Effect of Educational Sessions on COVID-19 Vaccine Hesitancy among Pregnant Women

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Abstract

Background: COVID-19 vaccine hesitancy had been defined by The World Health Organization (WHO) as one of the top ten global health threats since 2019. Vaccine hesitancy or refusal to accept is a growing concern throughout the world, especially as new and deadly variants emerge. **Aim:** To investigate the effect of educational sessions on COVID-19 vaccine hesitancy among pregnant women. **Study design:** A quasi-experimental research design was used. **Subjects:** A purposive sample of 159 pregnant women who attended the Antenatal Clinics of the Obstetric and Gynecological Department at Mansoura University Hospitals, Mansoura city, Dakhalia governorate, Egypt was studied. Three tools were used Structured interviews with a questionnaire assessed the women's general characteristics. The Oxford COVID-19 Vaccine Hesitancy Scale was used to assess the level of COVID-19 vaccine hesitancy and the Vaccine Conspiracy Beliefs Scale was used to assess the COVID-19 vaccine conspiracy beliefs. **Results:** The results revealed that the total level of vaccine hesitancy was significantly reduced from 25.8% (strongly hesitant) before the educational sessions to 7.5% after the educational sessions. Also, the willingness to receive the vaccine significantly increased from 11.9% before the educational sessions to 74.8% after the educational sessions. Furthermore, the vaccine conspiracy beliefs significantly decreased from 59.7% before the educational sessions to 5.0% after the educational sessions. **Conclusion:** COVID-19 educational sessions were an effective tool for decreasing the level of COVID-19 vaccine hesitancy among pregnant women. **Recommendation:** Further research on correcting conspiracy negative beliefs regarding COVID-19 vaccines, which correspond to a decrease in vaccine hesitancy among pregnant women, is warranted.

Keywords: COVID-19, vaccine hesitancy, pregnant women.

Introduction

The COVID-19 crisis refers to the high prevalence of a severe acute respiratory disease caused by the severe acute respiratory syndrome corona virus 2 (SARS-CoV-2). Worldwide, because of the terrible effects of the pandemic, mitigation measures are required to stop it **(Phua, 2020)**. The majority of nations used non-pharmaceutical interventions (NPIs), such as mask enforcement measures, hand sanitization campaigns, social withdrawal, travel bans, school closings, and partial or full lockdowns, to lessen the disease's ability to spread. **(Alradhawi, Shubber, Sheppard, & Ali, 2020)**. Non-pharmaceutical interventions were able to slow down the progression of the disease, but the most effective intervention to compact the spread of virus was pharmacological preventive interventions; that is, vaccinations **(Sestili, & Fimognari, 2020).**

Vaccinations are now key global public health interventions designed to combat the SARS-CoV-2 pandemic **(Heininger, 2020)**. With SARS-CoV-2 vaccine approval, optimism has been raised for an end to the pandemic through herd immunity. Herd immunity occurs when a sufficient number of populations have become immune to infection whether through vaccination or through immunity derived from previous infection. So, it is a form of protection that can be utilized the likelihood of infection for individuals especially those with lack of immune response. The threshold for SARS-CoV-2 herd immunity has been estimated to range between 50% and 67% **(Omer, Yildirim, & Forman, 2020)**.

Vaccines are one of the most cost-effective and reliable public health interventions that have been implemented and resulted in saving millions of lives each year **(Rodrigues, & Plotkin, 2020)**. The Sinopharm Chinese vaccine was approved as the first primary

vaccine against SARS-CoV-2 by the Egyptian Drug Authority (EDA). Beginning on January 24, 2021, medical teams at quarantine hospitals began administering vaccinations to patients in priority categories as part of Egypt's national vaccination campaign. Medical teams then created a public vaccination website where members of high-risk groups could sign up to receive the shots. Later, the COVID-19 Vaccines Global Access (COVAX) Facility initiative allowed for the acquisition of the second batch of AstraZeneca vaccine in January 2021 **(Saied, Saied, Kabbash, & Abdo, 2021)**. Worldwide, vaccine hesitancy among the population is a major obstacle **(Neumann-Böhme, et al., 2020; Schoch-Spana et al., 2021)**.

