

A Narrative review on Acceptance, hesitancy of COVID-19 vaccination on Pregnant & breastfeeding mother.



This is prepared for the partial fulfillment of the requirement of Master of Public Health (MPH) degree of Independent University of Bangladesh (IUB).

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DECLARATION

I do solemnly declare that the research work presented in this dissertation entitled “**A Narrative review on Acceptance, hesitancy of COVID-19 vaccination on Pregnant & breastfeeding mother**”, has been conducted by myself and not been submitted to any other university or academic institute for an academic qualification or certification degree previously. I certify that this is the true copy of my thesis with final revisions and approved by my thesis review committee.

I do hereby warrant that the work presented here does not breach any existing copyright and any material reproduced in this project has been properly acknowledged.

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Declaration by the Supervisor

This is to certify that Faijunnesa Khanam Jui worked on, '**A Narrative review on Acceptance, hesitancy of COVID-19 vaccination on Pregnant & breastfeeding mother**', under my supervision. I have gone through the paper. It is up to the mark and to my full satisfaction.

Signature of the Supervisor

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Faijunnesa Khanam Jui

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Summary:

Background: The COVID-19 pandemic has led to the death of many people worldwide. The World Health Organization (WHO) has declared vaccine resistance as one of the greatest health threats in the world even before the COVID-19 epidemic. The aim of this study was to evaluate the acceptance of COVID-19 vaccine in pregnant women.

Objectives: This study investigated the acceptance rate of COVID-19 vaccine, the hesitancy and their reported reason of vaccine hesitancy among pregnant women and breast-feeding mothers, with the goal of assisting in the development of COVID-19 vaccine program efficacy and promoting more research in this area.

Methodology: As this is a review article, direct data collection method was not applied in this study. A search was conducted using PubMed and Frontier in public health from January 2022 up to July 2023 restricted to the English language. All articles were initially included, and those with relevance were included in the synthesis of this paper.

Eligibility criteria: Studies providing any kind of cross-sectional study of overall COVID-19 vaccination acceptance among pregnant women in any country or region across the globe.

Results: A narrative review was performed for this study. Our narrative review included a total of eleven studies with a sample size ($n = 223-5,237$) participants which study conducted. The studies included revealed pregnant women's acceptance to receive the COVID-19 vaccine ranging from 2.7 to 77.1% across all ten studies. Several reasons were linked to this observation, and the predominant ones included: Insufficient information provided to the pregnant women about the side effects of the vaccines, concerns regarding vaccine safety, and skepticism of vaccine efficacy.

The findings showed a rate of COVID-19 vaccine acceptance in pregnant women on Sudan of 2.7%, which is lower than the acceptance rate among African countries like Ethiopia (62.2%). Contemporary research studies have reported an acceptance rate below 40% among pregnant women in Sudan (2.7%), South Korea (26.6%), Nepal (22%), West Indies (26.4%). On the other hand, Malaysia (77.1%), India (58%), Saudi Arabia (68%), Ethiopia (62.2%), Australia (68%), Switzerland (70.2%) were reported to have more than a 50% acceptance rate among pregnant women. The current study showed the highest acceptance rate (77.1%, Malaysia) of COVID-19 vaccine uptake among pregnant women.

Conclusions: The prevalence of COVID-19 vaccine acceptance in pregnant women was 53.46%, which was much lower than the general COVID-19 vaccination. Therefore, necessary interventions should be taken to increase the acceptance of the vaccine, address safety concerns and educate about it.

Therefore, health workers should focus on providing scientific-based information about the vaccine to reduce the doubts of pregnant women about participating in the COVID-19.

Keywords: COVID-19 vaccine acceptance, Vaccine hesitancy, Pregnant women

1.0. Background:

Pregnancy is considered a state of relative immunosuppression with a decrease in cellular immunity and possible susceptibility to infections. Also, there are changes in hormone levels, such as human chorionic gonadotropin (hCG), progesterone, and cortisol. In addition, the increase in uterus size causes the diaphragm to increase by 4 cm, widening the transverse diameter of the chest by 2 cm and affecting lung capacity. Furthermore, the immaturity of the immune system of fetuses and newborns makes them more vulnerable to infections. Therefore, pregnant women and neonates could be considered high-risk groups for infection during the pandemic. [4]

Although more than a year has passed since the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic started, no specific treatment against the disease is available. According to WHO, more than two million deaths have been recorded worldwide up to February 2021. Therefore, it is important to avoid infection. In the absence of an effective treatment for coronavirus disease 2019 (COVID-19) non-pharmaceutical interventions are the only available methods of disease control. Social distancing, face masks, and personal hygiene are the most effective precautions, but maintaining these actions is not practicable in the long term. As a result, herd immunity by vaccination becomes the most effective eradication method, as in other viral epidemic diseases in the past. [1,2]

Pregnant people are at increased risk of severe illness with COVID-19 infection and COVID-19 is associated with pre-eclampsia, preterm birth, stillbirth and caesarean delivery. [7] A large body of evidence now suggests that COVID-19 vaccination is effective and safe during pregnancy. [8]

As of 27 July 2022, 32.8% of the population in the USA are still rejecting the COVID-19 vaccine. [44] One of the largest groups for vaccine hesitancy are pregnant people. Despite concern about being exposed to COVID-19, [45] only 25% of expectant mothers have had at least one dose of the COVID-19 vaccine, compared with 76.9% of all women in the USA [9].

COVID-19 hesitancy among women planning to become pregnant, who are pregnant, and who are breast-feeding is still a global phenomenon. Unfortunately, there is a lack of national educational programs that provide those groups of people with the information they need about the vaccine [11].

Global studies found that pregnant women; women who were planning to become pregnant; or breast-feeding mothers were more hesitant to take COVID-19 vaccine compared to other women [12-16]. Three main reasons could explain COVID-19 vaccine hesitancy among this specific population. Firstly, there were concerns regarding COVID-19 vaccine safety, effects, and side effects, mainly because it was developed in a short period of time and received accelerated approval for use [13]. This created concerns about causing harm to the fetus for pregnant women or infertility for women who were planning to become pregnant [17]. Secondly, lack of proper scientific-based knowledge on the seriousness of COVID-19 disease, its effects on pregnancy and breast-feeding, and how the COVID-19 vaccine can minimize the severe effects of the disease on pregnant and breast-feeding women [18, 19]. Thirdly, the rumors and misinformation announced on the media, the conspiracy theory, and the widespread social uncertainty regarding the vaccine brought a public challenge to receive the vaccine [20]. Many researchers have investigated the rates of accepting attitudes toward COVID-19 vaccination among pregnant people [3, 16,17]. However, no one has explored the actual rate of being vaccinated during pregnancy among the women studied. In addition, husbands' views about COVID-19 vaccination of their pregnant wives have not yet been surveyed. Since husbands, especially those in low- and middle-income Asian countries, are commonly involved in the decision-making of their wives, particularly on important matters [21-23], the husband's acceptance or hesitation toward the COVID-19 vaccines offered to the wife might affect vaccine acceptance by the pregnant spouse.

