

Parental Awareness, Acceptance, and Hesitancy about Child Vaccination in Saudi Arabia: A Systematic Review

Faisal Muqbil Aldahmashi¹, Ibrahim Enad Alenazi², Naif Eid Aleid³, Abdullah Nasser AlBarrak⁴, Saud Abdulmajeed Bin Rakhis⁵

1. Assistant Consultant of Pediatrics, Rumah General Hospital
2. Assistant Consultant of Family Medicine, King Fahad Medical City, Riyadh
3. Acting Consultant of Family Medicine, King Fahad Medical City, Riyadh
4. Consultant of Family Medicine, King Fahad Medical City, Riyadh
5. Acting Consultant of Family Medicine, Prince Sultan Military Medical City, Riyadh

ABSTRACT

Objectives: To assess the current state of vaccination coverage and the extent of vaccine hesitancy in Saudi Arabia. **Methods:** To locate research that met the inclusion criteria, a thorough computerized search of relevant databases was carried out. A comprehensive search was carried out on PubMed, SCOPUS, Science Direct, Cochrane Library, and Web of Science to locate relevant material. **Results:** Our data included eleven trials with 6947 participants and 2781 (40%) were males. The prevalence of hesitancy among Saudi populations towards vaccination ranged from 6.5% to the COVID-19 vaccine and 80% to the HPV vaccine, with a total prevalence of 2888 (41.6%). Various factors reduce hesitation, including free vaccinations, media campaigns, reading about the vaccine, leaders receiving it, relatives receiving it, work-mandated vaccinations, religion, trust in medical procedures, going back to regular life, and removing protective measures. We emphasize the necessity of focused educational initiatives to encourage favorable attitudes and conceptions of the vaccine and raise vaccination rates. **Conclusion:** We recorded a high hesitancy prevalence towards vaccination among the Saudi population. While the nation's immunization programs have shown remarkable effectiveness, focused efforts are required to address the particular causes of vaccine reluctance. Saudi Arabia can guarantee the long-term effectiveness of its public health programs and keep its population safe from diseases that can be prevented by vaccination by comprehending and addressing these variables.

1. Introduction

Vaccinations are one of the most effective methods for preventing infectious diseases, offering significant protection with minimal side effects. To ensure the success of a population-wide vaccination program, high immunization coverage is essential [1]. Achieving a vaccination rate between 75% and 94% is necessary to establish herd immunity, which ensures optimal disease protection even for

individuals who cannot be vaccinated for medical reasons. Vaccination efforts have drastically reduced the global incidence of infectious diseases. For example, according to WHO statistics, confirmed cases of pertussis dropped from 1,982,355 in 1980 to 143,963 in 2017 [2]. Similarly, polio cases declined from 52,795 in 1980 to just 96 in 2017. The WHO also monitors expected annual immunization rates for various diseases, with these figures being officially reported by member states each year. In 2018, the World Health Organization reported global vaccination coverage ranging from 90% for the first dose of the tetanus vaccine to 28% for the rotavirus vaccine [3].

The Ministry of Health supported the free rollout of the Expanded Program on Immunization (EPI) to the Saudi population. Data from the Ministry's surveillance show that vaccination rates are generally high across Saudi Arabia, contributing significantly to the reduction of childhood mortality and illness from the targeted diseases [4]. However, like many countries around the world, Saudi Arabia faces the challenge of unequal vaccine coverage among its population. Insufficient vaccination not only increases the risk of children contracting preventable diseases, but also has long-term negative effects on both the economy and humanitarian efforts.

Maintaining a high vaccination rate is essential, as demonstrated by the increase in outbreaks of vaccine-preventable diseases worldwide and the ongoing challenges posed by the COVID-19 pandemic. In Saudi Arabia, while overall vaccination rates for mandatory vaccines remain high, growing concerns are emerging about pockets of vaccine hesitancy within certain demographic groups. This reluctance can lead to reduced herd immunity and the resurgence of diseases, posing risks not only to individuals who decline vaccination but also to the wider community. Additionally, Saudi Arabia faces unique challenges in addressing vaccine hesitancy due to the transient nature of the expatriate population, the influence of social media, and religious beliefs. The primary aim of this systematic review is to evaluate the current status of vaccination coverage and the prevalence of vaccine hesitancy in Saudi Arabia.