Vaccine hesitancy was defined by the WHO as "Delay in acceptance or refusal of vaccination despite availability of vaccination services" **(MacDonald, 2015; WHO, 2019)**. A major challenge alter the vaccine acceptance is the doubt about the vaccine safety. This challenge need to be resolved by the policymakers, health care providers, governments and community leaders **(Coustasse, Kimble, & Maxik, 2021**).

The vaccine hesitancy categories range from fully accepts vaccine to vaccine hesitant to strongly oppose vaccinations **(Buckley, and National Academies of Sciences, Engineering, and Medicine, 2020)**. Providing credible information about the safety and effectiveness of the vaccines can help people who are hesitant about the vaccination to change their opinion after being reassured **(Rief, 2021)**. Contributors to COVID-19 vaccine hesitancy are conspiracy beliefs about the vaccine. Vaccine conspiracy beliefs come from negative attitudes toward vaccine science, which predict intentions to take the vaccine in the future **(Bertin et al., 2020).**

To achieve herd immunity, safeguard the most susceptible groups, and restart social and economic activities, it is essential to ensure a high demand for COVID-19 vaccinations and to promote adoption of COVID-19 vaccines. In order to make the vaccination decision that is best for them, persons who are reluctant, sceptical, or unmotivated about being vaccinated need sources, knowledge, and assistance **(Manners, Bautista, Sidoti, & Lopez, 2020).** Evidence from the behavioral, social, and psychological sciences shows that people's motives are influenced by their knowledge, their thoughts and feelings such as their concerns about danger, safety, and trust, and by social interactions recommendations from social norms, health care providers, and information processing **(Kahn, Brown, Foege, Gayle, and National Academies of Sciences, Engineering, and Medicine, 2020)**.

Significance of the study:

With more cases and reports of viral variants in the United Kingdom, Brazil, and South Africa as well as the transmission of the variants to other nations, there is an increasing need for vaccination acceptance **(Kelekar, Lucia, Afonso, & Mascarenhas, 2021).** Pregnant women are the first group identified by WHO as being at risk for infection, thus they are the perfect audience for educational sessions since their decision on immunisation will have an impact on both their health and the health of their unborn children **(Salmon, Dudley, Glanz, & Omer, 2015; Danchin, et al., 2018).**

SARS-CoV-2 vaccinations must be made available, and vaccination campaigns must be created to boost the population's immunisation rate **(Lai, Shih, KO, Tang, & Hsueh, 2020).** To increase pregnant women's acceptance and uptake of the COVID-19 vaccine, systematic methods should be put into place.

The uptake of vaccinations could be considerably increased by a few coordinated measures, such as training and teaching sessions, simple vaccine access, and post-vaccination rewards **(Robbins, Ward, & Skinner, 2011; Bonanni, et al., 2018)**.

Aim of the Study

This study aimed to investigate the effect of educational sessions on COVID-19 vaccine hesitancy among pregnant women.

Hypotheses

To fulfill the aim of this study, two hypotheses were tested:

- **Hypothesis I:** Pregnant women who attend the educational sessions exhibit lower level of COVID-19 vaccine hesitancy after the

sessions than before the sessions.

- **Hypothesis II:** Pregnant women who attend the educational sessions exhibit lower scores for COVID-19 vaccine conspiracy beliefs after the sessions than before the sessions.

Operational definition

COVID-19 vaccine hesitancy refers to a delay in acceptance of COVID-19 vaccines or refusal to take a COVID-19 vaccine despite the availability of vaccination services.

COVID-19 vaccine conspiracy beliefs refer to a negative attitude toward the vaccine science that predicted the intention to be vaccinated against COVID-19 in the future.

Subjects and Methods

Research Design

The current study used a quasi-experimental research methodology, (pre-and post-test design). A quasi-experiment is empirical experimental research that does not involve control group and is used to determine the causal influence of an intervention on a target population.

Study Setting

This study was conducted at the antenatal clinics in the Obstetrics and Gynecological Department at Mansoura University Hospitals. Antenatal clinics provide free antenatal care services to pregnant women. They are located on the first floor and consist of a waiting hall with approximately 30 chairs, 1 laboratory, and 3 examination rooms; one of the rooms is used for four-dimensional ultrasound, and the other two rooms are used for routine medical examination. Each examination room consists of three coach chairs, a weight scale, a sphygmomanometer, and ultrasound. The antenatal clinics are open all days of the week, from 9.00 a.m. to 2.00 p.m., except for Thursday and Friday.