1.1. Vaccine recommendations during pregnancy

The American College of Obstetrics and Gynecologists (ACOG) recommends vaccination against several vaccine preventable infectious diseases during pregnancy, including seasonal influenza, Tdap (diphtheria, tetanus, and pertussis), and the COVID-19 vaccine [38-40]. COVID-19 infections in pregnancy can have severe outcomes. The risk of COVID-19 vertical transmission from mother to child is still unclear, however, data suggests 62% higher odds of preeclampsia developing during a COVID-19 infection [41] in addition to a significantly high risk for maternal mortality [42] in unvaccinated mothers [43]. Infants born to vaccinated mothers that contracted COVID had less severe infections and were less likely to require hospitalization.

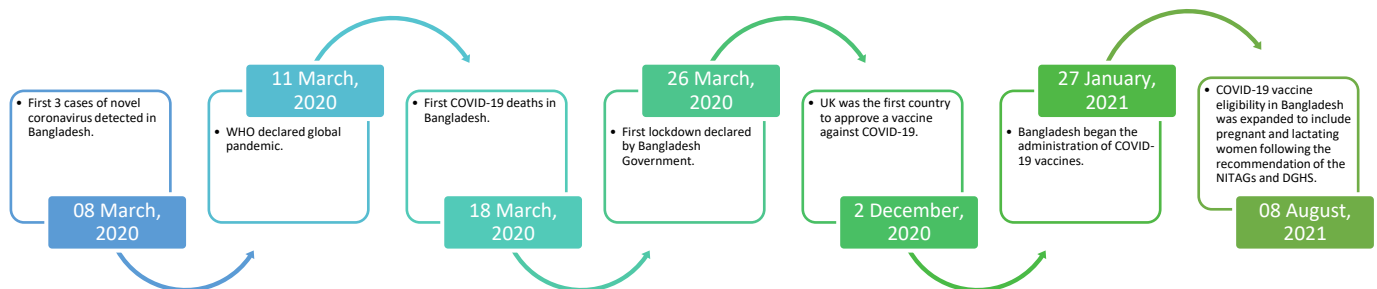


Figure-1: Timeline of events for COVID-19 outbreak and vaccine recommendations in Bangladesh.

1.2. Vaccine Hesitancy

Vaccine hesitancy and refusal are multifactorial, complex issues that both the medical and public health systems need to address synergistically. Vaccine hesitancy in pregnant people is a unique issue as a pregnant mother may view concern for vaccination through either a parental lens - having concern for the vaccine's impact on the health of the unborn baby, and/or through a personal lens – having concern for the vaccine's impact on her own health.

1.3 Objectives

The aim of this study is to summarize the acceptance rate of COVID-19 vaccine, the hesitancy and their reported reason of vaccine hesitancy among pregnant women and breast-feeding mothers of all over the World, with the goal of assisting in the development of COVID-19 vaccine program efficacy and promoting more research in this area, by summarizing some articles related to this regard.

2.0. Materials and Method:

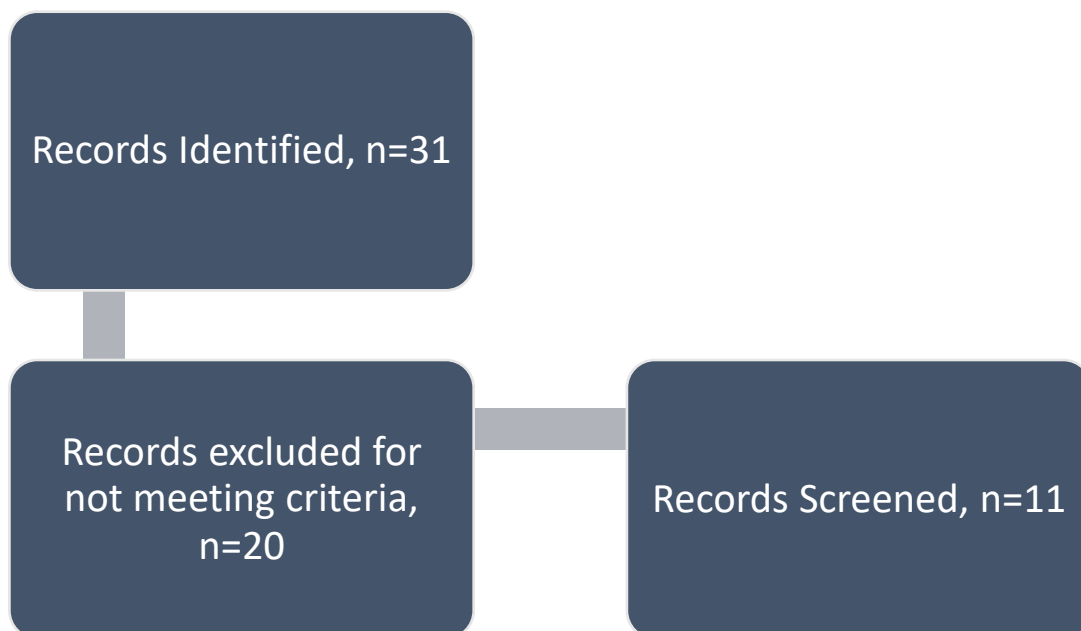
Since it is a review article, no direct data collection was done here. Rather, results from different original research paper on the same topic were investigated. To conduct this narrative review, articles related to the topic were searched through Google scholar databases and some electronic databases like PubMed, frontiers in Public health using the search terms “vaccine acceptance” AND “vaccine hesitancy” AND “pregnancy”. This search was continued from December 2021 to July 2023, by following the requirements to conduct a narrative review. The included journals were selected based on some criteria’s like studies should be on pregnant women, cross- sectional studies, published in English language. At the beginning, all the journals related to the ‘acceptance of COVID-19 vaccine on pregnant women’ were short listed; those were published after the rise of COVID-19 pandemic. Through this search a total of 551 results came out related to the topic and among them 215 original journals were found. After going through the ‘Titles and Abstract’ 31 articles were found to be related to the topic and eliminated the grey literatures. After choosing the related articles, study continued with the full-text of the journals and only 11 articles were finalized to conduct this narrative review. Full-text journals were excluded if the study was a review, qualitative study or mixed method study (both qualitative and quantitative). The data collected from the studies were qualitatively analyzed and summarized in this study. The graphs given in this article are constructed using Microsoft Office Excel 2016.

A flow-chart has been given to show the search process to finalize the articles,

Table-1: literature search inclusion criteria.

Inclusion criteria	Reasons for Exclusion
50 % of subjects included study must be pregnant at the time of the study	Studies that focused on parental acceptance of vaccination for children
Studies surveyed pregnant women about maternal vaccination during the course of their pregnancy	Studies that focused on opinions of health care workers
Cross-sectional study	Studies with subject groups composed of <50 % pregnant women, only post-partum women, or only non-pregnant women
Quasi-experimental pre-post design.	Review articles

Figure-2: Chart of Article Selection.



3. Results:

After screening several articles, results of relevant research papers were summarized to understand the acceptance of COVID-19 vaccines on pregnant mother. The following table summarizes the result from the articles included in the study. The 11 papers reviewed from my literature search are described in Table 2.

Table-2: Summary of findings in different articles regarding COVID-19 vaccine acceptance on pregnant women.

