

Systematic Review (Pages: 37-54)

Pregnant Women's Knowledge, Attitude, Practice, and Barriers Associated with the Uptake of Influenza Vaccination: A Systematic Review

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Abstract

Background: Vaccination is the most effective way to prevent influenza during pregnancy. This study aims to determine the knowledge, attitude, practice (KAP), and barriers associated with the uptake of influenza vaccination during pregnancy among pregnant women worldwide.

Materials and Methods: In this systematic review, a systemic search of online databases (Medline, EMBASE, Scopus, Web of Science, Cochrane Library, ProQuest, CINAHL, and Google Scholar search engine) was performed to identify all studies that considered KAP and barriers to the vaccination of women during pregnancy with no time limit up to December 2022.

Results: A total of 24 studies from 22 countries were selected. The overall correct knowledge, positive attitude, and good practice ranged from 5.5 to 96%, 34.6 to 79.5%, and 1.1 to 73.8%, respectively. The highest and lowest knowledge scores belonged to women in Thailand and Iran. The highest positive attitude was related to Iranian pregnant women and the lowest to Italian women. The highest positive performance belonged to pregnant women in the UK and the lowest to Turkish women. The most mentioned barrier was concern regarding the side effects of the vaccine (80.9%). Other barriers were a lack of awareness of the safety of influenza vaccination, lack of medical endorsement by healthcare providers, unawareness of the advantages of influenza vaccination for the mother and infant, and the negative attitude of pregnant women towards influenza vaccination.

Conclusion: The pregnant women had low knowledge, moderate attitude, and low behavior toward the flu vaccine uptake during pregnancy. Concern regarding the side effects of the vaccine was the most mentioned barrier.

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

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1- INTRODUCTION

Influenza (aka flu) is a highly contagious viral disease and an important cause of acute respiratory infections worldwide and the influenza epidemic is a serious global health challenge. The world has witnessed four influenza epidemics during the 20th and 21st centuries (1918-19, 1968-69, 1975-78, and 2009-10) with high mortality (1). The most effective way to prevent influenza during pregnancy is vaccination. The first influenza vaccine was used in the USA in 1945. In 1957-8, the flu vaccine was administered to highrisk people over 65 years and pregnant and 2010. women. in the Advisory Committee on Immunization Practices (ACIP) officially announced the administration of the seasonal flu vaccine (2-5). Influenza can be devastating during pregnancy because of the increased risk of fetal demise (6) and preterm labor and birth (7, 8), and can cause severe, lifethreatening illness in pregnant women (9, 10).

In 2012, the World Health Organization (WHO) identified pregnant women as the most important target group for seasonal influenza vaccination in countries considering the initiation or expansion of vaccination programs (11). Influenza administered to vaccines have been pregnant women for decades (12). Overwhelming evidence indicates the safety of the inactivated influenza vaccines for pregnant women and the fetus during all trimesters of pregnancy and for women (13-15). breastfeeding Some studies have shown that the flu vaccine prevents between 20 and 90% of flu or its complications (16), but the opinions of pregnant women about the flu vaccine and its benefits for the mother and child are different in different regions of the world.

Mothers and pregnant women report inadequate information about the risks and benefits of influenza vaccination across the world. According to a survey in the USA in 2020, 40% of pregnant women refused to inject influenza and Tdap (tetanus, diphtheria, and pertussis) vaccines, putting themselves and their babies at high risk of hospitalization and death, and 20% reported that they were not recommended to be vaccinated (17). The reasons for pregnant women's reluctance to be vaccinated during this period included concerns about the unsafety of vaccines and a lack of knowledge of their limited risk for themselves and their children (18).

Another study in Italy evaluated the awareness of the influenza vaccine and its administration during pregnancy as very low (19), and the performance regarding the influenza vaccine in pregnant women as poor (20). Different studies in the USA showed that more than half of the pregnant women had a good response to the vaccine, as influenza 85% were recommended to vaccinate by the medical staff, and this affected their performance to receive the influenza vaccine (21). According to the WHO, the best way to prevent pregnant mothers from contracting influenza is vaccination (11), but vaccine administration rates are far from optimal indicators in most countries. Mothers have frequently cited concerns about vaccine safety as a barrier to vaccination (22).