Sampling

The present study was conducted from the beginning of September 2021 to the end of November 2021. The sampling included a purposive sample of 159 pregnant women who attended the Antenatal Clinic in the Obstetric and Gynecological Department at Mansoura University Hospitals. Pregnant women were eligible to enroll in this study if they met the following criteria: age between 18 and 44 years, able to read and write, had a normal singleton pregnancy, and were in the third trimester of pregnancy (27–40 weeks of gestation).

Sample Size: Based on data from the literature ***(Bruno et al., 2021)***, considering a level of significance of 5% and power of 80%, the sample size was calculated using the following formula: n = n = $[2(Z_{\alpha/2} + Z_{\beta})^2 \times p\ (1\text{-}p)]/(p1 - p2)^2$, where, p = pooled proportion obtained from previous study, $Z_{\alpha/2}$ (=1.96, for a 5% level of significance) and Z_{β} (equal to 0.84 for 80% power of study). Therefore, n = $[(1.96 + 0.84)^2 \times \{2(0.974)^2\}]/ (2.7)^2$ = 158.9. Accordingly, the sample size required was 159.

Data Collection Tools: *Tool I: Structured interview questionnaire: this instrument was developed after reviewing the relevant literature* ***(Stawicki et al., 2020; Bruno et al., 2021; Kerdoun et al., 2021)****. The aim was to assess the general characteristics of pregnant women. The questionnaire included two parts: the first part involved the general characteristics of the pregnant women such as age, level of education, residence, pre-COVID-19 pandemic employment status, employment change due to the COVID-19 pandemic, and the history of COVID-19 infection. The second part included the pregnant women`s obstetric history such as gravidity, gestational age, number of living children, and mode of previous deliveries.*

Tool II: Oxford COVID-19 Vaccine Hesitancy Scale

Tool II was adapted from was adopted from **Freeman et al. (2020)** to assess COVID-19 vaccine hesitancy. It consisted of seven questions [e.g., 'If there is a COVID-19 vaccine available?' I would (1) get it as soon as possible, (2) take it when offered, (3) not sure what I will do, (4) delay getting it, (5) refuse to get it]. The level of vaccine hesitancy was defined as willing (answer 1 or 2), doubtful (answer 3), or strongly hesitant (answer 4 or 5).

The COVID-19 Vaccine Hesitancy Scale rated item specific response options coded from 1 to 5. Scores ranged between 7 and 35, with higher scores indicating higher COVID-19 vaccine hesitancy. The total score of vaccine hesitancy was determined according to the responses: a response of 1 or 2 for each item was categorized as willing to have the COVID-19 vaccine; a response of 3 or 4 for each item was categorized as doubtful to have the COVID-19 vaccine, and a response of 5 was categorized as strongly hesitant to have the COVID-19 vaccine.

Tool III: Vaccine Conspiracy Beliefs Scale. This tool was adapted from **Shapiro, Holding, Perez, Amsel, & Rosberger (2016).** It was used to assess pregnant women's negative attitudes toward COVID-19 vaccines and their intentions to be vaccinated against COVID-19 in the future. It consisted of seven-items and the questionnaire asked participants how much they agreed on a seven-point scale with vaccine conspiracy statements [e.g., 'Vaccine safety data is often fabricated (made up).' (1) strongly disagree, (2) disagree, (3) somewhat disagree, (4) neutral, (5) somewhat agree, (6) agree, (7) strongly agree]. A one-factor Confirmation Factor Analysis model suggested a good fit for the seven points. Higher ratings suggested that conspiracy theories were more widely supported.

Validity. Panels of five nursing experts tested the tools in the field of maternity nursing. Their suggested configurations were made, such as the rephrasing of some sentences.

***Reliability*:** The tools were assessed by Cronbach's alpha to assess the internal consistency of the tools, which was 0.905 for Oxford COVID-19 Vaccine Hesitancy Scale; 0.894 for COVID-19 Vaccine Conspiracy Beliefs.