2. Methods

We implemented this systematic review in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [5] criteria. An internet-based search was performed on PubMed, Web of Science, SCOPUS, Cochrane Library, and Science Direct to find English-language studies on vaccination coverage and the extent of vaccine hesitancy in Saudi Arabia. The search technique in these cases made use of pertinent keywords; "Vaccination," "Vaccine," "Immunization," "Childhood," "Children" "Parents," "Caregivers," "Knowledge," "Perception," "Acceptance," and "Hesitancy." To assess the quality of the included study, several reviewers sifted through the search results, chose relevant papers, collected data, and used the appropriate evaluation methods. These reviewers ensured that trustworthy studies and data were chosen for additional evaluation and summary in this systematic review by independently extracting pertinent material and critically assessing the included research's quality using established assessment processes.

Eligibility Criteria

Inclusion criteria:

1. Studies that reported the prevalence of vaccine hesitancy.
2. Studies that investigated the vaccination perception and the extent of vaccine hesitancy.
3. Studies implemented in the Kingdom of Saudi Arabia.
4. Research that is printed in publications with peer review.
5. Recent studies published in the last two years (2023-2024).
6. Studies available in the English language.
7. Research conducted on human subjects.

Exclusion criteria:

1. Studies that did not report a quantitative prevalence of vaccine hesitancy.
2. Studies conducted outside the determined geographical region (Saudi Arabia).
3. Studies not available in the English language.
4. Animal or in vitro studies.
5. Reviews, case reports, editorials, and opinion pieces.

Data Extraction

The search results were verified for correctness using Rayyan (QCRI) [6]. To determine if the titles and abstracts of the search results were relevant, the inclusion and exclusion criteria were used. Papers meeting the inclusion criteria were subjected to a thorough review by the study team. To settle disagreements, consensus was used. Key study data were recorded using an established data extraction form, including study titles, authors, year of publication, Saudi city, participant demographics, type of vaccination, prevalence of vaccine hesitancy, outcomes on hesitancy, and outcomes on coverage. To investigate the probability of bias, a neutral evaluation instrument was developed.

Strategy for Data Synthesis

A qualitative review was made possible by the descriptions of the research findings and features that were created using data from pertinent studies. The best strategy to guarantee the utilization of the data from the included studies was identified following the completion of the data collection for the systematic review.

Risk of Bias Assessment

We utilized the ROBINS-I technique to evaluate the risk of bias because it allows for extensive assessment of confounding, which is significant because bias owing to omitted variables is common in studies in this field. The ROBINS-I tool is intended to evaluate non-randomized investigations and can be applied to cohort designs in

which participants exposed to various staffing levels are monitored over time. Two reviewers separately assessed the risk of bias for each paper, and disagreements were resolved through group discussion [7].

3. Results

Systematic search outcomes

Following the removal of 391 duplicates, a systematic search yielded 844 study papers. After 453 studies' titles and abstracts were reviewed, 388 papers were rejected. Out of the 65 reports that needed to be obtained, 3 articles were not found. 62 articles passed the full-text screening procedure; 29 were dismissed as the study results were erroneous, 8 because the type of population was incorrect, 2 were editor's letters, and 12 were for the wrong study setting. The eligibility requirements were satisfied by eleven research publications that have been incorporated in this systematic review. Figure 1 depicts a diagram of the approach used to select the literature.

