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Systematic Review (Pages: 41-59)

Pregnant Women's Knowledge, Attitudes, Practices, and Barriers Associated with Influenza Vaccination Uptake: A Systematic Review

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Abstract

Background: Vaccination is the most effective method for preventing influenza during pregnancy. This study aims to determine the knowledge, attitudes, and practices (KAP), as well as barriers associated with the uptake of influenza vaccination among pregnant women worldwide.

Materials and Methods: In this systematic review, a comprehensive search of online databases (Medline, EMBASE, Scopus, Web of Science, ProQuest, CINAHL, and Google Scholar) was conducted to identify all studies examining knowledge, attitudes, practices (KAP), and barriers related to vaccination among pregnant women up to December 2022.

Results: A total of 24 studies from 22 countries were analyzed to assess knowledge, attitudes, and practices regarding influenza vaccination among pregnant women. The mean correct knowledge score was 50.75% (ranging from 5.5% to 96%), with the highest score reported in Thailand and the lowest in Iran. The mean positive attitude score was 57.05% (ranging from 34.6% to 79.5%), with Iranian women showing more positive attitudes than Italian women, who had less favorable views.

The mean practice score related to vaccination was 37·45% (ranging from 1·1% to 73·8%), with the best performance observed in the UK and the poorest in Turkey. The primary barrier to vaccination was concern over side effects, cited by approximately 80·9% of participants as a major deterrent. Other significant barriers included a lack of awareness about vaccine safety, insufficient endorsement or recommendation from healthcare providers, unawareness of the benefits that vaccination provides for both mothers and infants, and negative attitudes towards vaccination among pregnant women.

Conclusion: The findings indicate that pregnant women generally possess limited knowledge and exhibit low vaccination practices regarding influenza, despite holding moderate positive attitudes. The widespread concern about vaccine side effects highlights the urgent need for targeted educational interventions to enhance understanding and boost vaccination uptake.

Key Words: Attitudes, Barriers, Influenza Vaccination, Pregnancy, Practices, Knowledge.

*Please cite this article as: Payandeh Sh, Nabavi N, Movahedinia S, Poudineh V, Afzoon S, Malakoti N. Pregnant Women's Knowledge, Attitude, Practice, and Barriers Associated with the Uptake of Influenza Vaccination: A Systematic Review. Health Provid 2023; 3(1): 41-59. doi: **10.22034/HP.2022.375002.1028**

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Received date: Feb. 12, 2023; Accepted date: Jun.22, 2023

1- INTRODUCTION

Influenza (also known as flu) is a highly contagious viral disease and an important cause of acute respiratory infections worldwide, posing a serious global health challenge (1). The world has witnessed four major influenza pandemics during the 20th and 21st centuries (1918-19 was one; others include outbreaks like those in 1957-58 which might not be categorized strictly under "epidemics" here but significant events occurred then; actual pandemics were noted in periods such as 1968-69 and later ones like H1N1 from 2009 to early next year), each associated with high mortality rates (2). Vaccination is recognized as the most effective way to prevent influenza during pregnancy. The first influenza vaccine was used in the USA starting from about 1945. Initially targeting military personnel before wider civilian use developed over time; by 1957–58, it began being administered more broadly to high-risk groups including individuals over 65 years old along with pregnant women; further expansion came when ACIP officially recommended seasonal flu vaccines by 2010 for broader populations based on risk factors or age criteria outlined at that time (3–6). Influenza can have severe consequences during pregnancy due to increased risks such as fetal demise (7) and preterm labor/birth (8), potentially causing severe life-threatening illnesses among pregnant women themselves (9, 10).

In 2012, the World Health Organization (WHO) identified pregnant women as the highest priority group for seasonal influenza vaccination in countries considering the initiation or expansion of vaccination programs (1). Influenza vaccines have been administered to pregnant women for decades (2). Overwhelming evidence indicates the safety of inactivated influenza vaccines for pregnant women and fetuses during all trimesters of pregnancy, as well as for breastfeeding women (3-5). Some studies have shown that the flu vaccine prevents between 20% and 90% of flu cases and their complications (6); however, opinions among pregnant women about the flu vaccine and its benefits for both mother and child vary across different regions of the world (1, 2, 5).

Mothers and pregnant women report inadequate information regarding the risks and benefits of influenza vaccination globally (11-16). A survey conducted in the USA in 2020 revealed that 40% of pregnant women declined the influenza and Tdap (tetanus, diphtheria, and pertussis) vaccines, which places both themselves and their babies at an increased risk of hospitalization and mortality. Additionally, 20% of respondents indicated that they were not advised to receive vaccinations (17). The reluctance among pregnant women to get vaccinated during this period can be attributed to concerns about vaccine safety and a lack of awareness regarding the limited risks associated with vaccination for both themselves and their children (18).

Another study conducted in Italy found that awareness of the influenza vaccine and its administration during pregnancy was very low (19), and the overall uptake of influenza vaccination among pregnant women was poor (20). In contrast, various studies in the USA indicated that more than half of pregnant women had a positive attitude toward the influenza vaccine, with 85% reporting that they were recommended to get vaccinated by medical staff, which positively influenced their likelihood of receiving the vaccine (21). According to the World Health Organization (WHO), vaccination is the most effective way to prevent pregnant mothers from contracting influenza (11); however, vaccination rates remain suboptimal in many countries. Mothers frequently cite concerns about vaccine

safety as a significant barrier to vaccination (22).