Nevertheless, vaccine-preventable diseases during pregnancy can be life threatening for the mother and child. Therefore, informing pregnant mothers is essential to improve their knowledge and encourage them to be vaccinated. Studies have found little information about the coverage of influenza vaccination in pregnant women and their knowledge and attitude about its importance across different countries, especially in people at risk of this disease.

The importance of annual influenza vaccination for pregnant mothers and the lack of current information about the level of awareness, acceptance of the vaccine, and the reasons for rejecting the vaccine in these groups created the incentive to conduct this study to determine the knowledge, attitude, practice (KAP), and barriers associated with the uptake of influenza vaccination during pregnancy among pregnant women worldwide.

2- MATERIALS AND METHODS

The Preferred Reporting Items for Systematic review and Meta-Analysis (PRISMA) statement was used as the template for this review (23).

2-1. Eligibility criteria

The participants, interventions, comparators, and outcomes (PICO), as a framework, was used to formulate the review objective and inclusion criteria.

Participants: Pregnant or postpartum women worldwide.

Interventions and Comparators: The included studies are non-interventional, so a comparison group did not exist.

Outcomes: KAP and barriers toward influenza vaccination.

2-2. Included studies

The review included studies that reported any form of quantitative or qualitative assessment, measurement, and evaluation of KAP regarding influenza vaccination among pregnant women in any country or region of the world. The inclusion criteria were the focus on knowledge and/or attitude and/or practice and/or barriers and concerns towards influenza vaccination, being published up to December 2022, written in English or Persian, and published articles with full text available.

2-3. Exclusion criteria

The exclusion criteria were 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, costeffectiveness analyses, and studies that focused on outcomes of influenza vaccination in pregnancy.

2-4. Information sources

A systemic search of electronic databases Medline (via PubMed), EMBASE, Scopus, Web of Science, CINAHL, and Google Scholar search engine was conducted. The search was done independently and in duplication by two reviewers, and any disagreements about eligibility were decided by the third author. **Figure 1** shows the PRISMA flow diagram of the search and screening process.

2-5. Search

The databases (Medline (via PubMed), EMBASE, Scopus, Web of Science, CINAHL, and Google Scholar search engine) were searched for articles up to December 22, 2022, by combining MeSH terms for vaccines, vaccination, immunization, influenza vaccination, knowledge, attitude, practice, barriers, concerns, pregnancy, pregnant women, and world.

2-6. Study selection

A database search was done for possible studies, abstracts were screened for eligible studies, full-text articles were obtained and assessed, and a final list of included studies was made. In addition to primary articles, their references were also searched for additional studies. This process was done independently and in duplication by two reviewers, and any disagreement was resolved by the third reviewer. References were organized and managed using EndNote software (version X8).

2-7. Data collection process

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

2-8. Risk of bias in individual studies

The risk of bias assessment followed the standard tool of Hoy et al. (24). It is a valuable tool for evaluating the quality of observational studies. The checklist, consisting of ten items plus a summary assessment, addresses two dimensions: external validity by mean of items 1 - 4(domains: selection and nonresponse bias), and internal validity by mean of items 5-10 (domains: measurement bias and item bias related to the analysis). The assessment was done by two reviewers independently and in duplication, and any discrepancies were resolved by the third reviewer. Therefore, studies that received

'yes' for eight or more of the ten questions were classified as 'low risk of bias.' Studies that received 'yes' for six to seven of the ten questions were classified as 'moderate risk' whereas studies that received 'yes' for five or fewer of the ten questions were classified as 'high risk'.

2-9. Synthesis of results

Given the heterogeneity of study design, among the studies, statistical meta-analysis was not possible; therefore, we conducted a narrative synthesis of factors at each level.

2-10. Ethics statement

Ethical approval was not required for this study as it is a systematic review.



