Arar, Ministry of health, Arar, SAU
- 2- General Practice, Princes Nourah bint Abdulrahman University, Riyadh, SAU
- 3- Medicine and surgery, Shaqra University, Shaqra, SAU
- 4- Medicine and Surgery, Princess Nourah Bint Abdulrahman University, Riyadh, SAU
- 5- Family Medicine, Qassim University, Qassim, SAU
- 6- Medicine and Surgery, king Saud bin Abdulaziz for health sciences, Riyadh, SAU
- 7- Medicine and Surgery, Qassim University, Riyadh alkhabra, SAU
- 8- Medicine and Surgery, Ibsina college, Jeddah, SAU
- 9- Medicine and Surgery, King Saud Bin Abdulaziz University for Health Sciences, Riyadh, SAU
- 10- Medicine and Surgery, King Saud Bin Abdulaziz University for Health Sciences, Riyadh, SAU

Abstract

Objectives: To identify the primary reasons why parents may hesitate or refuse to vaccinate their children.

Methods: A detailed computerized search of relevant databases was conducted to identify studies that met the inclusion criteria. The search encompassed PubMed, SCOPUS, Science Direct, Cochrane Library, and Web of Science to find pertinent research.

Results: Our analysis included eight studies with a total of 5264 Saudi parents and fathers comprised less than half of the participants, totaling 1786 (33.9%). For childhood vaccinations, barriers included parental age, with younger parents more likely to vaccinate, as well as lower education levels and the presence of chronic health conditions among parents. For HPV vaccines, major barriers included fears of side effects, inadequate information, and beliefs that vaccination was unnecessary due to the child's sexual activity or young age. In families with lower education, these concerns were more prominent. For COVID-19 vaccines, the primary barriers were the need for more information, concerns about efficacy, potential side effects, and time constraints, which limited parents' willingness to vaccinate their children.

Conclusion: The study identifies several key barriers to vaccine uptake in Saudi Arabia, particularly for childhood, HPV, and COVID-19 vaccines. Parental age, education level, cultural beliefs, and misinformation play significant roles in vaccine hesitancy. Addressing these barriers through education, culturally sensitive health communication, and policy changes could improve vaccination rates and overall public health outcomes, particularly in preventing diseases like cervical cancer and other vaccine-preventable illnesses.

Keywords: Parental barriers; Childhood vaccination; Public health; Saudi Arabia; systematic review.

Introduction

Childhood vaccination is one of the most effective public health strategies aimed at preventing infectious diseases and ensuring the well-being of future generations. Vaccination programs have significantly reduced morbidity and mortality rates associated with vaccine-preventable diseases worldwide. However, despite the proven benefits of vaccinations, many countries, including Saudi Arabia, face challenges related to vaccine uptake, particularly among children. In Saudi Arabia, a complex interplay of factors contributes to parental hesitancy and barriers surrounding childhood vaccination, including cultural beliefs, healthcare accessibility, misinformation, and socio-economic status [1].

Research indicates that parental beliefs about the safety, efficacy, and necessity of vaccines can significantly influence their decisions regarding immunizing their children. In Saudi Arabia, where traditional and modern health beliefs coexist, parents often grapple with a range of perceptions concerning vaccination [2]. Cultural attitudes toward healthcare, particularly in relation to reliance on alternative medicine and varying religious interpretations, can also shape parental attitudes toward vaccinations. Furthermore, the dissemination of misinformation through social media platforms plays a pivotal role in exacerbating vaccine hesitancy, as parents may encounter conflicting narratives that foster doubt and fear concerning immunizations [3].

Healthcare accessibility is another critical factor that influences parental decisions about childhood vaccination. In a nation characterized by both urban and rural populations, the availability of healthcare facilities, coupled with the potential financial burdens associated with obtaining vaccines, can create significant obstacles for parents. The perception of the healthcare system's reliability and the quality of services provided also impact parents' willingness to seek vaccinations for their children. Additionally, socio-economic factors, such as education and income levels, can shape parental understanding of the importance of vaccines, further complicating the vaccination landscape [4].