Vaccine-preventable diseases during pregnancy can pose significant risks to both mothers and their children. Therefore, it is crucial to provide pregnant women with information that enhances their understanding and encourages vaccination. Research indicates a substantial gap in knowledge regarding influenza vaccination coverage among pregnant women, as well as their attitudes toward its importance across various countries, particularly among those at higher risk for the disease (11, 12). The critical need for annual influenza vaccination for pregnant women, coupled with the lack of current data on awareness, acceptance, and reasons for vaccine hesitancy within these populations, has prompted this study. This study aimed to determine the knowledge, attitudes, practices (KAP), and barriers associated with the uptake of influenza vaccination during pregnancy among women worldwide.

2- MATERIALS AND METHODS

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement served as the template for this review (23).

2-1. Eligibility criteria

The Participants, Interventions, Comparators, and Outcomes (PICO) framework was used to formulate the review objective and inclusion criteria.

- **Participants**: Pregnant or postpartum women worldwide.
- **Interventions**: Studies focusing on influenza vaccination awareness, attitudes, and practices.
- **Comparators**: Not applicable, as the included studies are non-interventional and do not involve a comparison group.
- **Outcomes**: Knowledge, Attitudes, and Practices (KAP) and barriers related to influenza vaccination.

2-2. Included studies

The review included studies that reported any form of quantitative or qualitative assessment, measurement, or evaluation of Knowledge, Attitudes, and Practices (KAP) regarding influenza vaccination among pregnant women in any country or region worldwide. The inclusion criteria focused on studies addressing knowledge, attitudes, practices, barriers, and concerns related to influenza vaccination. Additionally, eligible studies were required to be published up to December 2022, written in English or Persian, and have the full text available.

2-3. Exclusion criteria

The exclusion criteria included abstracts not linked to the full article, articles not written in English or Persian, reviews or meta-analyses, letters to the editor, editorials, short reports, case reports, briefs, clinical guidelines, cost-effectiveness analyses, and studies that focused on the outcomes of influenza vaccination during pregnancy.

2-4. Information sources

A systematic search of electronic databases, including Medline (via PubMed), EMBASE, Scopus, Web of Science, CINAHL, ProQuest, and the Google Scholar search engine, was conducted. The search was performed independently and in duplicate by two reviewers, with any disagreements regarding eligibility resolved by a third author. **Figure 1** shows the PRISMA flow diagram of the search and screening process.

2-5. Search

The search for articles published up to December 22, 2022, was conducted by

combining MeSH terms related to vaccines, vaccination, immunization, influenza vaccination, knowledge, attitude, practice, barriers, concerns, pregnancy, pregnant women, and worldwide.

2-6. Study selection

A search was conducted to identify potential studies. Abstracts were screened for eligibility, full-text articles were obtained and assessed, and a final list of included studies was compiled. In addition to primary articles, the references of these studies were also searched for additional relevant research. This process was carried out independently and in duplicate by two reviewers, with any disagreements resolved by a third reviewer. References were organized and managed using EndNote software (version X8).

2-7. Data collection process

A researcher-developed form was created as a template to guide data collection for each study. Two reviewers independently collected the data, while a third reviewer resolved any discrepancies. The collected data included the authors' names, country, study period, study design, study population, sample size, and main results.

2-8. Risk of bias in individual studies

The risk of bias assessment was conducted using the standard tool developed by Hoy et al. (24), which is a valuable instrument for evaluating the quality of observational studies. The checklist consists of ten items plus a summary assessment and addresses two dimensions: external validity through items 1–4 (domains: selection and nonresponse bias) and internal validity through items 5–10 (domains: measurement bias and analysis-related bias). The assessment was performed independently and in duplicate by two reviewers, with any discrepancies resolved by a third reviewer. Studies that received a 'yes' for eight or more of the ten questions were classified as having a ‘low risk of bias.’ Studies that received a 'yes' for six to seven of the ten questions were classified as having a ‘moderate risk,’ while those that received a 'yes' for five or fewer of the ten questions were classified as having a ‘high risk.’

2-9. Synthesis of results

Given the heterogeneity of study designs, methodologies, and populations among the included studies, conducting a statistical meta-analysis was not feasible. The studies varied in objectives, sample sizes, geographical locations, and data collection methods, making quantitative synthesis challenging. As a result, we employed a narrative synthesis approach to summarize the factors influencing influenza vaccination uptake among pregnant women.

2-10. Ethical considerations

Ethical approval from a research ethics committee was not required for this study, as it involved the analysis of publicly available articles and did not include any human participants, personal data, or interventions. The study adhered to ethical research practices by focusing solely on data already published in the public domain.