Author	Year of Publication	Study country	Study design	Measurement tool	Result
Omar et al. [24]	July, 23	Sudan	Cross-sectional study	Face to face interviews was conducted using questionnaire	COVID-19 vaccine acceptance among the pregnant women was 2.7%
Dhakal et al. [6]	March, 23	Nepal	An institutional-based cross-sectional analytical study	A semi-structured interview	COVID-19 vaccine acceptance was found to be 22%
Momani et al. [46]	March, 23	Jordan	Quasi-experimental pre-post design.	Structured questionnaire	Interventional group reported significantly higher vaccination rate and lower mean score of hesitancy than the control group.
Khan et al. [25]	February, 23	West Indies	Cross-sectional study	Questionnaire that was used by the WHO SAGE Working Group on Vaccine Hesitancy in 2015	The vaccine acceptance was 26.4%
Kalok et al. [29]	February, 23	Malaysia	Multi-center cross-	A self-administered electronic	The maternal vaccine acceptance in our study was 77.1%.

			sectional study	questionnaire through a Google form	
Kumar, et al. [5]	January, 23	India	Descriptive cross-sectional study	Pre-validated, structured, self-administrated questionnaire tool designed by Oxford COVID-19 vaccine hesitancy scale	58% stated their intent to receive the vaccine during pregnancy
T. Getachew et al. [28]	October, 22	Ethiopia	A facility-based cross-sectional study	pre-tested structured questionnaire, through a face-to-face interview	62.2% of pregnant women were willing to be vaccinated
M. Rikard-Bell et al. [27]	September, 22	Australia	Multicentre cross-sectional survey	Online survey	Willingness to receive vaccine (68% vs 88%) at Westmead compared to RNSH
J. Clin. Med. [10]	September, 22	South Korea	Cross-sectional study	self-administered questionnaire (online survey or paper survey)	Vaccine acceptance rate of 26.6%
Ghamri et al. [26]	April, 22	Saudi arabia	a cross-sectional, web-based study	An online standardized, anonymous questionnaire	the acceptance level of COVID-19 vaccine was 68%
Int. J. Environ. Res. Public Health. [20]	December, 21	Switzerland	An analytical cross-sectional survey-based study	self-administered questionnaire	The overall COVID-19 vaccine acceptance level was 70.2%, with a significant difference between PW (76.6%) and LW (48.8%).

The types of studies taken into account for this review can be summarized in the following way:

Table-3: Types of studies taken into account for review,

Study Conducted	Numbers	Percentage
Online survey	3	30%
Questionnaire Filled up by the Participants in paper	6	55%
Telephone survey	0	0%
Face to face interview	2	20%
Both Computer and Face to face Based Survey	0	0%

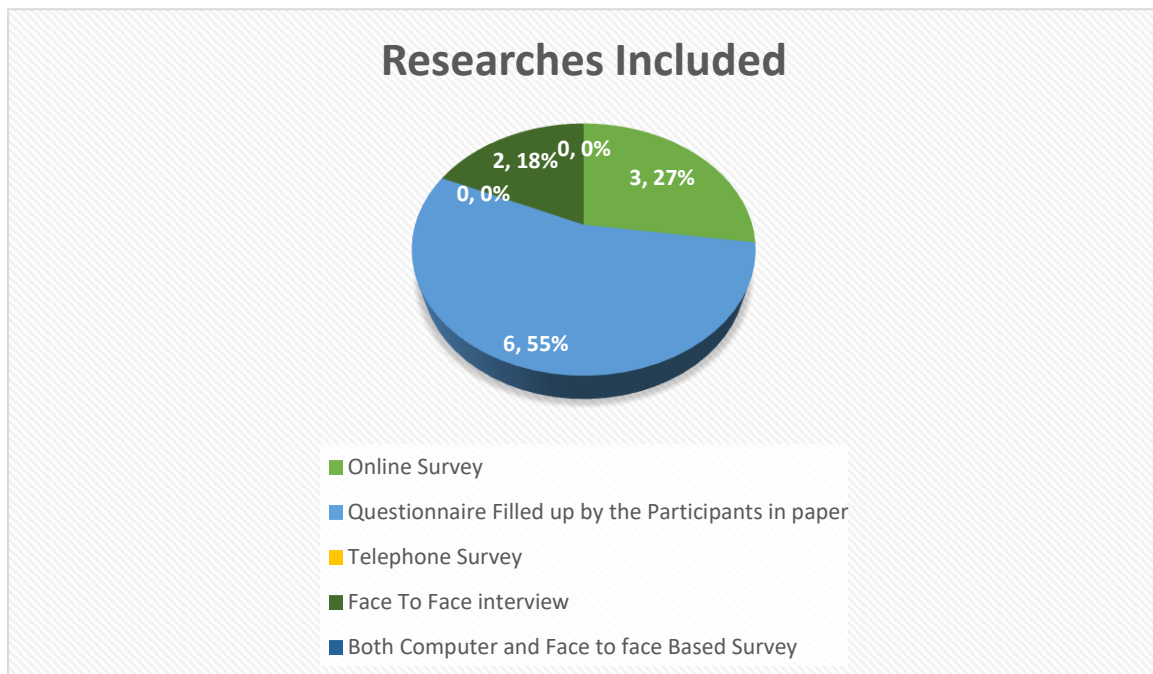


Figure-3: Types of studies taken into account for review.

The Population size of the studies considered here have shown some variety too, which can be found in the following figure. Figure 3 shows that the size of the population was highest for Saudi Arabia and lowest for Australia.