***Pilot Study*:** Pilot research on 10% of the total sample size of 16 pregnant women was conducted to evaluate the tools' applicability and clarity as well as to determine how long they would take to complete. The entire sample did not include any of the pilot study's pregnant participants.

Research Process: Four phases were performed to fulfill the research aim, namely, the preparatory, assessment, implementation, and evaluation phases.

Preparatory phase

During the preparatory phase, we collected relevant national and international literature related to the study, designed and validated the tools, and finally conducted the pilot study. Development of the content of the educational sessions was initially carried out by the researchers, and then the study tools were designed based on a review of the relevant literature. A booklet with illustrations in color was used to reinforce the health information provided in the educational sessions. The booklet was written in a simple Arabic language, and it covered the following: the meaning of the term vaccine, how vaccines function, types of vaccines, adverse reactions, and myths.

Interviewing and assessment phase

Early in the morning, the researchers went to the previously mentioned settings and checked the registration book to detect pregnant women who met the inclusion criteria. The researchers then met pregnant women individually and invited them to participate in the study. After they agreed to participate, the researcher informed the pregnant women about the aim of the study and the time required for participation. Once written consent was obtained, the researchers distributed three pre-test tools to record the general characteristics of the pregnant women (Tool I Structured Interview Questionnaire**)** and to take a baseline assessment of pregnant women's COVID-19 vaccine hesitancy levels (Tool II Oxford COVID-19 Vaccine Hesitancy Scale) and assess the pregnant women's negative attitudes toward the vaccines, which predicted negative intentions to be vaccinated against COVID-19 in the future (Tool III Vaccine Conspiracy Beliefs). Completing the questionnaire took about 20 minutes.

Implementation of the educational sessions phase

The colored Covid-19 vaccine booklet was given to the pregnant women before initiating the health education sessions. The educational sessions were split into two sessions. In the first educational session, the researcher illustrated information regarding the meaning, function, and types of vaccines. The second session illustrated vaccine adverse reactions and myths. Each session took about 20–40 minutes. Small groups of 5–10 pregnant women participated in the educational sessions. Participants were encouraged to ask questions at the end of the educational sessions. After the end of the first session, the contact numbers of the participants were obtained. The required time for the next visit was determined according to the schedule of antenatal visits. The second session was carried out at the next antenatal visit.

Evaluation Phase

The effect of the educational sessions was determined by assessing the pregnant women's COVID-19 vaccine hesitancy according to the Oxford COVID-19 Vaccine Hesitancy Scale and Vaccine Conspiracy Beliefs Scale, which

were the same tools used for pre-intervention assessment. The evaluation tools were distributed immediately after the second session.

Ethical Considerations:

Mansoura University's Faculty of Nursing Research Ethics Committee provided a letter of ethical approval for the study. Additionally, the Director of the Obstetric and Gynecological Department at Mansoura University Hospital gave his official approval for the study to be carried out. Every participant in the study was asked for their written agreement after it had been made clear what the study's goals, objectives, risks, and benefits were. All participants were given assurances regarding the privacy of the information gathered and the security of the intervention. The option to withdraw from the study was also available.

Statistical Analysis:

All statistical analyses were performed with SPSS for windows version 20.0 (SPSS, Chicago, IL). All continuous data were normally distributed and were expressed as the mean ±standard deviation (SD). Categorical data were expressed in numbers and percentages. Student's *t*-test was used for comparisons between two variables with continuous data, while a one-way analysis of variance (ANOVA) was used for comparisons of more than two variables with continuous data. A Chi-squared test was used for comparisons of variables with categorical data. The reliability (internal consistency) of the questionnaire used in the study was calculated. Statistical significance was set at $p < 0.05$.

Results

Table 1 shows the mean age of the studied pregnant women was 25.6 ±3.7 years. Table 1 presents that, 95% and 88% respectively of pregnant women were married and had a positive test for COVID-19 before pregnancy. In addition, 87.4% and 83.6%, respectively, reported no employment changes due to the COVID-19 pandemic and the women were from rural areas. Also, 74.8% of the participants had a middle education.

Table 2 shows that 71.7% of the studied pregnant women were pregnant for a second time and had one living child. 85.5% of the participants had a gestational age between 34–40 weeks. In addition, 63.52% delivered via cesarean section.