Fig.1: PRISMA Flowchart.

3- RESULTS

At the end of the search process, 24 studies from 22 countries/territories were selected, including the KAP of 28,081 participants towards influenza vaccination and barriers. The uptake rate of influenza vaccination in pregnant women was 73.8% (0-73.8%). The highest and lowest coverage rates were related to pregnant women in the UK and Italy, respectively. Concern regarding the side effects of the vaccine was the most mentioned barrier (80.9%). The main characteristics of the selected studies are summarized in **Table 1** and the following:

1. A cross-sectional interview of 507 pregnant women in four counties (Nairobi, Mombasa, Marsabit, and Siaya) in Kenya (2017 - 2018)aimed to assess the knowledge and attitudes of Kenvan pregnant women on influenza vaccination and factors influencing their willingness to receive influenza vaccines during pregnancy. The results showed that 369 (72.8%) women had heard about influenza. Among those, most believed that 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 that their baby would also be protected (60.4%) if the mother received influenza vaccine while pregnant. Also, 309 (83.7%) women were willing to get an influenza vaccine if offered. Factors associated with willingness to receive influenza vaccine were mothers' belief in protective effect (OR 3.87; 95% CI 1.56, 9.59), and safety (OR; 5.32; 95% CI: 2.35, 12.01) of influenza vaccines during pregnancy (25).

2. A cross-sectional interventional study in Turkey (2016) aimed to determine the knowledge and attitude of pregnant women and their primary healthcare providers towards immunization during pregnancy. The results showed that most of the 786 pregnant participants had a favorable attitude toward vaccination, but only 1.1% had influenza immunization, and none had Tdap immunization. Pregnant women's knowledge of the immunization process was insufficient, and the most important determinant of acceptance was the recommendation of their attending physician. Healthcare staff and family physicians had knowledge about vaccinations but abstention from administration (26).

3. A prospective study on 252 pregnant women aimed to investigate their knowledge, attitude. perceptions, and concerns toward the inactivated influenza vaccine in Turkey (2019). The results showed that the lack of information about influenza vaccines (59.4%) was the first reason for personal and parental vaccine rejection. Most (65.1%) pregnant women did not believe in or had doubts about the efficiency of the influenza vaccine during gestation. Most (80.9%) were not sure about or did not have confidence in the prenatal vaccine's ability to protect their postnatal. Some babies (25.6%)participants attributed their unwillingness to the fear of adverse effects, and some (11.5%) deemed gestational influenza immunization unnecessary because of underestimating the severe consequences of influenza in infants within the first six months of life. Higher education level was associated with higher knowledge of and willingness to immunize against influenza (27).

4. A descriptive cross-sectional study in Turkey (2019) aimed to investigate the knowledge and attitude level of pregnant women (n=391) about influenza infection and vaccines and factors affecting their vaccination decision. The results showed that the influenza vaccination rate among pregnant women participating in the study was low (35%), and 62.4% did not know that they could receive the influenza vaccine while pregnant. Also, the correct knowledge and attitudes of pregnant

women about influenza and vaccine were insufficient. Pregnant women avoided vaccination mostly with the prejudice that the vaccine could harm their babies (28).

5. A cross-sectional study in Turkey (2018-2019) aimed to evaluate the knowledge and perceptions of pregnant women (n=250) toward seasonal influenza vaccination and to determine the associated factors. The results showed that 98.8% of pregnant women did not receive vaccination during their pregnancy, 65.2% did not know that the vaccination was safe, and 64% did not know that the vaccination for influenza was recommended during pregnancy. The most frequent responses by the participants to justify their refusal of the vaccination were "my doctor was against it" and "it can be harmful to my baby" (25.6%, and 24%, respectively). It was determined that 98.4% of the participants were not recommended to receive the vaccination for influenza by any healthcare centers, and 92.8% did not receive any information on vaccination for influenza (29).