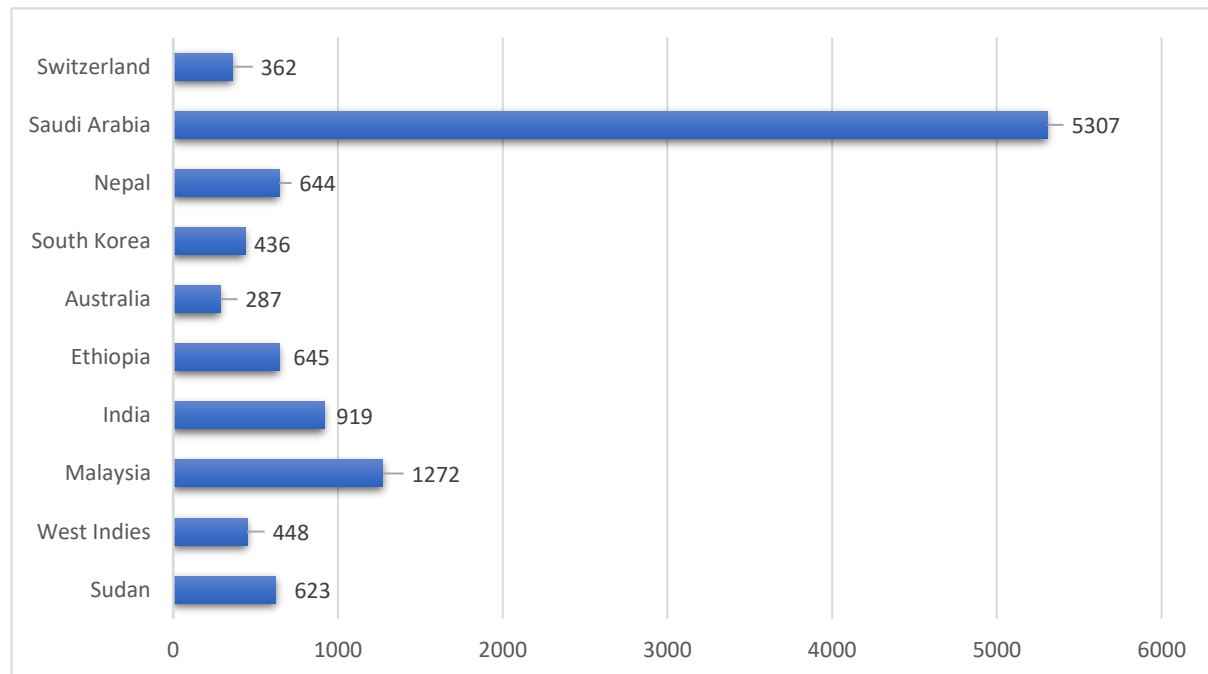


Figure-4: Covid-19 vaccine acceptance of pregnant women of Worldwide

The sample sizes of the studies considered here have shown some variety too, which can be found in the following figure. Figure 4 shows that the vaccine acceptance on pregnant women was highest for Malaysia and lowest for Sudan.

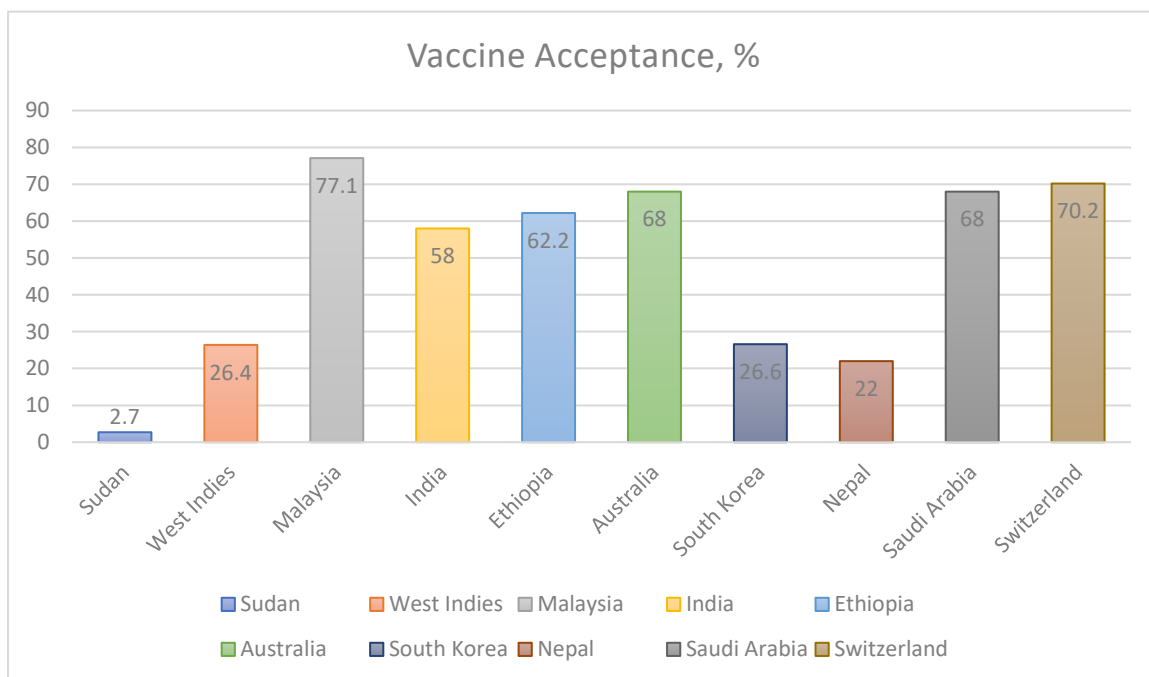


Figure-5: Covid-19 vaccine acceptance of pregnant women of Worldwide

The findings of Table-2 showed a rate of COVID-19 vaccine acceptance in pregnant women on Sudan of 2.7%, which is lower than the acceptance rate among African countries like Ethiopia (62.2%). Contemporary research studies have reported an acceptance rate below 40% among pregnant women in Sudan (2.7%), South Korea (26.6%), Nepal (22%), West Indies (26.4%). On the other hand, Malaysia (77.1%), India (58%), Saudi Arabia (68%), Ethiopia (62.2%), Australia (68%), Switzerland (70.2%) were reported to have more than a 50% acceptance rate among pregnant women. The current study showed the highest acceptance rate (77.1%, Malaysia) of COVID-19 vaccine uptake among pregnant women.

Table-4: Summary of findings in different articles regarding related factors of COVID-19 vaccine acceptance.

Authors (year)	(N) Number of pregnant women who would get vaccinated/total sample (%)	Maternal age as a factor of COVID-19 vaccination acceptance	Gestational age as a factor of COVID-19 vaccination acceptance	Educational level as a factor of COVID-19 vaccination acceptance	Occupational status	Husband's education level
		Maternal Age	Gestational Age	Educational Level/%		
Omar et al. (2023)	17/623 (2.7%)	28 (24-32) years	32 (27-38) weeks	<ul style="list-style-type: none"> · Secondary school or higher - 13 (3.5%) · Lower than secondary school - 4 (1.6%) 	<ul style="list-style-type: none"> · Employed 4 (7.6%) · Housewife 13 (2.3%) 	<ul style="list-style-type: none"> · Secondary school or higher 14 (4.5%) · Lower than secondary school 3 (1%)
Dhakal et al. (2023)	142/644 (22%)	25.38 (26-30) years	Not specified	<ul style="list-style-type: none"> · <Bachelor 105(19.6%) · ≥Bachelor 64(68.1%) 	<ul style="list-style-type: none"> · Service Holder 43(6.7) · Business 28(4.3) · Agriculture 34(5.3) · Housewife 529(82.1) · Wage labor 10(1.6) 	Not specified
Khan et al. (2023)	100/379 (26.4%)	30.8 years	26.3 weeks	<ul style="list-style-type: none"> · None 1 (0.3%)/0 (0.0%) · Primary 11 (2.8%)/0 (0.0%) · Secondary 214 (54.6%)/7 (18.4%) 	Not specified	Not specified

				Tertiary 166 (42.3%)/31 (81.6%)		
Kalok et al. (2023)	981/1272 (77.2%)	32.2 years	29.9 weeks	Non-tertiary education 149 (69.0%) Tertiary education 832 (78.8%)	Employed/self-employed 808 (80.1%) Housewife/unemployed 173 (65.8%)	Not specified
Kumar, et al. (2023)	535/919 (58%)	19-50 years	The maximum hesitancy was seen in the third trimester of pregnancy 29.5%	Not specified	Not specified	Not specified
T. Getachew et al. (2022)	400/645 (62.2%)	28.92 years	Not specified	No formal education 65 (10.1) Read and write 33 (5.1) 1-8 grade 49 (7.6) 9-12 grade 62 (9.6) Collage and above 191 (29.6)	Housewife 118 (18.3) Farmer 72 82 (12.7) Private employee 144 (22.3) Government employee 40 (6.2)	Not specified
M. Rikard-Bell et al. (2022)	195/287 (68%)	32.8 years	29 weeks	Not specified	Not specified	Not specified
J. Clin. Med. (2022)	116/436 (26.6%)	33 years	1st trimester 2 (1.7) 2nd trimester 29 (25) 3rd trimester 78 (67.2) Postpartum 7 (6.0)	College degree or above 100 (86.2)	Housewife 47 (40.5) Non-medical personnel 51 (44.0) Medical personnel 18 (15.5)	Not specified