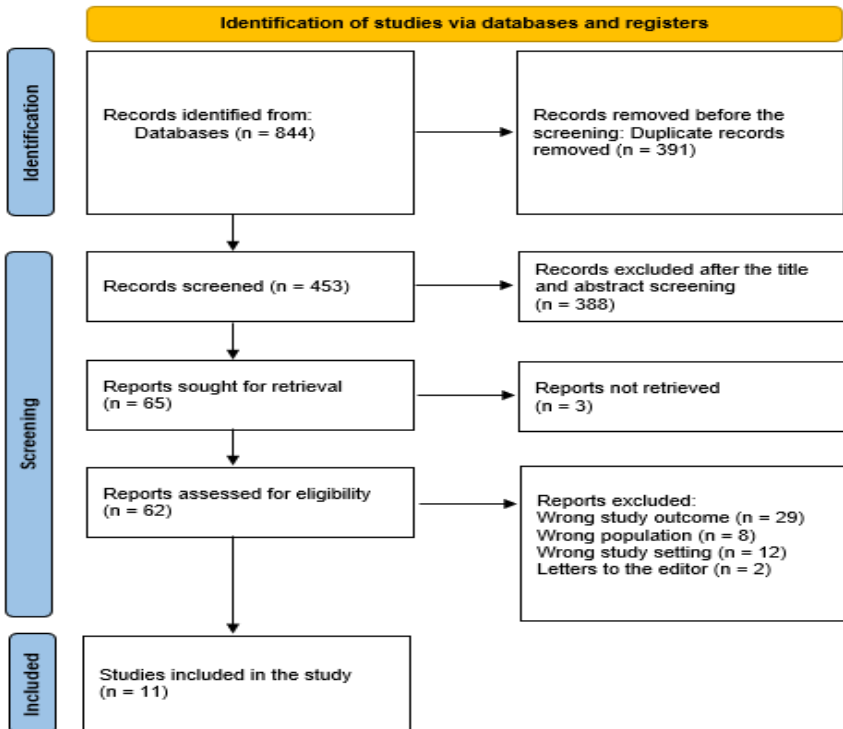


Figure 1: A PRISMA diagram is used to summarize the study decisions.

Sociodemographics of the comprised participants and studies

Table 1 displays the sociodemographic information from the research articles. Our data included eleven trials with 6947 participants and 2781 (40%) were males. All of

the included articles were cross-sectional studies [8-18]. One study was conducted in Riyadh [10], two in Jeddah [9, 14], two in Mecca [11, 13], two in Taif [18, 19], one in Abha [12], one in Madinah [15], one in Al-Kharj [17], and one was multi-centered [16].

Clinical outcomes

The clinical data are presented in Table (2). The prevalence of hesitancy among Saudi populations towards vaccination ranged from 6.5% [14] to the COVID-19 vaccine and 80% [13] to the HPV vaccine, with a total prevalence of 2888 (41.6%). Six studies discussed the COVID-19 vaccination [11, 14-18]. "Already infected," "fear of becoming ill after the vaccine," and "lack of sufficient details regarding the x adverse effects" were the most often cited reasons for hesitation to receive the COVID-19 vaccine [11, 14-18]. Various factors reduce hesitation, including free vaccinations, media campaigns, reading about the vaccine, leaders receiving it, relatives receiving it, work-mandated vaccinations, religion, trust in medical procedures, going back to regular life, and removing protective measures [18]. Regarding vaccine coverage, Asiri et al. reported that every region in Saudi Arabia has a high first-dose vaccination rate [11].

Three studies discussed the children's vaccination. Hesitancy was correlated with parents' educational attainment and the number of children (child order) [8, 9, 13]. Three studies discussed the HPV vaccination. Those who were unwilling cited a variety of reasons for their hesitation, such as ignorance, inadequate information, needle and vaccine anxiety, and divergent medical views. We emphasize the necessity of focused educational initiatives to encourage favorable attitudes and conceptions of the vaccine and raise vaccination rates [9, 10, 13].

Table 1: Sociodemographic parameters of the involved populations.

Study	Study design	City	Participants	Mean age	Males (%)
Alghamdi & Alghamdi, 2023 [8]	Cross-sectional	Jeddah	301	NM	133 (44.2%)
Alharthi et al., 2024 [9]	Cross-sectional	Riyadh	551	42.6 ± 12.7	454 (82.4%)
Turki & Alqurashi, 2023 [10]	Cross-sectional	Mecca	534	NM	0
Asiri et al., 2023 [11]	Cross-sectional	Abha	621	26.8 ± 12.4	352 (57.1%)
Sulaimani et al., 2024 [12]	Cross-sectional	Mecca	246	36 ± 7.2	139 (56.5%)
AlShamlan et al., 2024 [13]	Cross-sectional	Jeddah	1857	32.1 ± 8.5	0
Sayed, 2024 [14]	Cross-sectional	Madinah	186	30-49	71 (38.2%)
Majzoub et al., 2023 [15]	Cross-sectional	Multi-centered	399	20-60	327 (82%)

Iqbal et al., 2023 [16]	Cross-sectional	Al-Kharj	1507	NM	1101 (73%)
Alzahrani & Alghamdi, 2023 [17]	Cross-sectional	Taif	301	18 to >50	93 (30.9%)
Al-Ghuraibi et al., 2023 [18]	Cross-sectional	Taif	444	NM	111(25%)

Table (2): Clinical parameters and outcomes of the comprised research.