6. A nationwide web-based prospective cohort study in Germany (2012-2014) to assess pregnant aimed women's vaccination-related knowledge. risk perceptions related to influenza disease and vaccination during pregnancy, and the determinants of influenza vaccination uptake during pregnancy. Results showed that influenza vaccination uptake in pregnant women (n=838) in Germany was low. Pregnant women had a positive attitude towards vaccination in general but modest vaccination knowledge. only Overall, 10.9 % of women were vaccinated against seasonal influenza during pregnancy. While pregnant women perceived classical childhood diseases as riskier than their vaccinations, this relation was reversed for influenza; the risk of influenza vaccination was perceived as higher than the risk of the disease (30).

7. A cross-sectional study in Liverpool, UK (2020) aimed to examine the attitudes and knowledge of pregnant women toward influenza disease and vaccination and compare these to attitudes and knowledge about COVID-19 disease and vaccination. The results showed that 73.8% of pregnant women had received the influenza vaccine during their pregnancy. However, their concerns were mainly about the safety of their baby rather than themselves. Over half (56.5%) perceived themselves at risk of influenza, 70.5% believed that catching influenza would make their babies ill, and 64.6% believed that influenza could hurt their babies. Regarding vaccination, 60.3% believed that the influenza vaccine would prevent their baby from getting ill, and 70.8% believed it would protect their babies (31).

8. A cross-sectional study on 314 pregnant women in South England (2017-2018) aimed to determine the reception of routine vaccination among pregnant women. The results showed that the previous/intended of influenza and uptake 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 vaccination than British women of color (32).

9. A cross-sectional study in Western Australia (2021) aimed to determine the uptake of influenza vaccine in pregnant women, the proportion of women offered vaccination as part of antenatal care, and attitudes toward women's influenza vaccination in pregnancy. The results influenza showed that vaccination 23%. Predictors coverage was of vaccination included believing in the safety of vaccination for the infant, recommendation of vaccination by an antenatal care provider, and attending a general practitioner for most antenatal care. The majority (74%) of unvaccinated

women reported that they would have the vaccine if their antenatal care provider recommended it (33).

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

11. An anonymous quantitative interview within a grounded theory methodology in Australia used semi-structured qualitative interviews to explore pregnant women's perspectives (n=815)on influenza vaccination during pregnancy and postpartum pertussis vaccination. The results showed that the women were more concerned about potential risks to their infants' health than their own. They considered influenza as a disease affecting the mother, whereas they viewed pertussis as a threat to the baby and, therefore, riskier. As a result, they were more likely to vaccinate against pertussis 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 by two Health Departments of the Valencian Community (VC) in 2015–2016. The results showed that the intention to vaccinate after the midwife's advice was 77.4% in the initial sample (n = 1017). The obstetric variables (risk during the pregnancy, end of pregnancy, and feeding the newborn) did not have a statistically significant relationship with the vaccination. In addition, with the flu vaccine, "not being previously vaccinated" and "doubts about its safety" represented more than half of the reasons for its rejection (36).

13. An observational retrospective study on 200 pregnant women in Valencia, Spain (2014-2015) aimed to investigate the acceptance of influenza vaccination amongst pregnant women and the reasons for vaccination rejection. The results showed that 40.5% of pregnant women in the health department were vaccinated. Midwives were identified as sources of information for 89% of women. The vaccine was rejected due to low perceptions of risks of influenza infection (23%), lack of information (19%), considering the vaccine as unnecessary (16%), the proximity of delivery date (13%), and fear of side effects (12%) (37).

14. A quantitative study on postnatal women attending the Rotunda Hospital. Ireland (2016) aimed to determine the uptake of influenza vaccination during pregnancy, determinants of vaccination uptake, and knowledge, attitudes, and concerns of postnatal women. The results showed that 55.1% of responders (n=198) had received the influenza vaccine during pregnancy. Non-professionals were less likely to be vaccinated (adjusted odds ratio [aOR] 0.29, 95% CI: 0.09 to 0.89). Vaccination in a previous pregnancy (aOR 5.2, 95% CI: 1.69 to 15.62), and information from an HCP were strongly associated with vaccination (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 patient were more likely to be vaccinated against influenza during pregnancy (38).