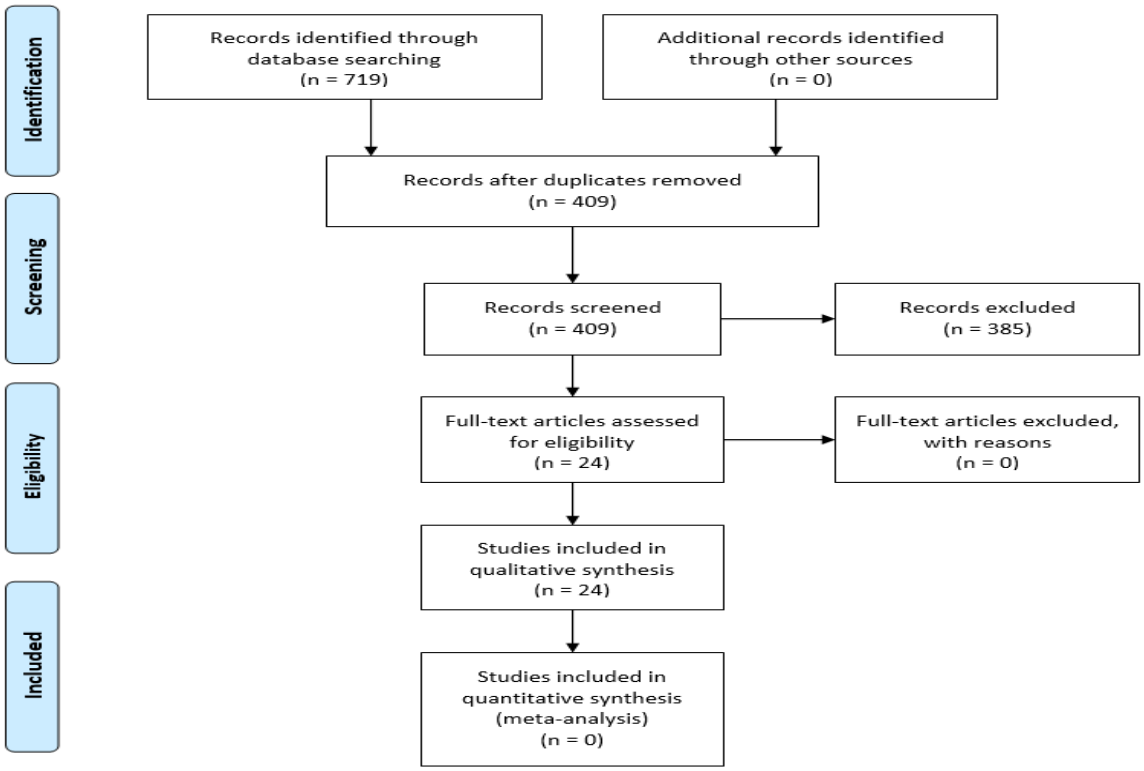

Fig.1: PRISMA Flowchart.

3- RESULTS

At the conclusion of the search process, 24 studies from 22 countries and territories were selected, encompassing the Knowledge, Attitudes, and Practices (KAP) of 28,081 participants regarding influenza vaccination and associated barriers. The uptake rate of influenza vaccination among pregnant women was 37.45%, with rates ranging from 1.1% to 73.8%. The highest coverage rate was observed among pregnant women in the UK, while the lowest was reported in Italy. Concerns about the side effects of the vaccine were the most frequently cited barrier, affecting 80.9% of participants. The main characteristics of the selected studies are summarized in **Table 1** and in the following sections:

1. A cross-sectional interview was conducted with 507 pregnant women in four counties (Nairobi, Mombasa, Marsabit, and Siaya) in Kenya from 2017 to 2018. The aim was to assess the knowledge and attitudes of Kenyan pregnant women regarding influenza vaccination and the factors influencing their willingness to receive the vaccine during pregnancy. The results indicated that 369 (72.8%) women had heard of influenza. Among those, most believed they would be protected (78.1%) if they received the influenza vaccine, felt that it was safe (68.3%) to receive the vaccine during pregnancy, and thought their baby would also be protected (60.4%) if the mother received the influenza vaccine while pregnant. Additionally, 309 (83.7%) women expressed a willingness to receive the influenza vaccine if offered. Factors associated with this willingness included the mothers' belief in the protective effect of the vaccine (OR 3.87; 95% CI 1.56–9.59) and its safety (OR 5.32; 95% CI 2.35–12.01) during pregnancy (25).

2. A cross-sectional interventional study conducted in Turkey in 2016 aimed to determine the knowledge and attitudes of

pregnant women and their primary healthcare providers regarding immunization during pregnancy. The results indicated that most of the 786 pregnant participants had a favorable attitude toward vaccination; however, only 1.1% had received the influenza vaccine, and none had received the Tdap vaccine. Pregnant women's knowledge of the immunization process was found to be insufficient, with the most significant determinant of acceptance being the recommendation of their attending physician. While healthcare staff and family physicians demonstrated knowledge about vaccinations, they often refrained from administering them (26).

3. A prospective study involving 252 pregnant women aimed to investigate their knowledge, attitudes, perceptions, and concerns regarding the inactivated influenza vaccine in Turkey in 2019. The results indicated that a lack of information about influenza vaccines (59.4%) was the primary reason for personal and parental vaccine rejection. Most (65.1%) pregnant women expressed doubts about the effectiveness of the influenza vaccine during pregnancy. Additionally, 80.9% were uncertain or lacked confidence in the vaccine's ability to protect their babies postnatally. Some participants (25.6%) attributed their unwillingness to receive the vaccine to fears of adverse effects, while 11.5% deemed gestational influenza immunization unnecessary due to underestimating the severe consequences of influenza in infants during the first six months of life. A higher education level was associated with increased knowledge and willingness to immunize against influenza (27).

4. A descriptive cross-sectional study conducted in Turkey in 2019 aimed to investigate the knowledge and attitudes of pregnant women (n=391) regarding influenza infection and vaccines, as well as the factors affecting their vaccination decisions. The results revealed that the influenza vaccination rate among participating pregnant women was low (35%), and 62.4% were unaware that they could receive the influenza vaccine while pregnant. Additionally, the level of correct knowledge and positive attitudes among pregnant women about influenza and the vaccine was insufficient. Many pregnant women avoided vaccination due to the belief that the vaccine could harm their babies (28).