Study ID	Vaccination type	Prevalence of hesitancy	Outcomes on hesitancy/ acceptance
Alghamdi & Alghamdi, 2023 [8]	Children vaccination	91 (30.2%)	Hesitancy was correlated with parents' educational attainment and the number of children (child order). Compared to respondents with a university degree, those having only completed secondary school had a larger rate of vaccine hesitation. Some parents were reluctant to vaccinate their kids and thought there were better ways to prevent illness.
Alharthi et al., 2024 [9]	HPV vaccine	52 (29.9%)	Those who were unwilling cited a variety of reasons for their hesitation, such as ignorance, inadequate information, needle and vaccine anxiety, and divergent medical views.
Turki & Alqurashi, 2023 [10]	HPV vaccine	148 (27.7%)	The participants conveyed a strong conviction on the necessity of educational workshops aimed at raising community knowledge regarding the HPV vaccine. The study emphasizes the necessity of focused educational initiatives to encourage favorable attitudes and conceptions of the vaccine and raise vaccination rates.
Asiri et al., 2023 [11]	COVID-19 vaccine	351 (56.5%)	In this study, "already infected" and "fear of becoming ill after the vaccine" were the most often cited reasons for hesitation to receive the COVID-19 vaccine, followed by "lack of sufficient details regarding the vaccine." Every region in Saudi Arabia has a high first-dose vaccination rate; the Aljuf region has the lowest rate, with 80% of its residents having received the vaccine, followed by the Najran region with 80.8%.
Sulaimani et al., 2024 [12]	Children vaccination	22 (8.9%)	While the percentage of reluctant parents is modest overall, there were a few questions that elicited more hesitant answers than non-hesitant ones.
AlShamlan et al., 2024 [13]	HPV vaccine	1488 (80%)	There are a number of reasons why people are reluctant to get the vaccine, the most commonly stated ones being ignorance and false beliefs about the risk of HPV and immunization.
Sayed, 2024 [14]	COVID-19 vaccine	12 (6.5%)	The mass COVID-19 Arabia's 19 vaccination campaigns played a critical role in keeping the illness under control, but they were also linked to vaccine resistance and reluctance among the

			populace. Vaccine reluctance has been mostly driven by uncertainty regarding potential adverse responses, whether short- or long-term.
Majzoub et al., 2023 [15]	COVID-19 vaccine	140 (35%)	Less than half of the children who received vaccinations reported experiencing any side effects, despite the study's conclusion that parents' primary concern was potential vaccine adverse effects.
Iqbal et al., 2023 [16]	COVID-19 vaccine	414 (27.5%)	While some parents expressed hesitation about their children receiving the COVID-19 immunization, most acknowledged the significance of the vaccination for children. The majority of parents surveyed expressed no concern about their children receiving the COVID-19 immunization and thought it would ultimately improve their quality of life.
Alzahrani & Alghamdi, 2023 [17]	COVID-19 vaccine	32 (10.6%)	The study's conclusions are in line with those of other research projects carried out in Saudi Arabia and around the globe, and they have significant ramifications for how politicians and medical professionals should handle vaccine reluctance.
Al-Ghuraibi et al., 2023 [18]	COVID-19 vaccine	138 (31.2%)	It has been discovered that various factors reduce hesitation, including free vaccinations, media campaigns, reading about the vaccine, leaders receiving it, relatives receiving it, work-mandated vaccinations, religion, trust in medical procedures, going back to regular life, and removing protective measures.

Table (2): Risk of bias assessment using ROBINS-I

Study ID	Bias due to confounding	Bias in the selection of participants into	Bias in the classification of interventions	Bias due to deviations from the intended	Bias due to missing data	Bias in the measurement of	Bias in the selection of reported result	Overall bias
Alghamdi & Alghamdi, 2023 [8]	Mod	Mod	Low	Low	Low	Mod	Low	Moderate
Alharthi et al., 2024 [9]	Mod	Mod	Low	Low	Low	Mod	Low	Moderate
Turki & Alqurashi, 2023 [10]	Mod	Mod	Mod	Low	Low	Low	Low	Moderate
Asiri et al., 2023 [11]	Mod	Mod	Low	Low	Low	Mod	Low	Moderate

Sulaimani et al., 2024 [12]	Mod	Mod	Mod	Low	Low	Low	Low	Moderate
AlShamlan et al., 2024 [13]	Mod	Mod	Low	Low	Mod	Mod	Low	Moderate
Sayed, 2024 [14]	Mod	Mod	Low	Low	Low	Low	Low	Moderate
Majzoub et al., 2023 [15]	Crit	Low	Low	Low	Mod	Mod	Low	Crit
Iqbal et al., 2023 [16]	Low	Low	Low	Low	Low	Low	Mod	Low
Alzahrani & Alghamdi, 2023 [17]	Mod	Low	Low	Low	Low	Low	Low	Mod
Al-Ghuraibi et al., 2023 [18]	Low	Low	Mod	Mod	Low	Low	Low	Low