15. A cross-sectional study in Managua, Nicaragua (2016) aimed to evaluate the knowledge, attitudes, and practices of pregnant women and their healthcare providers toward influenza vaccination. The results showed that of 1,303 pregnant women enrolled in the study, 42% had received influenza vaccination. Pregnant women in Managua had positive perceptions of the influenza vaccine and were receptive to influenza vaccination, especially after the offer and by recommendation their healthcare providers (p<0.05). In addition, of those who reported not receiving the vaccination. 46% indicated barriers to vaccination, including "I was not aware of influenza vaccination", "Vaccine was not available at the health facility when I had my appointments", "Healthcare providers advised me not to get vaccinated", and "Other reasons related to barriers to vaccination, unavailability, and lack of time to go for vaccination". One percent (7/758) reported concerns about the safety of the vaccine, and 3% (25/758) reported not needing or wanting it, while 34% (261/758) replied with "Don't know" to why they had not received vaccination (39).

16. A collected data survey on 1862 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 to increase maternal and childhood immunization. The results showed significant racial/ethnic disparities in the behavioral constructs of women in deciding on vaccination. Black women had the least confidence in maternal influenza vaccine safety (OR: 0.37; 95% CI: 0.27-0.49) (40).

17. A cross-sectional online study in Poland (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 surveyed women considered vaccination against influenza during pregnancy as safe. However, only 21% were vaccinated against influenza during their current pregnancy, and 17.5% intended to be vaccinated. The participants indicated various concerns about vaccination during pregnancy but also many benefits of vaccination. Most women who did not intend to be vaccinated were concerned about the impact of vaccination on the fetus or avoided taking medications during General knowledge about pregnancy. influenza, its complications, and vaccination was relatively high in the study group (41).

18. A cross-sectional study aimed to assess the knowledge and utilization of influenza vaccine uptake and its barriers and their relationship with personal factors in pregnant women in Saudi Arabia (2017-2018). The results showed that 57.1% of participants had good knowledge about the influenza vaccine during pregnancy, but only 19.8% received the vaccine. The largest barrier to influenza vaccine uptake during pregnancy was the participants' concern about its safety and side effects (34%). Only 36.6% of participants were ever offered the flu vaccine during pregnancy by a healthcare provider (42).

19. A cross-sectional study on 410 pregnant women in 2019-2020 aimed to evaluate the knowledge, attitude, and barriers to the uptake of seasonal influenza vaccine among pregnant women visiting primary healthcare centers (PHCs) in the Al-Ahsa region of Saudi Arabia. The results showed that 60.6% of participants had poor knowledge regarding the influenza vaccine during pregnancy, and 61.1% had a negative attitude toward influenza vaccination. Concern regarding the side effects of the vaccine was the most mentioned barrier (80.9%), and 66.1% of participants stated that they were not

offered the influenza vaccine by any doctor (43).

20. A cross-sectional study aimed to assess the influenza vaccine (IV) uptake and acceptability and the related knowledge and attitudes among pregnant women (n=1157) in Tunisia (2019). The results showed that less than 40% of the surveyed women were willing to be vaccinated during their next pregnancy, and only 4.6% received the IV during their current pregnancy. The presence of comorbidities before or during pregnancy was the main predictor of vaccine uptake. Healthcare providers (HCPs) are apparently the main "game changers" in influencing maternal IV uptake. However, the intention to accept the IV by pregnant women was associated significantly with recommendations and the perceived safety and effectiveness of the vaccine (44).

21. A cross-sectional study in three selected countries of Thailand, Peru, and India in 2017 aimed to evaluate knowledge, attitudes, and practices related to influenza disease and vaccination among pregnant women (n=4,648). The results showed that only 8% of the women in Nagpur (India) had heard of influenza and the benefits of influenza vaccination, compared to 90% in Lima (Peru), and 96% in Bangkok (Thailand) (p<0.05). Recommendation by healthcare providers for vaccination was strongly associated with receiving the vaccine (45).