5. A cross-sectional study conducted in Turkey from 2018 to 2019 aimed to evaluate the knowledge and perceptions of pregnant women (n=250) regarding seasonal influenza vaccination and to identify the associated factors. The results indicated that 98.8% of pregnant women did not receive the vaccination during their pregnancy, 65.2% were unaware that the vaccination was safe, and 64% did not know that influenza vaccination is recommended during pregnancy. The most common reasons participants provided for refusing the vaccination were "my doctor was against it" (25.6%) and "it can be harmful to my baby" (24%). Additionally, it was found that 98.4% of participants had not been advised to receive the influenza vaccination by any healthcare center, and 92.8% did not receive any information about influenza vaccination (29).

6. A nationwide web-based prospective cohort study conducted in Germany from 2012 to 2014 aimed to assess pregnant women’s vaccination-related knowledge, their risk perceptions regarding influenza disease and vaccination during pregnancy, and the determinants of influenza vaccination uptake. The results indicated that influenza vaccination uptake among pregnant women (n=838) in Germany was low. While pregnant women generally had a positive attitude toward vaccination, their knowledge about it was only modest. Overall, 10.9% of women were vaccinated against seasonal influenza during

pregnancy. Interestingly, while pregnant women perceived classical childhood diseases as riskier than their vaccinations, this perception was reversed for influenza; they viewed the risk of influenza vaccination as higher than the risk of the disease itself (30).

7. A cross-sectional study conducted in Liverpool, UK, in 2020 aimed to examine the attitudes and knowledge of pregnant women regarding influenza disease and vaccination, comparing these to their attitudes and knowledge about COVID-19 disease and vaccination. The results revealed that 73.8% of pregnant women had received the influenza vaccine during their pregnancy. However, their primary concerns centered on the safety of their babies rather than their own safety. Over half (56.5%) perceived themselves to be at risk of influenza, while 70.5% believed that contracting influenza would make their babies ill, and 64.6% thought that influenza could harm their babies. Regarding vaccination, 60.3% believed that the influenza vaccine would prevent their babies from getting ill, and 70.8% believed it would protect them (31).

8. A cross-sectional study involving 314 pregnant women in South England from 2017 to 2018 aimed to determine the acceptance of routine vaccinations among this population. The results indicated that the previous or intended uptake of influenza and pertussis vaccinations was 78%. The most common reason for declining vaccination was a fear of side effects for their child. White British women (79%) were significantly more accepting of influenza and pertussis vaccinations compared to British women of color (32).

9. A cross-sectional study conducted in Western Australia in 2021 aimed to determine the uptake of the influenza vaccine among pregnant women, the proportion of women offered vaccination as part of antenatal care, and women's attitudes toward influenza vaccination during pregnancy. The results revealed that influenza vaccination coverage was 23%. Predictors of vaccination included belief in the safety of vaccination for the infant, a recommendation for vaccination by an antenatal care provider, and attending a general practitioner for most antenatal care. The majority (74%) of unvaccinated women indicated they would receive the vaccine if their antenatal care provider recommended it (33).

10. A cross-sectional study conducted in Australia from 2006 to 2010 aimed to determine vaccination coverage, trends, and characteristics associated with influenza vaccine uptake, as well as the validity of self-reported influenza vaccination among a population of Indigenous pregnant women. The participants were involved in a vaccine trial before and during the 2009 H1N1 influenza pandemic. The results showed that vaccine coverage during the study period was 16% (35 out of 214), increasing from 2.2% (3 out of 136) prior to the pandemic (2006–2009) to 41% (32 out of 78) during the intra-pandemic period (2009–2010). None of the examined socio-demographic characteristics were associated with vaccine uptake (34).

11. An anonymous quantitative study conducted in Australia utilized a grounded theory methodology with semi-structured qualitative interviews to explore the perspectives of pregnant women (n=815) on influenza vaccination during pregnancy and postpartum pertussis vaccination. The results indicated that the women were more concerned about potential risks to their infants' health than to their own. They perceived influenza as a disease primarily affecting the mother, while they viewed pertussis as a significant threat to the baby, making it seem riskier. Consequently, they were more likely to vaccinate against

pertussis in order to protect their infant (35).

12. A prospective observational study in Spain aimed to describe the knowledge and attitudes related to the acceptance of the influenza vaccine during pregnancy among two Health Departments of the Valencian Community (VC) from 2015 to 2016. The results showed that the intention to vaccinate after receiving advice from a midwife was 77.4% in the initial sample (n=1017). The obstetric variables, including risk during pregnancy, timing of pregnancy, and feeding the newborn, did not have a statistically significant relationship with vaccination uptake. Additionally, regarding the influenza vaccine, "not being previously vaccinated" and "doubts about its safety" accounted for more than half of the reasons for rejection (36).

13. An observational retrospective study involving 200 pregnant women in Valencia, Spain, from 2014 to 2015 aimed to investigate the acceptance of influenza vaccination among pregnant women and the reasons for vaccine rejection. The results indicated that 40.5% of pregnant women in the health department were vaccinated. Midwives were identified as sources of information for 89% of the women. Reasons for rejecting the vaccine included low perceptions of the risks associated with influenza infection (23%), lack of information (19%), viewing the vaccine as unnecessary (16%), proximity to the delivery date (13%), and fear of side effects (12%) (37).