Table 3 shows that 66.7% of the studied pregnant women would accept taking the COVID-19 vaccine if it was offered after the educational sessions compared to 39% before the sessions. In addition, 57.3% of the studied pregnant women reported that they would get the COVID-19 vaccine as soon as possible once it was available after the educational sessions compared to 22.6% before the sessions. A total of 47.8% defined their attitude as very keen to receive the COVID-19 vaccine after the educational sessions compared to 13.8% before the session. Moreover, Table 3 illustrates that 34.6% of the participants stated that they would get the COVID-19 vaccine as soon as possible if it was available at the local pharmacy after the educational sessions compared to 11.3% before the sessions. Additionally, 44.6% of the studied pregnant women stated that they would strongly encourage their family or friends if they were thinking of getting vaccination after the educational sessions compared to 7.5% before the sessions. Table 3 shows that, 35.2 % of the studied pregnant women described themselves as eager to get a COVID-19 vaccine after the educational sessions compared to 12.6% before the sessions. Furthermore, 40.9% of the studied pregnant women stated that taking a COVID-19 vaccination is really important after the educational sessions compared to no one before the educational sessions. As is obvious in Table 3, there were highly statistically significant differences in all elements of the Oxford COVID-19 vaccine hesitancy results between pre- and post-intervention ($p<0.001$).

Figure 1 shows that 74.8% of the studied pregnant women reported that they were willing to take the COVID-19 vaccine after the educational sessions compared to 11.9% before the sessions. In addition, 62.3% were doubtful about taking the vaccine before the educational sessions compared to 17.6% post-intervention. Furthermore, only 7.5% of the studied pregnant women were strongly hesitant to take the vaccine after the educational sessions compared to 25.8% before the sessions. There were highly statistically significant differences between pre- and post-intervention regarding the level of COVID-19 hesitancy ($p<0.001$).

Table 4 shows evidence that (63.5% and 61.0%, respectively) of the studied pregnant women agreed that COVID-19 vaccine safety data is often fabricated and that immunizing pregnant women is harmful before the educational sessions compared to (1.3% and 4.4%, respectively) after the educational sessions. In addition, (63.5%, 61.6%, and 60.4%, respectively) of the studied pregnant women agreed that there is a deception about the COVID-19 vaccine safety, there is a link between the vaccines and autism and the government is trying to cover up this, and that COVID-19 vaccine effectiveness data is often fabricated before the intervention compared to (6.3%, 6.9%, and 6.9%, respectively) after the educational sessions. Furthermore, (55.3% and 54.7%, respectively) of the studied pregnant women agreed that the dangers of vaccines were cover up by the pharmaceutical companies in addition to that people are deceived about the effectiveness of vaccines before the educational sessions compared to (3.1% and 5.0%, respectively) after the educational sessions. There were highly statistically significant differences in all elements of COVID-19 Vaccine Conspiracy Beliefs Scale results between pre- and post-intervention ($p<0.001$).

Figure 2 illustrates that (59.7%) of the studied pregnant women had COVID-19 vaccine conspiracy beliefs before the educational sessions compared to 5.0% after the educational sessions. There were highly statistically significant differences between pre- and post-intervention regarding COVID-19 Vaccine Conspiracy Beliefs results ($p < 0.001$).

Table 5 shows that there was a positive association between the results from the COVID-19 Vaccine Hesitancy and COVID-19 Vaccine Conspiracy Beliefs tools before and after the educational sessions ($p<0.001$**).

Table 1: General characteristics of the studied pregnant women (N =159)

Variables	NO.	%
Age in years		
18–24	72	45.3
25–34	87	54.7
Mean ±SD 25.6 ±3.7		
Marital status		
Married	151	95.0
Divorced	5	3.1
Widow	3	1.9
Level of education		
Middle education	119	74.8
University	34	21.4
Postgraduate	6	3.8
Residence		
Urban	26	16.4
Rural	133	83.6
Pre-COVID-19 pandemic work status		
Not working	121	76.1
Working	38	23.9
Employment changes due to COVID-19 pandemic		
None	139	87.4
None but working from different locations	20	12.6
Had COVID-19 before pregnancy		
Yes, had a positive test	140	88
Might have had it but was not tested	13	8.2
Not had it but was not tested	6	3.8