4. Discussion

Even while the nation has made great progress toward attaining high vaccination coverage rates, especially for young vaccinations, several obstacles still need to be overcome. The analysis showed that, while vaccine hesitancy is not yet common, it is a developing issue that, if left unchecked, may jeopardize public health initiatives. We found that the prevalence of hesitancy among Saudi populations towards vaccination ranged from 6.5% [15] to the COVID-19 vaccine and 80% [14] to the HPV vaccine, with a total prevalence of (41.6%). This was higher than the global prevalence reported by Fajar et al. (25%) [20]. The high prevalence of HPV vaccination hesitancy may be due to the fact that most people in Saudi Arabia don't know much about HPV and the risks of cervical cancer that come with it. This is especially true because HPV-related illnesses aren't as widely publicized as other diseases that can be prevented by vaccination. Being a sexually transmitted illness, HPV is frequently associated with sexual activity and the HPV vaccine. This association might cause difficulty and reluctance to vaccinate in Saudi Arabia, where sexuality-related issues are highly sensitive, especially for parents making vaccination decisions for their daughters [21, 22].

We found that the most often cited reasons for hesitation to receive the COVID-19 vaccine were "Already infected," "fear of becoming ill after the vaccine," and "lack of sufficient details regarding the x adverse effects" [12, 15-19]. Various factors reduce hesitation, including free vaccinations, media campaigns, reading about the vaccine, leaders receiving it, relatives receiving it, work-mandated vaccinations, religion, trust in medical procedures, going back to regular life, and removing

protective measures [19]. Regarding vaccine coverage, Asiri et al. reported that every region in Saudi Arabia has a high first-dose vaccination rate [12]. Alalawi et al. also reported that being male, believing that one is more likely to contract COVID-19, having a good attitude about the influenza vaccine, and having a better educational level or greater awareness of the COVID-19 vaccine were the most often reported characteristics related to acceptance of the vaccine [23].

We found that hesitancy was correlated with parents' educational attainment and the number of children (child order) [8, 9, 13]. Similarly, Alamir reported that low educational attainment, doubts about the validity of vaccine research, and a lack of health knowledge are the most prevalent characteristics of apprehensive parents in Saudi Arabia [24].

In order to combat vaccination reluctance, healthcare providers should be trained in effective communication techniques. This entails being aware of the patients' cultural and religious issues as well as giving them accurate, fact-based information regarding the advantages and disadvantages of vaccinations. One way to combat vaccination reluctance may be to involve religious leaders in public health initiatives, particularly in areas where religious convictions have a significant impact on health decisions.

5. Limitations

There are various restrictions on this review. First, there was a lack of consistency in the methodology across the research that was part of the review, which made it challenging to directly compare the results of various investigations. Furthermore, the generalizability of the findings is limited due to the absence of detailed data on vaccine reluctance among certain populations, such as rural areas and expatriates. Third, because the review was limited to works written in English. Lastly, some of the findings might not accurately reflect the current state of affairs due to the quickly changing nature of vaccination reluctance, especially in light of the COVID-19 pandemic.

6. Conclusion

We recorded a high hesitancy prevalence towards vaccination among the Saudi population. While the nation's immunization programs have shown remarkable effectiveness, focused efforts are required to address the particular causes of vaccine reluctance. Saudi Arabia can guarantee the long-term effectiveness of its public health programs and keep its population safe from diseases that can be prevented by vaccination by comprehending and addressing these variables.

References

- Ehret J. The value of vaccination: a global perspective. *Vaccine*. 2003 Oct 1;21(27-30):4105-17.
- Fine P, Eames K, Heymann DL. "Herd immunity": a rough guide. *Clinical infectious diseases*. 2011 Apr 1;52(7):911-6.