14. A quantitative study conducted on postnatal women attending the Rotunda Hospital in Ireland in 2016 aimed to determine the uptake of influenza vaccination during pregnancy, as well as the determinants of vaccination uptake, and the knowledge, attitudes, and concerns of postnatal women. The results indicated that 55.1% of respondents (n=198) had received the influenza vaccine during their pregnancy. Non-professionals were less likely to be vaccinated (adjusted odds ratio [aOR] 0.29, 95% CI: 0.09 to 0.89). Vaccination during a previous pregnancy was strongly associated with uptake (aOR 5.2, 95% CI: 1.69 to 15.62), as was receiving information from a healthcare provider (aOR 12.8, 95% CI: 2.65 to 62.5). This study identified that women with higher socioeconomic status, those who attained a university degree, and those who were private or semi-private patients were more likely to be vaccinated against influenza during pregnancy (38).

15. A cross-sectional study conducted in Managua, Nicaragua, in 2016 aimed to evaluate the knowledge, attitudes, and practices of pregnant women and their healthcare providers regarding influenza vaccination. The results indicated that of the 1,303 pregnant women enrolled in the study, 42% had received the influenza vaccine. Pregnant women in Managua held positive perceptions of the influenza vaccine and were receptive to vaccination, particularly when it was offered and recommended by their healthcare providers ($p<0.05$). Among those who reported not receiving the vaccination, 46% cited barriers to vaccination, including "I was not aware of influenza vaccination," "The vaccine was not available at the health facility during my appointments," "Healthcare providers advised me against getting vaccinated," and "Other reasons related to barriers to vaccination, unavailability, and lack of time to go for vaccination." One percent (7 out of 758) expressed concerns about the safety of the vaccine, while 3% (25 out of 758) reported not needing or wanting it. Additionally, 34% (261 out of 758) responded with "Don’t know" when asked why they had not received the vaccination (39).

16. A survey conducted on 1,862 pregnant women from diverse prenatal care

practices in Georgia and Colorado (USA) from June 2017 through July 2018 assessed the effectiveness of a multilevel intervention aimed at increasing maternal and childhood immunization. The results revealed significant racial and ethnic disparities in the behavioral constructs influencing women's decisions regarding vaccination. Black women exhibited the least confidence in the safety of the maternal influenza vaccine (OR: 0.37; 95% CI: 0.27–0.49) (40).

17. A cross-sectional online study conducted in Poland in 2021 aimed to determine the knowledge and attitudes of Polish pregnant women (n=515) toward influenza vaccination during the COVID-19 pandemic. The results showed that 52% of the surveyed women considered vaccination against influenza during pregnancy to be safe. However, only 21% were vaccinated against influenza during their current pregnancy, and 17.5% intended to get vaccinated. The participants expressed various concerns about vaccination during pregnancy while also acknowledging many benefits of vaccination. Most women who did not intend to be vaccinated were worried about the impact of vaccination on the fetus or preferred to avoid taking medications during pregnancy. Overall, general knowledge about influenza, its complications, and vaccination was relatively high among the study group (41).

18. A cross-sectional study aimed to assess the knowledge and utilization of influenza vaccine uptake among pregnant women in Saudi Arabia from 2017 to 2018, as well as the barriers to vaccination and their relationship with personal factors. The results indicated that 57.1% of participants had good knowledge about the influenza vaccine during pregnancy, but only 19.8% had received the vaccine. The primary barrier to influenza vaccine uptake during pregnancy was participants' concerns about its safety and potential side effects (34%). Additionally, only 36.6% of participants reported being offered the flu vaccine during their pregnancy by a healthcare provider (42).

19. A cross-sectional study involving 410 pregnant women from 2019 to 2020 aimed to evaluate the knowledge, attitudes, and barriers to the uptake of the seasonal influenza vaccine among pregnant women visiting primary healthcare centers (PHCs) in the Al-Ahsa region of Saudi Arabia. The results indicated that 60.6% of participants had poor knowledge regarding the influenza vaccine during pregnancy, and 61.1% held a negative attitude toward influenza vaccination. Concern about the vaccine's side effects was the most frequently mentioned barrier (80.9%), and 66.1% of participants reported that they were not offered the influenza vaccine by any doctor (43).

20. A cross-sectional study conducted in Tunisia in 2019 aimed to assess the uptake and acceptability of the influenza vaccine (IV) among pregnant women (n=1,157) and to evaluate their related knowledge and attitudes. The results indicated that less than 40% of the surveyed women were willing to be vaccinated during their next pregnancy, and only 4.6% had received the IV during their current pregnancy. The presence of comorbidities before or during pregnancy was identified as the main predictor of vaccine uptake. Healthcare providers (HCPs) were recognized as key influencers in promoting maternal IV uptake. Furthermore, the intention to accept the IV among pregnant women was significantly associated with recommendations from HCPs and their perceptions of the vaccine's safety and effectiveness (44).

21. A cross-sectional study conducted by Arriola et al. in 2017 examined the awareness of influenza and its vaccination benefits among pregnant women in

selected countries, including Nagpur, India; Lima, Peru; and Bangkok, Thailand. The study revealed significant disparities in awareness levels: only 8% of women in Nagpur were aware of influenza and its vaccination benefits, compared to 90% in Lima and 96% in Bangkok ($p < 0.01$). The total sample size included 4,648 pregnant women across the three locations, with 167 participants from Nagpur. Despite the low awareness in Nagpur, many participants expressed significant concern about the risks of influenza to themselves and their infants. These findings highlight the crucial role of healthcare providers in promoting vaccination acceptance and underscore the urgent need for targeted educational interventions to enhance awareness and vaccination rates among pregnant women in regions with limited knowledge about influenza (45).