22. A cross-sectional study in Italy aimed to assess the knowledge, attitudes, and behaviors toward seasonal influenza and its vaccination among pregnant women. The results showed that 64.2% of pregnant women knew that influenza was more dangerous for pregnant women. This knowledge was lower among women with no education or primary or secondary

school education. Only 9.7% had received the vaccine, and 21.4% of the unvaccinated were willing to receive it. This positive attitude was higher among women with one child, who knew that the vaccine could protect them against influenza, and who had a positive attitude toward the usefulness of the vaccination during pregnancy (46).

23. A repeated cross-sectional study on 104 pregnant women in Italy in 2019-2020 aimed to assess the impact of COVID-19 on pregnant women's acceptance of the influenza vaccination offer. The results showed that the number of pregnant women who knew about the mild side effects of the vaccine and that the vaccines were sufficiently tested increased from 78.6 to 92.0%, and from 79.4 to 93.2% (p = 0.001), respectively. There was a reduction from 33.0 to 23.3% (p = 0.065) in the proportion of their trust in NHS operators. Also, results showed a higher vaccination acceptance in the earlier months of the 2020-21 flu season. It indicates a significant increase in the participants' knowledge about vaccination from 2019–20 to 2020–21, while a decrease in their trust in NHS operators (47).

24. A cross-sectional study on 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 showed that the presumptive offering of vaccination by healthcare providers in pregnancy and patient and public health educational interventions could be effective in communicating norms and strengthening intentions positive attitudes and concerning influenza vaccination in pregnancy, resulting in higher vaccination coverage (48).

Authors, Country, Reference	Study period	Study type	Study population	Sample size	Main findings	Summary of risk of bias
Otieno et al., Kenya, 25	2017- 2018	cross- sectional and interventional study	pregnant women	507	Approximately one third of pregnant women interviewed had never heard of influenza. Willingness to receive influenza vaccine was high among women who had heard about influenza.	low -risk
Celep et al., Turkey, 26	2016	cross- sectional and interventional study	pregnant women and healthcare staff	786 pregnant women, 146 healthcare staff	Most of the participants, either pregnant women or healthcare workers, were not vaccinated against pertussis and influenza.	low -risk
Sağlam et al., Turkey, 27	2019	prospective study	pregnant women	252	Approximately half of the pregnant women (46.0%) were not aware of the existence of an influenza vaccine.	low -risk
Durmaz et al., Turkey, 28	2019	descriptive cross- sectional study	pregnant women	391	The influenza vaccination rate was found low in pregnant women participating in the study. In addition, the correct knowledge and attitudes of pregnant women about influenza and vaccine were not sufficient.	low -risk
Pulatoğlu et al., Turkey, 29	2018- 2019	cross- sectional study	pregnant women	250	The knowledge of the participants on vaccination for influenza was inadequate and had misconceptions.	low -risk
Bödeker et al., Germany, 30	2012- 2014	prospective cohort study	pregnant women	838	The influenza vaccination uptake in pregnant women was low. Pregnant women had a positive attitude towards vaccination in general, but only modest vaccination knowledge.	low -risk
Kilada et al., UK, 31	2020	cross- sectional study	pregnant women	237	The majority of respondents had received the influenza vaccine. In addition, only about a third of the women believed they would get 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 staffs	The previous/intended uptake of influenza and pertussis vaccination was 78%. The commonest reason for declining vaccination was feared side effects for their child.	low -risk
Taksdal et al., Australia, 33	2012	computer assisted telephone interviews	pregnant women	416	The influenza vaccination coverage was 23%. The majority (74%) of unvaccinated women reported that they would have 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% (35/214), increasing from 2.2% (3/136) in the period preceding the pandemic (2006–2009) to 41% (32/78) in 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 before their own. They believed influenza as a disease affecting the mother.	low -risk
Rodríguez- Blanco et al., Spain, 36	2015– 2016	prospective observational study	pregnant women	1017	The intent to vaccinate in the initial sample after 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 staff	198 postpartum women, and 1180	55.1% of postpartum women had received the influenza vaccine during their pregnancy.	low -risk