Moreover, the role of healthcare providers in influencing parental decisions cannot be underestimated. Parents often seek guidance and reassurance from healthcare professionals regarding the immunization schedule and the associated risks and benefits. Thus, the communication skills and knowledge of healthcare providers are fundamental in addressing parental concerns and dispelling myths surrounding vaccinations [5].

While vaccination rates have been impressively high in many countries, there has been a resurgence of vaccine hesitancy and outright refusal in recent decades. Saudi Arabia, despite its advanced healthcare system, has not been immune to this global trend [6]. This review aims to assess the multifaceted barriers that parents in Saudi Arabia face when considering childhood vaccination. Understanding the factors that contribute to parental vaccine hesitancy in Saudi Arabia is crucial for developing effective interventions to increase vaccination rates. Low vaccination rates can lead to outbreaks of preventable diseases, posing a threat to the health of children and the community as a whole. By identifying and addressing parental concerns, healthcare providers and policymakers can promote informed decision-making and improve childhood immunization rates.

Methods

This study conducted a systematic review following the guidelines set by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [7]. We performed an electronic search to identify relevant English-language articles that explored how the barriers parents face regarding childhood vaccination in Saudi Arabia. The search encompassed databases such as PubMed, Web of Science, SCOPUS, and Science Direct. Our search strategy included keywords related to vaccination, parents, caregivers, and associated barriers. Independently analyzing the search results, two reviewers chose eligible studies, retrieved data, and used appropriate assessment instruments to gauge the caliber of the included study.

Eligibility Criteria

Inclusion Criteria:

1. Population: Saudi parents.
2. Intervention: Children vaccination.
3. Outcomes: Barriers faced by parents to vaccinate.
4. Study Design: Observational studies, randomized controlled trials (RCTs), cohort studies, and case-control studies published in peer-reviewed journals.
5. Language: English-language articles published.
6. Time Frame: Articles published within 2023-2024, or a specified relevant time frame defined by the researchers.

Exclusion Criteria:

1. Population: Non-Saudi parents.
2. Intervention: Studies that do not clearly discuss children's vaccination.
3. Outcomes: Studies that do not report relevant outcomes.
4. Study Design: Case reports, qualitative studies, literature reviews, editorials, and studies with insufficient methodological quality.
5. Language: Studies not published in English.
6. Duplicated Data: Studies that have overlapping patient populations or outcomes reported in other included studies.

Data Extraction

Rayyan (QCRI) was utilized to verify the accuracy of the search results [8]. The search produced titles and abstracts, which were assessed for relevance based on the established inclusion and exclusion criteria. The research team meticulously reviewed all studies meeting these criteria. Any disagreements were resolved through discussion and consensus. Key study data were systematically recorded using a predefined extraction form, including titles, authors, publication year, study location, participant demographics, gender distribution, vaccination type, and main outcomes. An unbiased evaluation tool was created to assess the potential for bias in the included studies.

Data Synthesis Strategy

Summary tables were developed using information from relevant studies to provide a qualitative overview of the research findings and key elements. After completing data collection for the systematic review, the most effective method for utilizing the information from the included studies was determined.

Risk of Bias Assessment

The Joanna Briggs Institute (JBI) [9] critical evaluation criteria for studies reporting prevalence data were employed to assess the quality of the studies. This evaluation tool comprises nine questions, where a positive response earns a score of 1, and a negative, ambiguous, or irrelevant response receives a score of 0. Scores were categorized into quality levels as follows: below 4 for low quality, between 5 and 7 for moderate quality, and above 8 for high quality. Independent researchers assessed the quality of the papers, and any disagreements were resolved through discussion.

Results

Systematic search outcomes

A thorough search of 886 study papers yielded 442 duplicates that were disregarded. After reviewing the titles and abstracts of 444 studies, 343 articles were rejected. Out of the 101 reports that were necessary, 2 were not found. 64 papers were excluded because the study results were inaccurate, 2 were editor's letters, and 3 were abstracts. 23 were disqualified for using the wrong demographic types. The qualifying requirements are met by

the eight research publications that comprise this systematic review. A diagram illustrates the process by which the literature was selected in **Figure 1**.