22. A cross-sectional study conducted in Italy aimed to assess the knowledge, attitudes, and behaviors of pregnant women regarding seasonal influenza and its vaccination. The results indicated that 64.2% of pregnant women recognized that influenza was more dangerous for them during pregnancy. This awareness was lower among women with no education or only primary or secondary school education. Only 9.7% had received the vaccine, while 21.4% of those who were unvaccinated expressed a willingness to receive it. This positive attitude was more prevalent among women with one child, those who understood that the vaccine could protect them against influenza, and those who held a positive view of the usefulness of vaccination during pregnancy (46).

23. A repeated cross-sectional study involving 104 pregnant women in Italy from 2019 to 2020 aimed to assess the impact of COVID-19 on pregnant women's acceptance of the influenza vaccination offer. The results indicated that the number of pregnant women aware of the mild side effects of the vaccine and that the vaccines had been sufficiently tested increased from 78.6% to 92.0% and from 79.4% to 93.2%, respectively ($p = 0.001$). However, there was a reduction in trust in National Health Service (NHS) operators, which decreased from 33.0% to 23.3% ($p = 0.065$). Additionally, the results showed higher vaccination acceptance in the earlier months of the 2020-21 flu season, indicating a significant increase in participants' knowledge about vaccination from 2019–20 to 2020–21, alongside a decrease in their trust in NHS operators (47).

24. A cross-sectional study involving 600 pregnant women in Canada aimed to evaluate the theory of planned behavior, augmented with information constructs, to predict and explain influenza vaccination uptake. The results indicated that the presumptive offering of vaccination by healthcare providers during pregnancy, along with patient and public health educational interventions, could effectively communicate norms and strengthen positive attitudes and intentions regarding influenza vaccination during pregnancy, ultimately resulting in higher vaccination coverage (48).

Table 1: General characteristics of the included studies (n = 24).

Authors, Country, Reference	Study period	Study type	Study population	Sample size	Main findings	*Quality assessment
Otieno et al., Kenya, 25	2017-2018	Cross-sectional study	Pregnant women	507	Approximately one-third of the pregnant women interviewed had never heard of influenza. Willingness to receive the influenza vaccine was high among those who had heard about the virus.	Low-risk
Celep et al., Turkey, 26	2016	Cross-sectional interventional study	Pregnant women and healthcare staff	786 pregnant women, 146 healthcare staff	Most participants, including both pregnant women and healthcare workers, were not vaccinated against pertussis or influenza.	Low-risk
Sağlam et al., Turkey, 27	2019	Prospective study	Pregnant women	252	Approximately half of the pregnant women (46.0%) were unaware of the existence of an influenza vaccine.	Low-risk
Durmaz et al., Turkey, 28	2019	Cross-sectional study	Pregnant women	391	The influenza vaccination rate among pregnant women participating in the study was found to be low. Additionally, the knowledge and attitudes of pregnant women regarding influenza and the vaccine were insufficient.	Low-risk
Pulatoğlu et al., Turkey, 29	2018-2019	Cross-sectional study	Pregnant women	250	The participants' knowledge about influenza vaccination was inadequate and included several misconceptions.	Low-risk
Bödeker et al., Germany, 30	2012-2014	Prospective cohort study	Pregnant women	838	The uptake of influenza vaccination among pregnant women was low. While pregnant women generally had a positive attitude toward vaccination, their knowledge about the influenza vaccine was only modest.	Low-risk
Kilada et al., UK, 31	2020	Cross-sectional study	Pregnant women	237	The majority of respondents had received the influenza vaccine. Additionally, only about one-third of the women believed they would become very ill from the disease.	Low-risk
Wilcox et al., UK, 32	2017-2018	Cross-sectional study	Pregnant women and healthcare staff	314 pregnant women and 204 healthcare staff	The previous or intended uptake of influenza and pertussis vaccination was 78%. The most common reason for declining vaccination was the fear of side effects for their child.	Low-risk
Taksdal et al., Australia, 33	2012	Cross-sectional study	Pregnant women	416	The influenza vaccination coverage was 23%. The majority (74%) of unvaccinated women reported that they would receive the vaccine if their antenatal care provider recommended it.	Low-risk
Moberley et al., Australia, 34	2006-2010	Cross-sectional study	Pregnant women	214	The vaccine coverage over the study period was 16% (35 out of 214), increasing from 2.2% (3 out of 136) in the period preceding the pandemic (2006–2009) to 41% (32 out of 78) during the intra-pandemic period (2009–2010).	Low-risk
Wiley et al., Australia, 35	2014	Semi-structured interviews (quantitative study)	Pregnant women	815	The women were more concerned about potential risks to their infants' health than their own. They viewed influenza primarily as a disease that affects the mother.	Low-risk
Rodríguez-Blanco et al., Spain, 36	2015–2016	Prospective observational study	Pregnant women	1,017	The intent to vaccinate in the initial sample, following the midwife's advice, was 77.4%.	Low-risk
Vila-Candel et al., Spain, 37	2014-2015	Observational retrospective study	Pregnant women	200	40.5% of pregnant women in the health department were vaccinated.	Low-risk
Barrett et al., Ireland, 38	2016	Quantitative study	Postpartum women and healthcare	198 postpartum women,	55.1% of postpartum women received the influenza vaccine during their pregnancy.	Low-risk