Table-1: The general	characteristics of included	studies (n=24).
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				healthcare		
Arriola et al., Nicaragua, 39	2016	cross- sectional study	pregnant women and healthcare providers	1,303 pregnant women and 619 healthcare providers	42% of pregnant women reported receiving influenza vaccination. Also, pregnant women had positive perceptions of influenza vaccine and were receptive to receiving influenza vaccination, especially after the offer and recommendation by their healthcare providers.	low -risk
Dudley et al., U.S., 40	2017- 2018	cross- sectional study	pregnant women	1,862	Addressing racial/ethnic disparities in vaccine uptake is crucial. Black women had the least confidence in maternal influenza vaccine safety.	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 be 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 influenza vaccine during pregnancy; however, 19.8% took the vaccine.	low -risk
Albattat et al., Saudi Arabia, 43	2019- 2020	cross- sectional study	pregnant women	410	60.6% of the women show lack of knowledge regarding flu vaccine during pregnancy, and 61.1% of them have negative attitude toward the flu vaccine uptake during pregnancy.	low -risk
Dhaouadi et al., Tunisia, 44	2019	cross- sectional study	pregnant women	1,157	40% of the pregnant women were willing to be vaccinated during their next pregnancy and only 4.6% received the IV 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 the women in Nagpur (India) had heard of influenza, and the benefits of influenza vaccination, 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 unvaccinated would be willing to receive it.	low -risk
Bruno et al., Italy, 47	2019- 2021	cross- sectional study	pregnant women	104	There was a significant increase of participants' knowledge about vaccination from 2019–20 to 2020–21, while 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 in pregnancy by healthcare providers, as well as patient and public health educational interventions, may be effective in communicating norms and strengthening positive attitudes and intentions concerning influenza vaccination in pregnancy, resulting in higher vaccine coverage.	low -risk

4- DISCUSSION

Influenza is a serious and lifethreatening illness caused by the influenza virus. Immunization against influenza saves millions of lives every year. The present study was conducted to determine the KAP and barriers associated with the uptake of influenza vaccination during pregnancy among pregnant women worldwide. The results showed that the rate of influenza vaccination coverage was 73.8% (0-73.8%). The overall correct knowledge, positive attitude, and good practice ranged from 5.5 to 96%, 34.6 to 79.5%, and 1.1 to 73.8%, respectively. These findings mean that pregnant women had low knowledge, moderate positive attitudes, and low vaccination behaviors toward the influenza vaccine uptake during pregnancy. Concern regarding the side

effects of the vaccine was the most frequently mentioned barrier (80.9%).

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, but it may occasionally to severe diseases, including lead pneumonia, respiratory failure, and death (1, 11, 12). Healthcare providers believe that pregnant women have an increased risk of developing severe diseases following influenza compared to nonpregnant adults. Influenza is also 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 the mother and the baby and is currently recommended in many countries. It has been proven to be safe and effective in reducing the occurrence and severity of the disease in vaccinated mothers and their children. Evidence shows that inactivated influenza vaccines are safe for pregnant mothers and fetuses during all trimesters of pregnancy and for breastfeeding women (11, 12, 51-54).

The WHO recommends that all pregnant women receive the influenza vaccine for seasonal influenza, as they will most likely 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 possible benefits of the influenza vaccine, vaccination rates during generally pregnancy remain low. Therefore, understanding the knowledge, attitudes, and practices toward influenza vaccination can improve vaccination coverage.

Based on the results of this review, the highest and lowest knowledge scores were related to Thai and Iranian pregnant women, respectively. The highest and lowest positive attitude was related to Iranian and Italian pregnant women, respectively. The results also showed that the highest positive performance was related to pregnant women in the UK and the lowest rate was related to Turkish women.