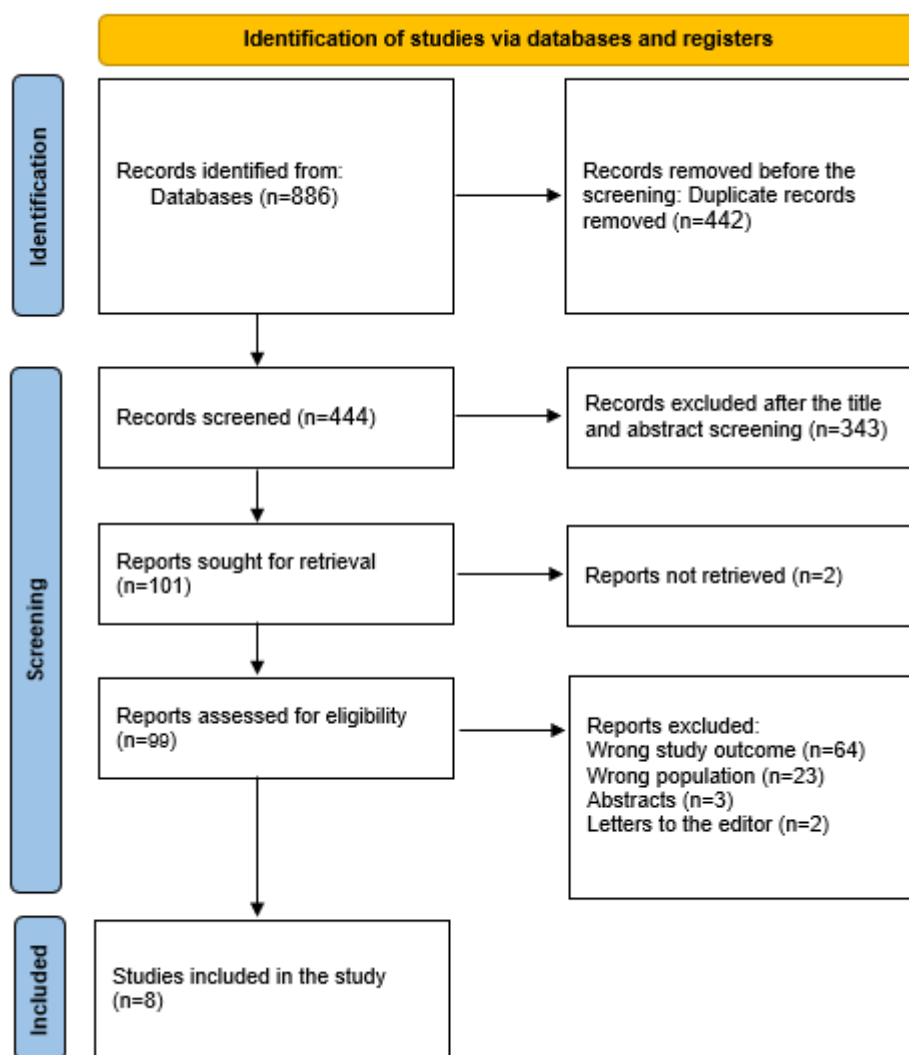


Figure 1: A PRISMA diagram is employed to encapsulate the research decisions.

Sociodemographics and clinical parameters of the involved participants and studies

Table 1 summarizes the socio-demographic data from the research articles. Our analysis included eight studies with a total of 5264 Saudi parents and fathers comprised less than half of the participants, totaling 1786 (33.9%). The studies consisted of four prospective cohort analyses [13, 14, 15, 18], two cross-sectional studies [16, 17], and one case-control [12]. Geographically, three studies were conducted in China [12, 14, 17], and one each in Korea [13], the UK [15], Iran [16], and Morocco [18].