Ghamri et al. (2022)	3548/5307 (68%)	32 years	24.21 weeks	<ul style="list-style-type: none"> . None 17 (58.6%) . Primary school 110 (78.6%) . Secondary school 623 (68.7%) . University 2860 (67.6%) 	<ul style="list-style-type: none"> . Housewife 1976 (64.1%) . Private sector 546 (70.4%) . Government sector 1088 (75.1%) 	Not specified
Int. J. Environ. Res. Public Health. (2021)	254/362 (70.2%)	31 years	Pregnant women in their third trimester (80.7%) had a significantly higher acceptance level of COVID-19 vaccine compared to the PW in the first trimester (41.7%).	<ul style="list-style-type: none"> . The PW with a master's degree or higher (85.3%) had a significantly higher acceptance level than the PW with basic education (42.9%) 	The pregnant healthcare workers (74%) had an insignificantly lower acceptance level compared to the non-healthcare workers (80.7%) .	Not specified

3.1 Demographic predictors of COVID-19 vaccine acceptance among pregnant women.

Table-4 shows the acceptance rate of vaccination against COVID-19 among pregnant women according to the studies included in the review and related factors of hesitancy (i.e., maternal age, gestational age, educational level, partners education level). As shown in the table, out of eleven studies maternal age were 25-33years.

Out of eleven studies, Two studies found that pregnant women in their third trimester were more likely to accept vaccination against COVID-19 than pregnant women in early pregnancy. But in the study by Kumar. et al. [5] showed different results as, among all stage of pregnancy the maximum hesitancy was seen in the third trimester of pregnancy 29.5%.

Out of the eleven studies that investigated whether eight studies showed that education level is a predictor of vaccine acceptance. More specifically, In a study by Ghamri et al. [26], pregnant women with primary education were 2.8 times more likely (OR: 2.853; 95% CI: 1.207–6.745) to accept vaccination against COVID-19 than illiterate pregnant women. In the study by Int. J. Environ. Res. Public Health. [20] The PW with a master's degree or higher (85.3%) had a significantly higher acceptance level than the PW with basic education (42.9%). In the study by Dhakal et al. [6] female less than Bachelor's degree graduates were 3.5 times less likely to accept being vaccinated against COVID-19 in relation to pregnant women who had a Bachelor's degree.

Seven out of the eleven studies showed that occupational status is a predictor of acceptance of COVID-19 vaccination among pregnant women. Employed pregnant women were found to be more likely to accept being vaccinated against COVID-19 than pregnant women who were unemployed/housewife. In a study by Ghamri et al. [26], Government sector workers (75.1%) are more likely to accept vaccinated against COVID-19 than non-government sector workers. On the other hand, in the study by T. Getachew et al. [28], private employees are high acceptance rate than government employees. Two studies show, The pregnant healthcare

workers (74%) had an insignificantly lower acceptance level compared to the non-healthcare workers/non-medical person (80.7%). [10, 20]

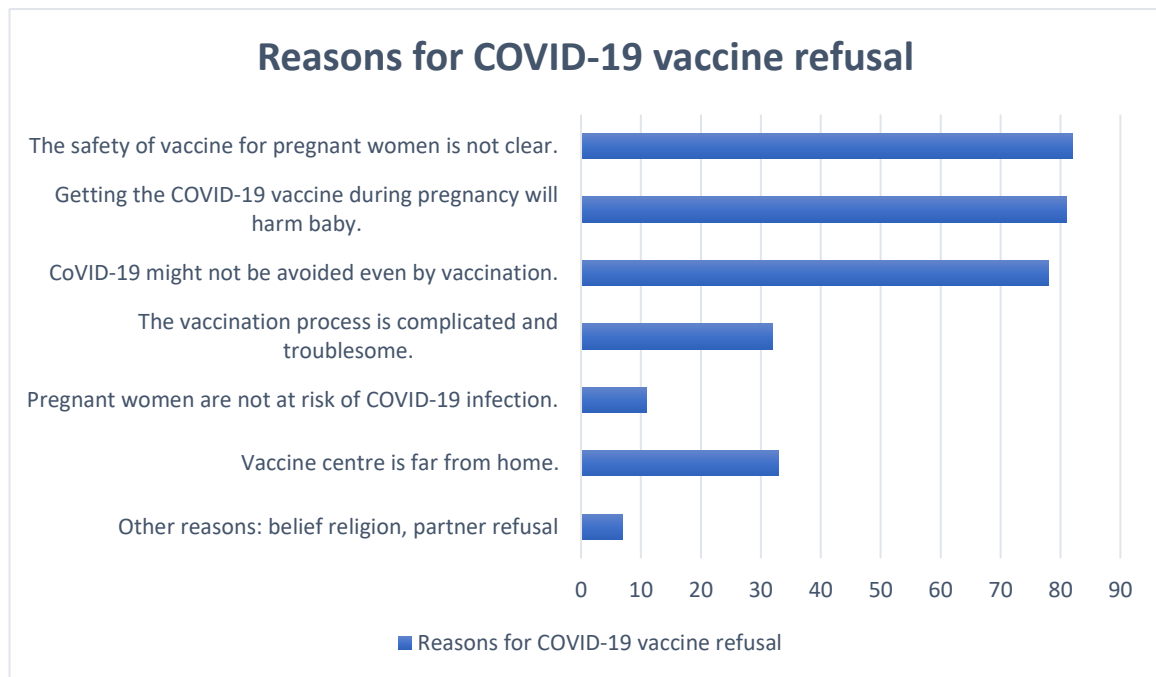
Only one study found that husband's education is a predictor of acceptance of COVID-19 vaccination among pregnant women. In the study by Omar et al. [24], showed that PW with secondary level education completed husband were 4.5 times more significantly to accept vaccination than lower than secondary school.

Table-5: Summary of findings in different articles assessing reasons of COVID-19 vaccine hesitancy among pregnant women.

Author (Years, Country)	Population	Reasons of Vaccine hesitancy
Omar et al. (2023, Sudan)	Pregnant women	<ul style="list-style-type: none"> • The side effects of the COVID-19 vaccination for mothers. • The side effects of the COVID-19 vaccination for my baby. • Lack of adequate information on the safety of the COVID-19 vaccine during pregnancy.
Dhakal et al. (2023, Nepal)	Pregnant women	<ul style="list-style-type: none"> • 82% were rejected the vaccine due to safety reasons. • The vaccine might harm the baby 81%, • The vaccine center is far 33%, vaccination process is complicated and troublesome 32%, • Other reasons were 7%, i.e., religion belief, a family decision.
Khan et al. (2023, West Indies)	Pregnant women	<ul style="list-style-type: none"> • The vaccine would harm their babies (75.5%), • There was not enough data on the COVID-19 vaccine in pregnancy (71.2%), • The vaccine would harm their bodies (61.9%).
Kalok et al. (2023, Malaysia)	Pregnant women	<ul style="list-style-type: none"> • Lack of adequate information • Harmful to baby • Vaccine side effects worry
Kumar, et al. (2023, India)	Pregnant & Lactating mothers	Not specified
T. Getachew et al. (2022, Ethiopia)	Pregnant women	<ul style="list-style-type: none"> • Fear of side effects. • Doubt about the safety and efficacy of Vaccine. • Unreliable due to short time of development. • Have no enough information. • The vaccine will cause COVID 19. • No vaccine is required for COVID 19.
M. Rikard-Bell et al. (2022, Australia)	Pregnant women	Not specified
J. Clin. Med. (2022, South Korea)	Pregnant women	<ul style="list-style-type: none"> • Vaccine safety and effectiveness. • Protection of their baby.