			staff	1,180 healthcare staff		
Arriola et al., Nicaragua, 39	2016	Cross-sectional study	Pregnant women and healthcare providers	1,303 pregnant women, 619 healthcare providers	42% of pregnant women reported receiving the influenza vaccination. Additionally, pregnant women had positive perceptions of the influenza vaccine and were receptive to receiving it, especially after being offered and recommended the vaccine by their healthcare providers.	Low-risk
Dudley et al., U.S., 40	2017-2018	Cross-sectional study	Pregnant women	1,862	Addressing racial and ethnic disparities in vaccine uptake is crucial. Black women exhibited the lowest confidence in the safety of the maternal influenza vaccine.	Low-risk
Pisula et al., Poland, 41	2021	Cross-sectional study	Pregnant women	515	52% of women believed that vaccination against influenza during pregnancy was safe. However, only 21% were vaccinated against influenza during their current pregnancy, and 17.5% intended to get vaccinated.	Low-risk
AlMusailhi et al., Saudi Arabia, 42	2017-2018	Cross-sectional study	Pregnant women	410	57.1% of the women had good knowledge about the influenza vaccine during pregnancy; however, only 19.8% received the vaccine.	Low-risk
Albattat et al., Saudi Arabia, 43	2019-2020	Cross-sectional study	Pregnant women	410	60.6% of the women showed a lack of knowledge regarding the flu vaccine during pregnancy, and 61.1% had a negative attitude toward flu vaccine uptake during pregnancy.	Low-risk
Dhaouadi et al., Tunisia, 44	2019	Cross-sectional study	Pregnant women	1,157	40% of pregnant women were willing to be vaccinated during their next pregnancy, while only 4.6% received the influenza vaccine during their current pregnancy.	Low-risk
Arriola et al., Thailand, Peru and India, 45	2017	Cross-sectional study	Pregnant women	4,648	Only 8% of women in Nagpur, India, had heard of influenza and its vaccination benefits, compared to 90% in Lima, Peru, and 96% in Bangkok, Thailand.	Low-risk
Napolitano et al., Italy, 46	2015-2016	Cross-sectional study	Pregnant women	372	Only 9.7% of pregnant women had received the vaccine, and 21.4% of those who were unvaccinated expressed a willingness to receive it.	Low-risk
Bruno et al., Italy, 47	2019-2021	Cross-sectional study	Pregnant women	104	There was a significant increase in participants' knowledge about vaccination from 2019-20 to 2020-21; however, a decrease in their trust in NHS operators was observed.	Low-risk
Greyson et al., Canada, 48	2017	Cross-sectional study	Pregnant women	600	The presumptive offering of vaccination during pregnancy by healthcare providers, along with patient and public health educational interventions, may effectively communicate norms and strengthen positive attitudes and intentions regarding influenza vaccination in pregnancy, ultimately leading to higher vaccine coverage.	Low-risk

* Based on the research conducted by Hoy et al. (24).

4- DISCUSSION

Influenza is a serious and life-threatening illness caused by the influenza virus. Immunization against influenza saves millions of lives every year (49, 50). The present study was conducted to determine the knowledge, attitudes, and practices (KAP) as well as the barriers associated with the uptake of influenza vaccination during pregnancy among pregnant women worldwide. The results showed that the mean correct knowledge score was 50.75% (ranging from 5.5% to 96%). The mean positive attitude score was 57.05% (ranging from 34.6% to

79.5%). The mean practice score related to vaccination was 37.45% (ranging from 1.1% to 73.8%). The primary barrier to vaccination was concern over side effects, noted by 80.9% of participants. This indicates that pregnant women had low knowledge, moderate positive attitudes, and low vaccination behaviors regarding the uptake of the influenza vaccine during pregnancy.

Influenza is a highly contagious virus and a primary cause of acute respiratory infections worldwide. Infection with influenza is characterized by a sudden onset of fever and respiratory symptoms. In most cases, influenza is mild and uncomplicated; however, it can occasionally lead to severe diseases, including pneumonia, respiratory failure, and death (1, 11, 12). Healthcare providers believe that pregnant women are at an increased risk of developing severe complications from influenza compared to non-pregnant adults. Additionally, influenza is an important cause of disease and hospitalization in infants under six months of age (47, 48).

Therefore, immunization against influenza during pregnancy is beneficial for both the mother and the baby and is currently recommended in many countries (2). It has been proven to be safe and effective in reducing the occurrence and severity of the disease in vaccinated mothers and their children (1). Evidence indicates that inactivated influenza vaccines are safe for pregnant women and fetuses during all trimesters of pregnancy, as well as for breastfeeding women (8, 11, 12, 51-54). The WHO recommends that all pregnant women receive the influenza vaccine for seasonal influenza, as they are likely to benefit from it and avoid complications (55). No study has demonstrated an increased risk of maternal complications or adverse fetal outcomes associated with the inactivated influenza vaccine. Despite the proven safety and potential benefits of the influenza vaccine, vaccination rates during pregnancy remain generally low. Therefore, understanding the knowledge, attitudes, and practices toward influenza vaccination can improve vaccination coverage. Research indicates that enhancing healthcare provider recommendations and education can significantly influence pregnant women's decisions to get vaccinated (56). Additionally, systematic reviews have shown that while the safety of the influenza vaccine is well-established, targeted interventions are necessary to increase awareness and acceptance among pregnant women (57).