Table 2: Obstetric history of the studied pregnant women (N =159)

Variables	NO.	%
Gravidity		
1	23	14.5
2	114	71.7
3–5	22	13.8
Gestational age		
27–33	23	14.5
34–40	136	85.5
Mean ±SD	31.9 ±5.4	
Number of living children		
None	30	18.9
1	114	71.7
2	15	9.4
Mode of previous deliveries		
Not delivered	29	18.23
Vaginal Delivery	29	18.23
Cesarean Section	101	63.52

Table 3: COVID-19 Vaccine Hesitancy Scale scores of the studied pregnant women (N =159)

Items of COVID-19 Vaccine Hesitancy	Pre		Post		Chi-Squared	
	NO.	%	NO.	%	X^2	P
1. If COVID-19 vaccine is offered Would you take it?						
Definitely	62	39	106	66.7		
Probably	11	6.9	19	11.9		
I may or I may not	35	22.0	21	13.2		
Probably not	44	27.7	13	8.2		
Definitely not	7	4.4	0	0.0	41.016	<0.001**
2. What will you do If there was a COVID-19 vaccine available?						
I will want to get it as soon as possible	36	22.6	91	57.3		
I will take it when offered	13	8.2	29	18.2		
I'm not sure what I will do	82	51.6	32	20.1		
I will put off (delay) getting it	21	13.2	5	3.1		
I will refuse to get it	7	4.4	2	1.3	64.467	<0.001**
3. How can you describe your attitude toward receiving COVOD-19 vaccine?						
Very keen	22	13.8	76	47.8		
Pretty positive	32	20.1	43	27.0		
Neutral	58	36.5	21	13.2		
Quite uneasy	29	18.3	12	7.6		
Against it	18	11.3	7	4.4	60.586	<0.001**
4. What will you do if a COVID-19 vaccine was available at your local pharmacy?						
Get it as soon as possible	18	11.3	55	34.6		
Get it when I have time	19	12.0	38	23.9		
Delay getting it	76	47.8	42	26.4		
Avoid getting it for as long as possible	32	20.1	18	11.3		
Never get it	14	8.8	6	3.8	42.003	<0.001**
5. What will you do if your family or friends were thinking of getting a vaccination?						
Strongly, i will encourage them	12	7.5	71	44.6		
Encourage them if I can	12	7.5	52	32.7		
Not say anything	35	22.1	13	8.2		
Ask them to delay the idea of taking the vaccine	67	42.1	17	10.7		
Suggest not take the step	33	20.8	6	3.8	125.477	<0.001**
6. How can you describe yourself?						
Eager to get the vaccine	20	12.6	56	35.2		
Willing to get the vaccine	19	11.9	45	28.3		
Not bothered about getting the vaccine	53	33.3	28	17.6		
Unwilling to get the vaccine	44	27.7	19	12.0		
Anti-vaccination	23	14.5	11	6.9	49.487	<0.001**
7. For you taking a COVID-19 vaccination is						
Consider really important	0	0.0	65	40.9		
Important	2	1.3	40	25.2		
Neither important nor unimportant	88	55.3	38	23.9		
Unimportant	46	28.9	12	7.5		
Really unimportant	23	14.5	4	2.5	152.523	<0.001**