- World Health Organization. Global and regional immunization profile. WHO: Geneva, Switzerland. 2018.
- MOH. Childhood Vaccines Available Daily in all Health Centers. Available online: <https://www.moh.gov.sa/en/Ministry/MediaCenter/News/Pages/News-2017-07-20-001.aspx> (accessed on 18 Aug 2024).
- 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.
- Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan—a web and mobile app for systematic reviews. *Systematic reviews*. 2016 Dec;5:1-0.
- Sterne JA, Hernán MA, Reeves BC, Savović J, Berkman ND, Viswanathan M, Henry D, Altman DG, Ansari MT, Boutron I, Carpenter JR. ROBINS-I: a tool for assessing risk of bias in non-randomised studies of interventions. *bmj*. 2016 Oct 12;355.
- Alghofaili MA, Aljuaid SO, Alqahtani N, Alghufaili M, Abd-Ellatif EE. Factors contributing to the delayed vaccination among children in Riyadh City, Saudi Arabia: a cross-sectional study. *Cureus*. 2023 Aug;15(8).
- Alghamdi AA, Alghamdi HA. Knowledge, attitude, and practice of vaccination among parents in Jeddah City, Saudi Arabia. *Cureus*. 2023 Jul;15(7).
- Alharthi TS, Alqahtani RK, Alghamdi M, Munshi AA, Alzahrani KA, Alenezi AQ, Almurakshi MM, Aljarbou AZ. Awareness and Attitudes Among Parents of Females Aged 9-26 in Saudi Arabia Regarding Human Papillomavirus Vaccination. *Cureus*. 2024 Jun;16(6).
- Turki YM, Alqurashi J. Knowledge, attitudes, and perceptions towards human papillomavirus (HPV) vaccination among adult women in primary health care centers in Makkah, Saudi Arabia. *Cureus*. 2023 Aug;15(8).
- Asiri WM, Alhussain RM, Alshehri NA, Al Maqbali MH. Willingness and Hesitancy Factors Toward COVID-19 Vaccination. *Bahrain Medical Bulletin*. 2023 Sep 1;45(3).
- 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).
- AlShamlan NA, AlOmar RS, AlAbdulKader AM, Shafey MM, AlGhamdi FA, Aldakheel AA, AlShehri SA, Felemban LA, AlShamlan SA, Al Shammari MA. HPV Vaccine Uptake, Willingness to Receive, and Causes of Vaccine Hesitancy: A National Study Conducted in Saudi Arabia Among Female Healthcare Professionals. *International Journal of Women's Health*. 2024 Dec 31;463-74.
- Sayed AA. COVID-19 vaccine hesitancy and attitudes of subjects with disability and their carers in Saudi Arabia: a cross-sectional study. *Frontiers in Public Health*. 2024 Feb 28;12:1282581.
- Majzoub RA, Alrofaie OH, Almotreb LK, Alateeq SK. Parental hesitancy and attitude concerning COVID-19 vaccine and its side effects in Saudi Arabia, Eastern region. *Cureus*. 2023 Nov;15(11).
- Iqbal MS, Khan MN, Qamer S, Khan SU. Parents' concerns, behavior, perception, and hesitancy regarding COVID-19 vaccinations for children in central Saudi Arabia. *Vaccines*. 2023 Oct 5;11(10):1566.
- Alzahrani AA, Alghamdi AN. Vaccine hesitancy among parents and its determinants during the era of COVID-19 in Taif City, Saudi Arabia. *Cureus*. 2023 Jun;15(6).
- Al-Ghuraibi M, Dighriri IM, Elrggal ME, Obaid NA. The socio-cultural factors behind the Saudi attitude toward COVID-19 vaccination: a survey-based study. *Frontiers in public health*. 2023 Jan 9;10:1026252.
- Fajar JK, Sallam M, Soegiarto G, Sugiri YJ, Anshory M, Wulandari L, Kosasih SA, Ilmawan M, Kusnaeni K, Fikri M, Putri F. Global prevalence and potential influencing factors of COVID-19 vaccination hesitancy: a meta-analysis. *Vaccines*. 2022 Aug 19;10(8):1356.

- Hussain AN, Alkhenizan A, McWalter P, Qazi N, Alshmassi A, Farooqi S, Abdulkarim A. Attitudes and perceptions towards HPV vaccination among young women in Saudi Arabia. *Journal of Family and Community Medicine*. 2016 Sep 1;23(3):145-50.
- Barhamain AS, Alwafi OM. Uptake of human papilloma virus vaccine and intention to vaccinate among women in Saudi Arabia. *Med Sci*. 2022;26(1).
- Alalawi M, Alsalloum MA, Garwan YM, Abuzeid M, Alalawi H, Eljaaly K, Thabit AK, Jose J. COVID-19 vaccine hesitancy among healthcare workers in Arab Countries: A systematic review and meta-analysis. *Plos one*. 2024 Jan 2;19(1):e0296432.
- 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.