It appears that the level of knowledge, attitude, and performance of pregnant mothers varies across geographical areas. The acceptance of influenza vaccines by pregnant women is a consequence of complex interactions of various factors. Providing necessary information to pregnant women is a crucial factor in increasing the influenza vaccine uptake. It is noteworthy that the WHO has declared "vaccine hesitancy" as one of the ten critical threats to public health worldwide (56). Regarding the injection of the influenza vaccine during pregnancy, a small percentage of participants had adequate performance regarding this vaccine (ranging from 1.1 to 73.8% in the present study).

Factors such as the recommendations by the healthcare staff, socioeconomic status, study location, and cost reduction for the consumer appear effective in improving the performance regarding influenza vaccination (38, 39, 42, 44). Results of a review showed that influenza vaccine coverage remains low in pregnant women, possibly due to a lack of healthcare workers' education, a tendency in the general public to downplay the seriousness of influenza, and a failure of prenatal care providers to offer the vaccine (57).

Healthcare professionals are reliable and the foremost (89% in the present study) source of information about influenza vaccination. Their provision of health information to expectant mothers serves to increase the acceptance level of maternal and filial influenza vaccination. Yudin et al. showed the impact of patient education on knowledge of influenza and influenza vaccination in their study as they obtained an even more striking increase (37%) in vaccination rates within one year (58). It can be concluded that the health literacy and educational level of individuals affect their awareness of vaccination (46).

Various studies have shown the significant effect of awareness on vaccination during pregnancy and the essential role of healthcare workers in providing vaccination training and advice (33, 36-38, 45, 57, 59, 60). Healthcare providers, especially doctors and midwives, should be aware of the latest national and international guidelines regarding influenza to encourage mothers to receive the vaccine during routine pregnancy care.

In this review, concern regarding the side effects of the vaccine was the most frequently mentioned barrier (80.9%). Other barriers were doubts regarding the safety of the influenza vaccine, lack of medical endorsement bv healthcare providers, unawareness of the advantages of influenza vaccination for the mother and infant, and the negative attitude of pregnant women towards influenza vaccination. Factors associated with vaccination intake were study location, perceived infection severity. overall toward vaccination feelings during pregnancy, older women, and women with a pre-existing condition at risk for severe influenza, vaccine accessibility, socioeconomic status, and the recommendations from health 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 guide a mother's perceptions and practices during pregnancy. These points should be considered when introducing vaccination during pregnancy. Some specific considerations regarding the acceptance of influenza vaccination among pregnant women are the following:

• The perception that influenza is not a serious disease.

• Low personal risk perception for influenza.

• The belief that vaccination is not necessary 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 regarding vaccine safety and side effects,

• Preference for curative treatment of influenza.

• 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 concerning influenza risk versus vaccine benefits.

• Lack of proximity to or knowledge of the place of vaccination.

• Regarding the role of HCPs:

• Absence of a recommendation;

• Negative advice or discouragement; and

• Distrust in HCPs and/or health system.

• Other:

• Lack of awareness of influenza vaccine recommendation during pregnancy

• Absence of a previous history of influenza vaccination; and

• 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 vaccination. Based on the results, the pregnant women had low knowledge, moderate attitudes, and low vaccination behavior toward the influenza vaccine uptake during pregnancy. Concern regarding the side effects of the influenza vaccine was the most frequently mentioned barrier. Other barriers were a lack of awareness of the safety of influenza vaccination, lack of medical endorsement by healthcare providers, unawareness of the advantages of influenza vaccination for the mother and infant, and the negative attitude of pregnant women toward influenza vaccination.

addition, In factors associated with vaccination intake were study location, perceived infection severity, overall feelings toward vaccination during pregnancy, older women and women with a pre-existing condition at risk for severe influenza, and socioeconomic status. It is evident that higher awareness and attitude increase people's performance. Correct and accessible information on the risks of influenza illness and vaccine accessibility and vaccine recommendations, especially from doctors and midwives, play an essential part in the perceptions of vaccine effectiveness and coverage among pregnant women.

6- CONFLICT OF INTEREST: None.

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