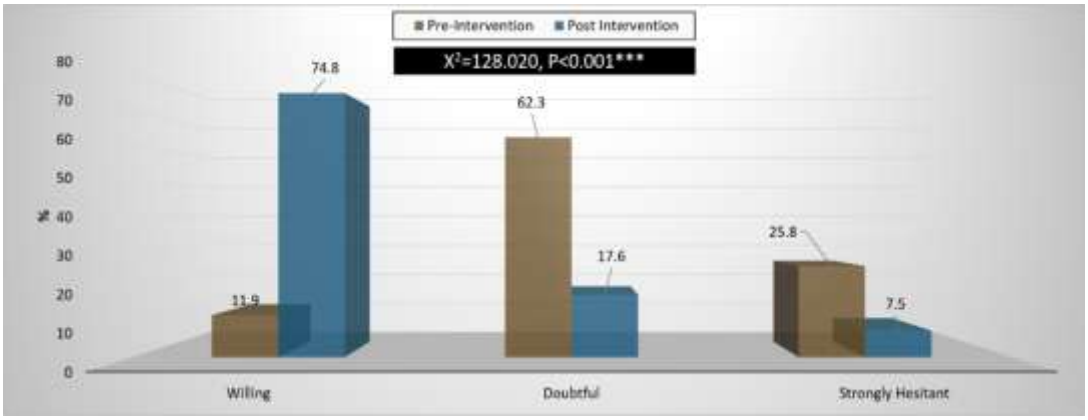

Figure 1. Distribution of COVID-19 Vaccine Hesitancy Scale scores (N = 159)

Table 4. COVID-19 Vaccine Conspiracy Beliefs among the studied pregnant women (N=159)

COVID-19 Vaccine Conspiracy Beliefs	Pre						Post						Chi-Square	
	Disagree		Don't Know		Agree		Disagree		Don't Know		Agree			
	(N= 159)						(N= 159)							
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	X^2	P
1. I think that vaccine safety data is often fabricated.	37	23.3	21	13.2	101	63.5	146	91.8	11	6.9	2	1.3	163.203	<0.001**
2. I think that immunizing pregnant women is harmful, and this fact is covered up.	49	30.8	13	8.2	97	61.0	140	88.1	12	7.5	7	4.4	121.739	<0.001**
3. I think that the dangers of vaccines were covered up by the pharmaceutical companies	60	37.7	11	6.9	88	55.3	144	90.6	10	6.3	5	3.1	108.711	<0.001**
4. I think that people are deceived about the effectiveness of vaccines.	53	33.3	19	11.9	87	54.7	137	86.2	14	8.8	8	5.0	103.589	<0.001**
5. I think that vaccine effectiveness data is often fabricated.	48	30.2	15	9.4	96	60.4	138	86.8	10	6.3	11	6.9	112.071	<0.001**
6. I think that people are deceived about vaccine safety.	44	34.0	14	2.5	101	63.5	140	88.1	9	5.7	10	6.3	114.650	<0.001**
7. I think that the government is trying to cover up the link between vaccines and autism.	49	30.8	12	7.5	98	61.6	140	88.1	8	5.0	11	6.9	114.055	<0.001**

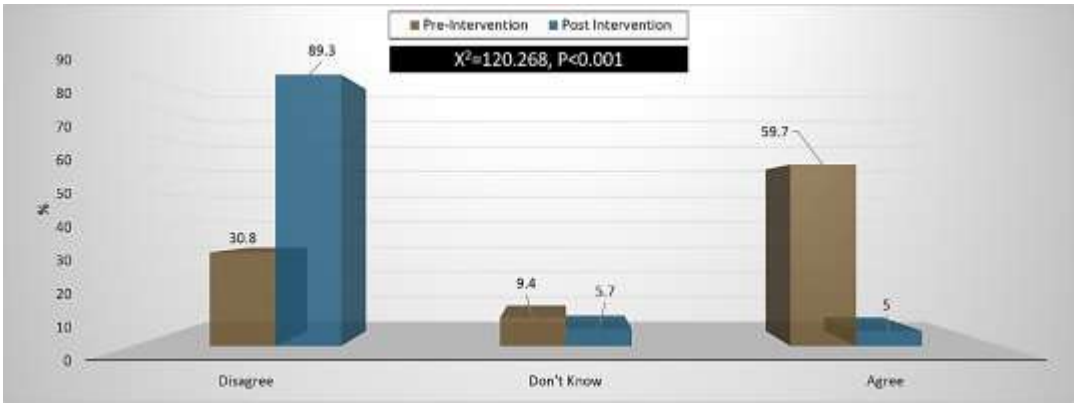

Figure 2. Total scores of the COVID-19 Vaccine Conspiracy Beliefs tool

Table 5. Association between total COVID-19 Vaccine Conspiracy Beliefs and level of Covid-19 Vaccine Hesitancy total scores (N= 159)