Table (2) shows the clinical parameters

Our findings identify multiple barriers to vaccine uptake across childhood, HPV, and COVID-19 vaccines. For childhood vaccinations, significant barriers were observed, including delays among specific demographics such as parents with chronic diseases, those with lower educational levels, and older parents. A key barrier was age, where younger parents were less hesitant compared to older ones, suggesting a generational gap in vaccination attitudes. Higher education levels among parents and positive family histories were found to support vaccination, but concerns regarding vaccine safety and doubts about the necessity of certain vaccines persisted [10, 12, 15].

For HPV vaccinations, the main barriers were fear of negative side effects, inadequate information about the vaccine, and misconceptions regarding the child's sexual activity. Parents expressed reluctance based on beliefs that the vaccine was not necessary due to the age of their children. Families with higher educational backgrounds showed more support for vaccination, while families with lower education were more likely to cite these barriers. Additionally, marital status influenced vaccination decisions, with married parents expressing concerns about the effects of the HPV vaccine on natural immune development [11, 13, 14, 16].

For COVID-19 vaccines, barriers included a lack of sufficient information, as nearly all respondents indicated they required more details about the vaccine's efficacy before deciding to vaccinate their children. Concerns about potential side effects, such as severe reactions, were prevalent, and many parents believed that the vaccine's coverage would be temporary. Time constraints also acted as a barrier, with parents citing a lack of time as a reason for delaying or not vaccinating their children against COVID-19 [17].

Table (1): Sociodemographic parameters of the comprised research.

Study ID	Study design	Country	Participants (n)	Mean age	Fathers (%)
Basham et al., 2024 [10]	Cross-sectional	Riyadh	402	NM	216 (53.7%)
Al Saedi et al., 2024 [11]	Cross-sectional	Jeddah	426	40	46 (10.8%)
Sulaimani et al., 2024 [12]	Cross-sectional	Makkah	246	36 ± 7.2	139 (56.5%)
Maqbul et al., 2024 [13]	Cross-sectional	Riyadh	424	NM	105 (24.8%)
Alamir et al., 2024 [14]	Cross-sectional	Abha	281	NM	101 (35.9%)
AlMuammar et al., 2024 [15]	Cross-sectional	Jeddah	2127	18 to >45	548 (25.8%)
Alnaeem et al., 2023 [16]	Cross-sectional	Al-Ahsa	380	18 to >50	141 (37.2%)
AlOsaimi et al., 2023 [17]	Cross-sectional	Madinah	978	NM	490 (50.1%)

Table (1): Clinical parameters and outcomes of the comprised research.

Study ID	Vaccine type	Main outcomes	JBI
Basham et al., 2024 [10]	Childhood vaccination	Delays in vaccines were found for children aged 6 to 12 months, parents with over four children, moms with chronic diseases, fathers over the age of 36, and fathers with primary education.	Moderate
Al Saedi et al., 2024 [11]	HPV	Fear of negative consequences (33.1%) and a lack of information (19.7%) were the primary reasons for reluctance.	Moderate
Sulaimani et al., 2024 [12]	Childhood vaccination	The only significant link with reluctance status was age: parents who were younger were less reluctant than older parents (P-value < 0.006).	Moderate
Maqbul et al., 2024 [13]	HPV	Adoption of the HPV vaccine in connection to a positive family history of cervical cancer shows that 38.21% of parents who received the free HPV vaccination reported no family history of cervical cancer. Around 42.92%	Moderate

		of families with a university education support the immunization for their daughters at schools.	
Alamir et al., 2024 [14]	HPV	Parents with more advanced degrees, such as university graduates, expressed increased support for mandatory vaccinations and an appreciation for natural immune development in their children. Marital status influenced vaccination-related decisions, with differences in vaccine refusal levels and difficulty explaining the HPV vaccine observed among participants based on marital status.	Moderate
AlMuammar et al., 2024 [15]	Childhood vaccination	They found a significant association between "Acceptance of the Vaccine for the children" and mothers, Saudi participants, and high educational level	
Alnaeem et al., 2023 [16]	HPV	Concerns about potential adverse effects for their child (29.8%) and doubt about the vaccine's efficiency (27.9%) were major reasons why parents did not vaccinate their children against HPV. Some parents mentioned their child's insufficient sexual activity (17.4%) or their conviction that the immunization was unnecessary (17.4%).	Moderate
AlOsaimi et al., 2023 [17]	COVID-19	The majority of respondents (98.2%) stated that they required more information ($p = 0.004$) on the efficacy of COVID-19 vaccines in children before deciding whether to vaccinate them. In terms of negative opinions concerning COVID-19 vaccination, 71.3% believe there will be severe side effects, 67.7% believe the vaccine's coverage will be temporary, and 41.2% believe a lack of time is the primary reason for not vaccinating their child.	Low