Based on the results of this review, the highest knowledge scores were associated with Thai pregnant women, while the lowest scores were observed among Iranian pregnant women. The highest positive attitudes were related to Iranian pregnant women, whereas the lowest attitudes were found among Italian pregnant women. Additionally, the results indicated that the highest positive performance was seen in pregnant women in the UK, while the lowest performance was associated with Turkish women.

It appears that the levels of knowledge, attitudes, and performance among pregnant women vary across geographical areas. The acceptance of influenza vaccines by pregnant women results from complex interactions among various factors. Providing essential information to pregnant women is crucial for increasing influenza vaccine uptake. Notably, the WHO has declared "vaccine hesitancy" as one of the ten critical threats to public health worldwide (58). Regarding the administration of the influenza vaccine during pregnancy, a small percentage of participants demonstrated adequate performance concerning this vaccine, with rates ranging from 1.1% to 73.8% in the present study.

Factors such as recommendations from healthcare staff, socioeconomic status, study location, and cost reduction for consumers appear to be effective in improving performance regarding influenza vaccination (38, 39, 42, 44). The results of a review indicated that influenza vaccine coverage remains low among pregnant women, possibly due to a lack of education among healthcare workers, a tendency within the general public to downplay the seriousness of influenza, and a failure of prenatal care providers to offer the vaccine (59).

Healthcare professionals are a reliable and primary source of information about influenza vaccination, as indicated by 89% of participants in the present study. Their provision of health information to expectant mothers helps increase the acceptance levels of both maternal and infant influenza vaccinations. Yudin et al. demonstrated the impact of patient education on knowledge regarding influenza and its vaccination, reporting a significant 37% increase in vaccination rates within one year (60). It can be concluded that health literacy and the educational level of individuals significantly affect their awareness of vaccination (46).

Various studies have demonstrated the significant impact of awareness on vaccination during pregnancy and the essential role of healthcare workers in providing vaccination training and advice (33, 36-38, 45, 59, 61, 62). Healthcare providers, especially doctors and midwives, should stay informed about the latest national and international guidelines regarding influenza to encourage mothers to receive the vaccine during routine pregnancy care (63).

In this review, concern about the side effects of the vaccine was the most frequently mentioned barrier, cited by 80.9% of participants. Other barriers included doubts regarding the safety of the influenza vaccine, lack of medical endorsement from healthcare providers, unawareness of the benefits of influenza vaccination for both mother and infant, and negative attitudes among pregnant women toward influenza vaccination. Factors associated with vaccination uptake included study location, perceived severity of infection, overall attitudes toward vaccination during pregnancy, older age, pre-existing conditions that increase the risk of severe influenza, vaccine accessibility, socioeconomic status, and recommendations from healthcare providers and antenatal care.

Pregnancy is a unique period in a woman's life. A variety of shared cultural and personal beliefs, expectations, values, fears, and social influences shape a mother's perceptions and practices during this time. These factors should be taken into account when introducing vaccination during pregnancy (64). Some specific considerations regarding the acceptance of influenza vaccination among pregnant women include the following:

- The perception that influenza is not a serious disease.
- Low personal risk perception for influenza.
- The belief that vaccination is unnecessary because they are already in good health or have acquired immunity.
- Lack of awareness of the benefits of influenza vaccination during pregnancy.
- Concerns regarding vaccine effectiveness.
- Lack of confidence in vaccine safety.
- Misconceptions about vaccine safety and side effects.
- Preference for curative treatments for influenza.
- A desire to avoid vaccination during pregnancy, especially during the first trimester.

- Previous reactions to vaccines, existing underlying medical conditions, and medical contraindications.
- Fear of needles.
- Lack of accurate awareness regarding the risks of influenza compared to the benefits of vaccination.
- Lack of proximity to or knowledge about vaccination locations.
- Regarding the role of healthcare providers (HCPs):
- Absence of a recommendation.
- Negative advice or discouragement.
- Distrust in HCPs and/or the health system.

Other factors include:

- Lack of awareness of influenza vaccine recommendations during pregnancy.
- Absence of a previous history of influenza vaccination.
- Negative media influence (25–48).

5- CONCLUSION

Pregnant women and their unborn children are at high risk of morbidity and mortality from influenza infection. The most effective way to prevent influenza during pregnancy is through vaccination. Based on the results, pregnant women exhibited low knowledge, moderate attitudes, and low vaccination behavior regarding influenza vaccine uptake during pregnancy. Concern about the side effects of the influenza vaccine was the most frequently mentioned barrier. Other barriers included a lack of awareness regarding the safety of influenza vaccination, insufficient medical endorsement from healthcare providers, unawareness of the benefits of influenza vaccination for both mother and infant, and negative attitudes toward influenza vaccination among pregnant women.

Additionally, factors associated with vaccination uptake included study location, perceived severity of infection, overall feelings toward vaccination during pregnancy, older age, pre-existing conditions that increase the risk of severe influenza, and socioeconomic status. It is evident that higher awareness and positive attitudes enhance individuals' performance regarding vaccination. Providing accurate and accessible information about the risks of influenza illness, ensuring vaccine accessibility, and receiving recommendations from healthcare providers—especially doctors and midwives—play essential roles in shaping perceptions of vaccine effectiveness and improving vaccination coverage among pregnant women.

6- CONFLICT OF INTEREST: None.

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