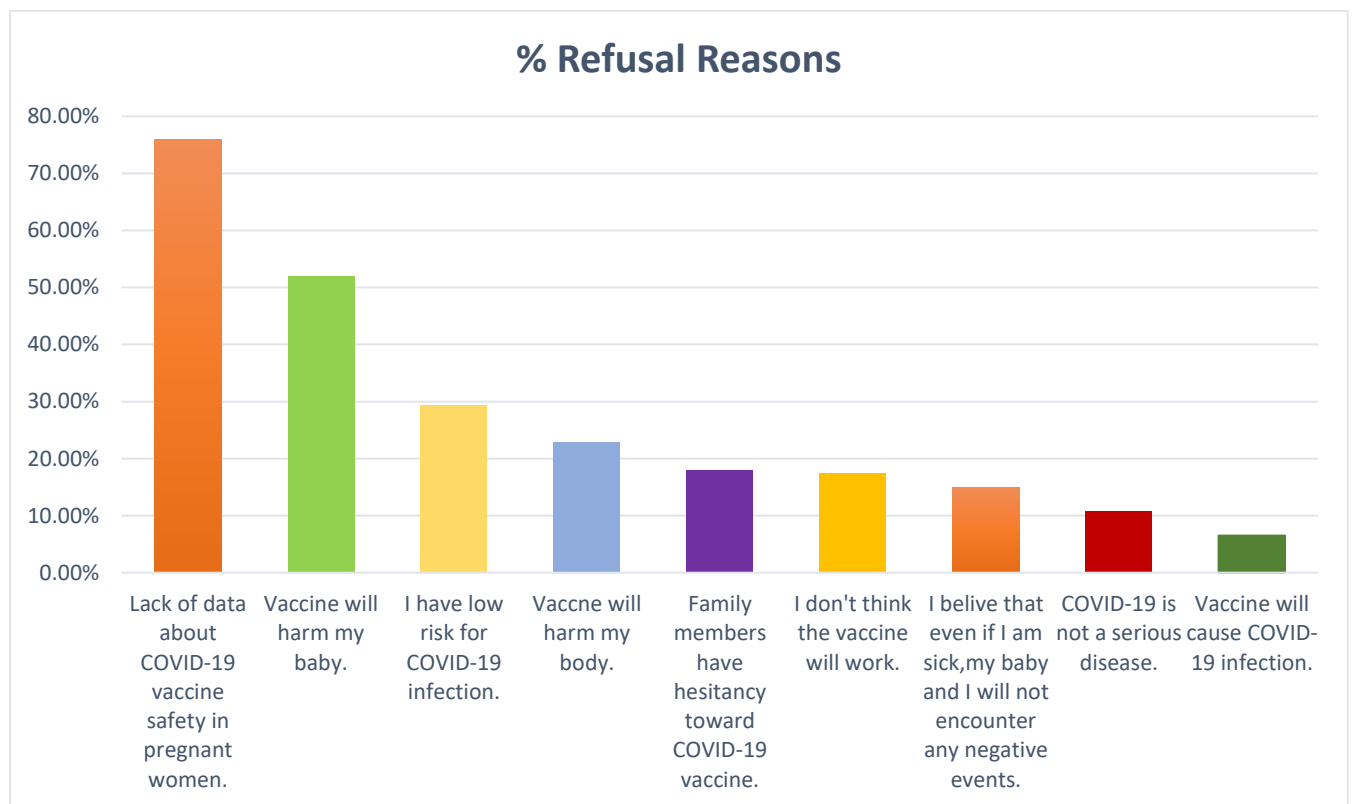
Ghamri et al. (2022, Saudi Arabia)	Pregnant women	<ul style="list-style-type: none"> • Lack of data about COVID-19 vaccine safety in pregnant women. • Vaccine will harm my baby. • low risk for COVID-19 infection. • Vaccine will harm my body. • Family members have hesitancy toward COVID-19 vaccine. • I don't think the vaccine will work. • I believe that even if I am sick, my baby and I will not encounter any negative events. • COVID-19 is not a serious disease. • Vaccine will cause COVID-19 infection.
Int. J. Environ. Res. Public Health. (2021, Switzerland)	Pregnant & lactating womens	Not specified

Our First question, “What are the primary concerns of pregnant people that lead them to be hesitant about receiving vaccinations?”, was addressed by authors of 7 articles and revealed several thematic reasons explaining why people are concerned about receiving vaccination during pregnancy (Table 5). The primary reason mentioned throughout a majority of the literature reviewed was COVID-19 vaccine can harm their unborn child. The second most frequent reason was fear of side effects or adverse events. The third most frequent reason was lack of information or data about COVID-19 vaccine safety about pregnant women. Additional less frequently reasons included: religion beliefs; family decision; vaccine cost; spousal hesitation for the pregnant partner to receive the vaccine; and misinformation and misconceptions about vaccination.



Dhakal et al. [6] <https://doi.org/10.1371/journal.pone.0278694.g002>

Figure-6: Reason for refusal of covid-19 vaccine among Pregnant Women.



Ghamri et al. [26]

Figure-7: Reasons of refusal of getting a COVID-19 vaccine among the participant group.

3.2 Literature addressing the Covid-19 vaccine acceptance among pregnant women and lactating mothers.

An analytical cross-sectional survey-based study was carried out in Czechia, between August and October 2021. The study utilised a self-administered questionnaire (SAQ) adapted from previous instruments used for the same purpose. The SAQ included closed-ended items covering demographic characteristics, clinical and obstetric characteristics, attitudes towards COVID-19 vaccination, and potential psychosocial predictors of vaccine acceptance. [20]

Out of the 362 included participants, 278 were pregnant (PW) and 84 were lactating women (LW). The overall COVID-19 vaccine acceptance (immediate and delayed) level was substantially high (70.2%), with a significant difference between PW (76.6%) and LW (48.8%). Pregnant women in their third trimester (80.7%) had a significantly higher acceptance level of COVID-19 vaccine compared to the PW in the first trimester (41.7%).

Among the LW, there was no significant difference in terms of age between the vaccine-accepting group and the vaccine-resistant group (32.8 ± 4.8). Additionally, there was no significant difference in terms of education level or employment status. The lactating healthcare workers (72.2%) had a significantly higher acceptance level compared to the non-healthcare workers (39.7%).