Discussion

This systematic review identifies multiple barriers to vaccine uptake across childhood, HPV, and COVID-19 vaccines. For childhood vaccinations, significant barriers were observed, including delays among specific demographics such as parents with chronic diseases, those with lower educational levels, and older parents. A key barrier was age, where younger parents were less hesitant compared to older ones, suggesting a generational gap in vaccination attitudes. Higher education levels among parents and positive family histories were found to support vaccination, but concerns regarding vaccine safety and doubts about the necessity of certain vaccines persisted [10, 12, 15]. Lastly, cultural and religious factors can influence vaccination attitudes in the Saudi population. While Islam generally encourages preventive healthcare, specific interpretations or community beliefs can create doubt about the necessity or safety of vaccines [18]. **AlAmir** reported that the percentage of parental immunization hesitancy in Saudi Arabia varies significantly, ranging from 3.1 to 72.2%. Concerns about vaccination side effects emerged as the primary factor for vaccine hesitation. The analysis indicated that many Saudi Arabian parents are still hesitant to vaccinate their children. They feel that the potential negative consequences of vaccination outweigh its beneficial effects versus disease [19].

Furthermore, individual views and attitudes concerning vaccines play an important impact in vaccine acceptability. Cultural and religious views, as well as personal encounters with vaccines or vaccine-preventable diseases, all have an impact on people's vaccination decisions. Sustainable health policy and practice must address these various perspectives by engaging with communities to understand their concerns and delivering open and readily available vaccine information.

For HPV vaccinations in this review, the main barriers were fear of negative side effects, inadequate information about the vaccine, and misconceptions regarding the child's sexual activity. Parents expressed reluctance based on beliefs that the vaccine was not necessarily due to the age of their children. Families with higher educational backgrounds showed more support for vaccination, while families with lower education were more likely to cite these barriers. Additionally, marital status influenced vaccination decisions, with married parents expressing

concerns about the effects of the HPV vaccine on natural immune development [11, 13, 14, 16]. Parents in Saudi Arabia often refuse the HPV vaccine for their daughters due to cultural, social, and informational factors. Many believe the vaccine is unnecessary, as it is associated with sexually transmitted infections, which they perceive as irrelevant due to expectations of premarital abstinence. Additionally, a lack of awareness about the vaccine's role in preventing cervical cancer and concerns about promoting sexual activity contribute to hesitancy. Misinformation about safety and side effects, along with conservative social and religious values, also play significant roles in vaccine refusal [20]. **Padilha *et al.*** found that according to parents' perceptions, the primary variables for making decisions about childhood vaccination are: relationships with healthcare providers; convictions (cultural, spiritual, personal) and individual encounters; knowledge about childhood immunizations universal and free access to medical care; motion and structures of family arrangement; family framework; social relationships; and public health and social legislation involving vaccination programs [21].

We found that barriers to COVID-19 vaccination included a lack of sufficient information, as nearly all respondents indicated they required more details about the vaccine's efficacy before deciding to vaccinate their children. Concerns about potential side effects, such as severe reactions, were prevalent, and many parents believed that the vaccine's coverage would be temporary. Time constraints also acted as a barrier, with parents citing a lack of time as a reason for delaying or not vaccinating their children against COVID-19 [17]. **Alahmad** demonstrated that it is the transplantation team's responsibility to listen to children's and parents' worries about immunization, educate them, and dispel their doubts and fears, ultimately encouraging them to receive the vaccination. Administering the program in a scientific manner that does not place a financial strain on families is appropriate; in such circumstances, a financial incentive may be considered a better choice. However, given the financial issues caused by COVID-19, it may not be practical to conduct a big vaccination effort, particularly in LMICs. Children are the population that is growing most rapidly and have a longer life expectancy, so vaccines must not interfere with how they grow and develop. COVID-19 vaccine mandates must be reviewed [22].