Level of vaccine hesitancy	Pre						Post					
	Disagree (N =49)		Don't Know (N= 15)		Agree (N= 95)		Disagree (N = 142)		Don't Know (N=9)		Agree (N = 8)	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
Vaccine Conspiracy Beliefs												
Willing	13	26.5	0	0.0	6	6.3	115	81.0	2	22.2	2	25.0
Doubtful	36	73.5	15	100.0	48	50.5	25	17.6	0	0.0	3	37.5
Strongly Hesitant	0	0.0	0	0.0	41	43.2	2	1.4	7	77.8	3	37.5
Chi-Square		**47.176**			**<0.001****				**85.502**		**<0.001****	

Discussion

The current study designed to examine the effects of educational sessions on COVID-19 vaccine hesitancy among pregnant women. The current study stated that the hesitancy of the studied pregnant women to COVID-19 vaccines was reduced from more than one-quarter strongly hesitant before the educational sessions to minimal percent after the sessions, with a highly statistically significant difference, after the educational sessions than before the sessions. In addition, almost three-quarters of the studied pregnant women reported that they were willing to take a COVID-19 vaccine after the educational sessions compared to minimal percent before the sessions. These study findings may be attributed to the simplicity and clarity of the illustrated educational materials provided during the educational sessions.

This study finding is consistent with a randomized controlled trial performed by **Freeman et al. (2021)** in the UK that investigated the effects of written vaccination information on COVID-19 vaccine hesitancy among 15,014 adults in the UK. They concluded that vaccine hesitancy was reduced from more than one-quarter before the intervention to less than one-fifth after the intervention. In addition, the percentage of their participants who were willing to take the vaccine increased to more than three-quarters after providing the vaccine information. This similarity with the present study finding may indicate that the provision of the educational materials is an essential step to decrease COVID-19 vaccine hesitancy.

Similarly, an experimental survey conducted by **Palm, Bolsen, and Kingsland, (2021)** investigated the effect of different types of messages on both the safety and efficacy of COVID-19 vaccines on the decision to accept a vaccine. They found that their participants reported increased intentions to get the vaccine after receiving the educational tools**.** Another recent supporting study in America, conducted

by Motta,(2021), noticed that people's intentions to receive a COVID-19 vaccine increased when given information explicitly about its safety.

Contrarily, a quasi-experimental study was conducted by **Loomba, de Figueiredo, Piatek, de Graaf, and Larson,** (**2021**) to assess the effect of accurate information on the benefits of vaccination and population acceptance. They found that there were slightly higher acceptances in the group who received factual information than those who received misinformation.

Thus, the first study hypothesis was supported. The current study findings showed that**,** the conspiracy beliefs were among half of the studied pregnant women before the educational sessions compared to minimal percent after the educational sessions. The findings of this study may be attribute ed to the great need to correct conspiracy beliefs regarding COVID-19 vaccines with a simple, illustrated colored book such as that utilized in the present study.

The current study findings presented that there was a positive association between the total level of vaccine hesitancy and the total scores for conspiracy beliefs. The studied pregnant women who agreed about COVID-19 conspiracy beliefs were hesitant to take the vaccine and vice versa. This study's findings indicated that negative beliefs toward COVID-19 vaccines are a strong contributor to COVID-19 hesitancy. The high vaccine hesitancy before the educational sessions may have contributed to the finding that more than three-fifths of the studied pregnant women perceived that COVID-19 vaccine safety and effectiveness data were often fabricated and immunizing pregnant women is harmful.

In the same line, a cross-sectional survey-based study conducted by **El-Elimat et al, (2021)** in different Jordanian regions indicated that conspiracy beliefs were behind the participants' hesitancy to take the vaccine. Incongruent to the present study findings, a global survey of prospective COVID-19 vaccination acceptability was carried out by **Lazarus et al, (2020)** showed that mistrust in the vaccine was a strong factor for vaccine hesitancy.

Conclusions

The study hypotheses were accepted in the light of the research findings. The level of COVID-19 vaccine hesitation among pregnant women was reduced with the use of COVID-19 educational sessions.

Recommendations

- Applying further research including replicating the current study on a larger population and in different settings, to correct the conspiracy negative beliefs regarding COVID-19 vaccine, which result in a decrease of vaccine hesitancy among pregnant women.
- Education about the benefits of vaccines should be included in antenatal care to decrease vaccine hesitancy.

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