Among the PW, there was a significant difference in terms of age between the vaccine-accepting group (31.6 ± 4.3) and the vaccine-resistant group (30.4 ± 5.0). Moreover, there was a significant difference in terms of education level and employment status. The PW with a master's degree or higher (85.3%) had a significantly higher acceptance level than the PW with basic education (42.9%). The pregnant healthcare workers (74%) had an insignificantly lower acceptance level compared to the non-healthcare workers (80.7%). (Table-6)

Table-6: Demographic, anamnestic and psychosocial risk factors of COVID-19 vaccine hesitancy among pregnant and lactating women.

Variable	Outcome	Lactating women, n= 84		Pregnant women, n=278	
		Acceptance, n=41	Rejection, n=43	Acceptance, n=213	Rejection, n=65
Age	Years	31.0 ± 4.7	32.8 ± 4.8	31.6 ± 4.3	30.4 ± 5.0
Education Level	Basic	2(66.7%)	1(33.3%)	6(42.9%)	8(57.1%)
	Secondary	14(45.2%)	17(54.8%)	81(75%)	27(25%)
	Bachelor's	8(61.5%)	5(38.5%)	27(69.2%)	12(30.8%)
	Masters'/Higher	17(45.9%)	20(54.1%)	99(85.3%)	17(14.7%)
Employment Status	Yes	36(46.8%)	41(53.2%)	200(79.4%)	52(20.6%)
	No	5(71.4%)	2(28.6%)	13(52%)	12(48%)
Healthcare Professional	Yes	13(72.2%)	5(27.8%)	37(74%)	13(26%)
	No	23(39.7%)	35(60.3%)	163(80.7%)	39(19.3%)

Another analysis Kumar, et al. [5], revealed that even after government approval, 26% of pregnant and lactating women showed vaccine hesitancy and 58% of individuals were willing to take COVID-19 vaccine. When compared, lactating individuals showed less vaccine hesitancy (22%) than pregnant individuals (27%)

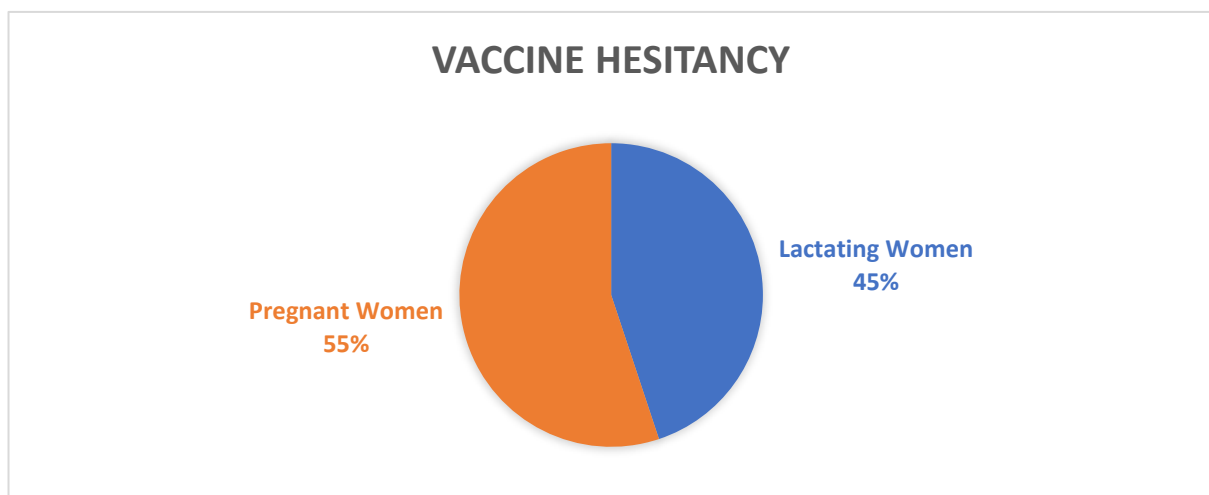


Figure-8: vaccine hesitancy among PW & LW.

3.3 Literature describing Psychosocial Predictors of Vaccine Hesitancy.

The impact of media/social media on participants' decisions was reported by only 8.3% of the participants. Most PLW (58.7%) did not think that the Czech government made decisions in the participants' best interest concerning the offered vaccines. Only 15% of the participants believed that the pharmaceutical companies were honest and transparent regarding safety data for pregnant women. Nearly one quarter (24.7%) agreed, and another quarter (26.9%) disagreed with the notion that healthcare professionals would tell them honestly about the risks and benefits of vaccines, less than those (48.3%) who were still hesitant. The partners' impact on vaccine decisions was also limited (10%), and up to half of the participants (50.6%) were unsure about the risk-benefit ratio of receiving COVID-19 vaccines. Almost one-third of participants (32.5%) indicated that they had sufficient knowledge about the COVID-19 vaccines. The vast majority disagreed (82.4%) or were not sure (17.1%) that there was sufficient evidence suggesting the safety of COVID-19 vaccines for females, while only 2 (0.6%) participants thought there was enough evidence on COVID-19 vaccines' safety (Table 7).

Table-7: COVID-19 vaccine-related attitude predictors of pregnant and lactating women (PLW).

Variable	Outcome	Percentage, %
[Media] Do reports you hear/read in the media/on social media make you re-consider the choice to take the COVID-19 vaccine?	No = 0	65.3%
	Not Sure = 1	26.4%
	Yes = 2	8.3%
[Government] Do you trust that your government is making decisions in your best interest concerning what vaccines are provided (e.g., your government purchases the highest quality vaccines available)?	No = 0	58.7%
	Not Sure = 1	32.7%
	Yes = 2	8.6%
[Industry] Do you trust pharmaceutical companies to provide credible data on COVID-19 vaccine safety and effectiveness?	No = 0	43.2%
	Not Sure = 1	41.8%
	Yes = 2	15%
[Health Professional] Do you trust your health care provider to tell you about the risks and benefits of vaccines honestly?	No = 0	26.9%
	Not Sure = 1	48.3%
	Yes = 2 89	24.7%
Partner] My decision whether to get vaccinated or not is driven by my husband/partner?	No=0	83.1%
	Not Sure = 1	6.9%
	Yes = 2	10%

Int. J. Environ. Res. Public Health. [20]

3.4 Literature addressing impact of tele-educational program on COVID-19 vaccine hesitancy and receiving the vaccine among pregnant women.

The study presented, the intervention group reported significantly lower mean score of hesitancy than the control group after delivering the program (M = 24.67, SD = 5.11; M = 27.45, SD = 4.92. respectively). Results showed a statistically significant difference in the levels of hesitancy in the intervention group. Before the program, women in the intervention group reported significantly higher levels of hesitancy compared to those after the program (M = 28.35, SD = 4.91; M = 24.66, SD = 5.11; respectively). However, results for the control group showed no statistically significant difference in the mean score of the hesitancy to get the vaccine before and after the program, see Table-9.

Table-8: Hesitancy of getting the vaccine between the intervention group and the control group.

Variable	Group	N	Mean ± SD	P-value
Hesitancy before the program	Intervention	205	28.35±4.91	0.127
	Control	220	27.61±4.96	
Hesitancy after the program	Intervention	205	24.67±5.11	<0.001
	Control	220	27.45±4.92	

Table-9: Hesitancy of getting the vaccine before and after the program.