The findings suggest the need for targeted public health interventions to increase vaccine uptake. Educational campaigns that address misconceptions about vaccine safety and necessity, particularly among parents with lower education levels, are essential. Culturally sensitive messaging, especially regarding the HPV vaccine, could help mitigate concerns related to sexual activity. Healthcare providers should engage parents in open discussions, providing clear, evidence-based information about the benefits of vaccines and addressing specific concerns related to chronic conditions, age, or cultural beliefs.

Strengths and limitations

This study provides valuable insights into the barriers faced by parents regarding childhood, HPV, and COVID-19 vaccinations, particularly within the Saudi population. By identifying specific factors such as parental age, education level, cultural norms, and misconceptions, the study highlights critical areas for intervention. The focus on different types of vaccines allows for a comprehensive understanding of the diverse barriers across various health conditions, providing a broader scope for future research and health policy improvements.

One limitation of the study is its reliance on qualitative data, which may be subject to reporting bias and the influence of cultural sensitivities, particularly regarding the HPV vaccine. Additionally, the study does not account for regional variations within Saudi Arabia, where access to healthcare and education may vary, potentially affecting vaccine hesitancy. The lack of longitudinal data also limits the ability to assess whether these barriers evolve over time as information becomes more accessible or as public health campaigns gain traction.

Conclusion

The study identifies several key barriers to vaccine uptake in Saudi Arabia, particularly for childhood, HPV, and COVID-19 vaccines. Parental age, education level, cultural beliefs, and misinformation play significant roles in vaccine hesitancy. Addressing these barriers through education, culturally sensitive health communication, and policy changes could improve vaccination rates and overall public health outcomes, particularly in preventing diseases like cervical cancer and other vaccine-preventable illnesses.

References:

1. Ventola CL. Immunization in the United States: Recommendations, Barriers, and Measures to Improve Compliance: Part 1: Childhood Vaccinations. *P T*. 2016;41(7):426-436.
2. Alsubaie SS, Gosadi IM, Alsaadi BM, et al. Vaccine hesitancy among Saudi parents and its determinants. Result from the WHO SAGE working group on vaccine hesitancy survey tool. *Saudi Med J*. 2019;40(12):1242-1250.
3. Alshammari TM, Subaiea GM, Hussain T, Moin A, Yusuff KB. Parental perceptions, attitudes and acceptance of childhood immunization in Saudi Arabia: A cross sectional study. *Vaccine*. 2018;36(1):23-28.
4. Cooper S, Schmidt BM, Sambala EZ, et al. Factors that influence parents' and informal caregivers' views and practices regarding routine childhood vaccination: a qualitative evidence synthesis. *Cochrane Database Syst Rev*. 2021;10(10):CD013265. Published 2021 Oct 27.
5. Smith PJ, Kennedy AM, Wooten K, Gust DA, Pickering LK. Association between health care providers' influence on parents who have concerns about vaccine safety and vaccination coverage. *Pediatrics*. 2006;118(5):e1287-e1292.
6. Galal B, Lazieh S, Al-Ali S, Khoshnood K. Assessing vaccine hesitancy in Arab countries in the Middle East and North Africa (MENA) region: a scoping review protocol. *BMJ Open*. 2022;12(2):e045348. Published 2022 Feb 11.
7. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, Shamseer L, Tetzlaff JM, Akl EA, Brennan SE, Chou R. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *International journal of surgery*. 2021 Apr 1;88:105906.
8. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan—a web and mobile app for systematic reviews. *Systematic reviews*. 2016 Dec;5:1-0.
9. Munn Z, Aromataris E, Tufanaru C, Stern C, Porritt K, Farrow J, Lockwood C, Stephenson M, Moola S, Lizarondo L, McArthur A. The development of software to support multiple systematic review types: the Joanna Briggs Institute System for the Unified Management, Assessment and Review of Information (JBI SUMARI). *JBI evidence implementation*. 2019 Mar 1;17(1):36-43.
10. Basham K, Al Mutairi F, Baw B, Al Said L. Exploring influential factors in childhood vaccine delays in Riyadh, Saudi Arabia. *Journal of Family Medicine and Primary Care*. 2024 Aug 1;13(8):3165-72.
11. Al Saedi RA, Al Daajani MM, Alghamdi SA. Parental Awareness, Attitude, and Acceptability of the Human Papillomavirus Vaccine in Jeddah, Saudi Arabia: An Analytical Cross-Sectional Study. *Cureus*. 2024 Jul 27;16(7).
12. Sulaimani M, Al-Mehmadi S, Sulaimani M, Alsubhi S. Prevalence and Determinants of Routine Childhood Vaccination Hesitancy in Makkah, Saudi Arabia. *Cureus*. 2024 Jun;16(6).
13. Maqbul MS, Allihaydan FS, Elfaham RH, Baragaa LA, Elfaham SH, Allihaydan NS, Alswat AK, Alhilal SO, Alzaki RS, Jasim WE, Alduhailan YA. Perceptions, attitude, and knowledge of Saudi parents towards the human papilloma virus vaccine. *Vacunas (English Edition)*. 2024 Apr 1;25(2):181-92.
14. Alamir AA, Almotairi AH, Almutairi FH, Almujeel KN, Almhmd AE, Alanazi AF, Alotaibi KF, Alanazi MH, Alsaeri AS, Alruwaili MA, Alghamdi RS. Knowledge and Attitude of Parents Regarding the Human Papillomavirus Vaccine as a New Component in the Saudi Vaccination Schedule. *Cureus*. 2024 Jan;16(1).
15. AlMuammar S, Alshora W, Sadik Gari A, Bahaj RK, Alansari BA. Parental willingness and factors influencing COVID-19 vaccination for children in Saudi Arabia. *Pediatric Health, Medicine and Therapeutics*. 2024 Dec 31:29-48.
16. Alnaeem L, Alanizi S, AlQarni G, Alwadani J, Bomouzah F, Ali Z. Acceptance, knowledge, and attitude of parents toward the human papillomavirus vaccine in the eastern region of Saudi Arabia: a cross-sectional study. *Cureus*. 2023 Dec;15(12).
17. AlOsaimi HM, Alqahtani AM, Alanazi NM, Alotibi NN, Alrazog MS, Aljameel HA, Alshehri RM, Alhusayni SJ, Alshammari MK. Barriers and Motivators toward Childhood COVID-19 Vaccination: A Cross-Sectional Study Conducted among Saudi Population. *Medicina*. 2023 Nov 21;59(12):2050.

18. Zainudin EN, Mohammad KA, Aris A, Shahdan IA. Vaccination: influencing factors and view from an Islamic perspective. *IIUM Medical Journal Malaysia*. 2018 Oct 18;17(2).
19. Alamir AA. Childhood vaccination hesitancy in Saudi Arabia: are we still facing a problem?: A narrative review. *Saudi Medical Journal*. 2024 Jun;45(6):551.
20. Kisa S, Kisa A. Religious beliefs and practices toward HPV vaccine acceptance in Islamic countries: A scoping review. *PloS one*. 2024 Aug 29;19(8):e0309597.
21. Padilha AR, Resende MA, dos Reis MD, de Oliveira VC, de Oliveira PP, de Carvalho NM. Reasons for Parents and Guardians for Non-Adherence to Human Papilloma Virus Vaccination: Scoping Review. *Research, Society and Development*. 2022;11:1-5.
22. Alahmad G. Ethical challenges involved in COVID-19 vaccine mandates for children: a systematic review. *Vaccines*. 2023 Mar 6;11(3):601.