Variable	Group	Mean ± SD	Mean difference	P-value
Intervention group	Hesitancy before the program	28.35±4.91	3.69	<0.001
	Hesitancy after the program	24.67±5.11		
Control group	Hesitancy before the program	27.61±4.96	0.16	0.22
	Hesitancy after the program	27.45±4.92		

Table-10: Difference in COVID-19 vaccination.

Variable		Not taken	One dose
Intervention group	COVID-19 vaccination before the program	205	0
	COVID-19 vaccination after the program	43	162
Control group	COVID-19 vaccination before the program	220	0
	COVID-19 vaccination after the program	216	4

This indicates that the program significantly lowered the mean score of hesitating to get the vaccine for the intervention group only. Results showed that women in the intervention group received the vaccine at a significantly higher rate after the program than before it. However, receiving the vaccine did not differ for the control group, Table-10.

3.5 Discussion:

The present narrative review included 11 studies that met certain inclusion and exclusion criteria and aimed to estimate the acceptance of COVID-19 vaccination among pregnant women. 11 studies including 11,368 pregnant women from 11 countries were included in the analysis. Additionally, we intended to investigate factors associated with vaccination acceptance, as well as reasons for vaccination hesitancy.

The acceptance rate of vaccination against COVID-19 among pregnant women ranged from 2.7% to 77.1%. The results of our study are significantly vary from the results of two earlier meta-analyses and found that the global prevalence of pregnant women receiving the vaccine for COVID-19 was approximately 49–54% [47]. COVID-19 vaccination acceptability in pregnant women was 54 percent globally [48]

Acceptance of COVID-19 vaccination was associated with several factors, including older age, occupational status, higher level of education, advanced gestation, knowledge about COVID-19, and confidence that COVID-19 vaccines are safe and effective. More specifically, older age was found to be associated with higher acceptance of COVID vaccines [26, 49] This finding is plausible because pregnancy at advanced maternal age is known to be a risk factor for adverse outcomes, such as higher rates of NICU admission for the neonate, preterm birth, miscarriage, preeclampsia, low birth weight, worse Apgar scores, and cesarean deliveries. In addition, older age is associated with higher mortality due to COVID-19. It is probable that older pregnant women face COVID-19 with added fear, resulting in their higher acceptance of COVID-19 vaccination [47, 48]

Moreover, in our review, the rate of COVID-19 vaccination acceptance was highest among Malay ans Swiss pregnant women and lowest among those of Sudanese Arabs and Nepalis [6, 20, 24, 29]. Latins and Black or African American race are associated with more than 60% acceptance rate of vaccination against COVID-19 during pregnancy [28]. Pregnant women in their third trimester were more likely to accept vaccination against COVID-19 than pregnant women in early pregnancy. But another study showed Indian pregnant women were maximum hesitance at third trimester of pregnancy [5]. Education level is a predictor of vaccine acceptance where pregnant women with primary education, more than Bachelor's or Master's degree more likely to accept vaccination against COVID-19 than illiterate pregnant women.

On the other hand, employed pregnant women were more willingly get vaccinated against COVID-19 than pregnant women who were unemployed/housewife. The pregnant healthcare workers had an insignificantly lower acceptance level compared to the non-healthcare workers/non-medical person [10, 20]. Husband's education also a predictor of acceptance of COVID-19 vaccination among pregnant women which shows more acceptance for educated husbands.

Confidence in COVID-19 vaccines and fewer concerns about the safety and side effects of COVID-19 vaccines are predictors of acceptance of COVID-19 vaccination. Similar factors, such as confidence in the safety and effectiveness of COVID-19 vaccines, confidence in the information received about vaccination against COVID-19, confidence in childhood vaccines, and influenza vaccination in the previous year, are associated with a higher rate of intention of pregnant women to receive a COVID-19 vaccine [17, 26, 49]. In general, high levels of information and knowledge about COVID-19 vaccines reduce fear and have a significant effect on a pregnant woman's decision to get vaccinated against COVID-19 [48]

Consistent with the results of the previous study and despite the international recommendations for COVID-19 vaccination for all adults, many studies reported high levels of hesitancy among individuals with low levels of education, among women who are planning to get pregnant, pregnant women, and breast-feeding mothers [30-34]. This hesitancy was explained by a lack of knowledge about COVID-19 disease, vaccine safety, the importance of the COVID-19 vaccine for women who are planning to get pregnant, pregnant women, or breastfeeding mothers, and the misleading information on social media platforms [35–37]. Furthermore, one study found that insufficient prenatal care was one factor that was associated with COVID-19 vaccine hesitancy. This may suggest that health workers have an important role in patients' education on vaccine safety and importance. Accordingly, previous studies suggested that evidence-based education could change women's behavior, which is likely to decrease COVID-19 vaccine hesitancy and, therefore, minimize the effect of the COVID-19 pandemic.

Vaccine hesitancy is dynamic in that patients do not always hold a static level of vaccine hesitancy or resistance. It is important for providers to have effective vaccine strategies to address patients' concerns about vaccination as they fluctuate between different levels of vaccine hesitancy or resistance. Pregnant people may move between higher or lower states of vaccine hesitancy based on their personal experiences, previous pregnancy experiences, vaccine education, and their current pregnancy. We found that the source of education can

heavily influence a person's willingness to accept a vaccine during pregnancy, whereas the delivery method of vaccine education had a lesser impact on a person's willingness to accept vaccination during pregnancy. The sources of education with the greatest influence on vaccine acceptance during pregnancy were institutional backed sources, followed by verbal education from family members. Institutional sources included: verbal education from trusted health care providers and written information from academic clinical facilities. Considering both the historical context of vaccine hesitancy and results from the literature search, we propose that health care providers consider our suggested framework developed to deliver vaccine information to pregnant persons based on their current feelings towards vaccination.

Our study aimed was the first to compare vaccination behavior in the light of vaccine acceptance rate and hesitancy attitudes toward COVID-19 vaccination among pregnant women Worldwide.

4.0. Limitations:

This paper has several limitations. Given the nature of narrative reviews, the articles included in our study were not systematically reviewed. Moreover, articles in the English language were only included which may have prevented us from accessing literature in other native languages across South Asia. In addition, conference proceedings and other databases such as Scopus were not included in our search, which limited our final results. Our review only included cross-sectional studies that were survey-based while other studies including ones that analyze threads on social media platforms may have provided more insights since the use of such platforms increased during the pandemic. Also, qualitative studies may have given more in-depth descriptions of individual experiences. Collectively, these different factors could potentially add bias, and varying views may reflect different findings suggesting the diversity of opinions and conclusions.

4.1. Conclusion:

In summary, it can be said that most of the studies considered in this review has shown that the hesitancy and acceptance of COVID-19 vaccine among the pregnant women depends on their own knowledge about vaccine as well as their partners also. It was concluded that the knowledge of pregnant women after being given an education program about COVID-19 vaccination improved their willingness to participate in the COVID-19 vaccination and decreased their hesitancy. Efforts need to be made to increase the knowledge of pregnant women through health education on COVID-19 vaccination by health workers so that the coverage of COVID-19 vaccination in pregnant women can increase, which in turn will affect the morbidity and mortality rates of pregnant women due to COVID-19 infection. From this review, it can be also suggested that further investigation is also required to understand different socio economic and other issues to better understand the factors of hesitancy of COVID-19 vaccine among pregnant women in Bangladesh.

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