Pregnant Women's Awareness, Beliefs and Self-protective Behaviors Regarding COVID-19 Pandemic: Nursing Intervention Based on Health Belief Model.

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Abstract

Background: COVID-19 is a respiratory infection causing minor to severe complications. Health Belief Model improves pregnant women's awareness, and beliefs and encourages the adoption of self-protective behaviors. **Aim:** The present study aimed to evaluate the effect of nursing intervention based on health belief model regarding COVID-19 pandemic on pregnant women's awareness, beliefs, and self-protective behaviors. **Design:** A quasi-experimental design. **Setting**: The study was conducted at the antenatal outpatient clinics of Mansoura University Hospitals, Egypt. **Subjects:** A purposive sample of one hundred fifty- four pregnant women was divided into intervention and control groups each containing seventy-seven women). **Tools:** an interviewing questionnaire, COVID-19 health belief scale, and COVID-19 self-protective behaviors survey were used for data collection. **Results:** There was no statistically significant difference between the studied groups concerning their general characteristics. Nevertheless, highly statistically significant differences between the studied groups in all areas of COVID-19 awareness and health belief model constructs were found. Furthermore, highly significant positive correlations at P level 0.01 between women's total awareness scores, health belief model scores, and self-protective behaviors regarding COVID-19 for the intervention group than the control group. **Conclusion:** Nursing intervention based on the health belief model positively improved pregnant women's awareness, beliefs, and self-protective behaviors regarding COVID-19 pandemic. **Recommendation:** Nursing interventions for COVID-19 prevention should be provided to all pregnant women at all maternal and child health centers until the virus is completely eradicated.

Keywords: Awareness, Beliefs, COVID-19 pandemic, Health Belief Model, Nursing Intervention.

Introduction:

COVID-19 is a worldwide pandemic that is caused by a novel coronavirus initially discovered late in 2019 in Wuhan city, China, and reached 26 countries by February 2020 **(Wong et. al., 2020; Zhong et. al., 2020)**. According to WHO in August 2021, the total number of confirmed COVID-19 cases worldwide was 213,752,662 with a total of 4,459,381 deaths. While in Egypt, the total number of confirmed cases was 286,938 with a total of 16,691 deaths **(WHO, 2021)**.

This emerging disease is highly infectious and spreads rapidly via droplets resulting from coughing or sneezing **(Barakat & Kasemy, 2020)**. It can be transmitted through close contact with oral secretions and breathing of the infected person, touching instruments, or surfaces contaminated with the virus **(David et. al., 2020)**. Its main symptoms are dry cough, dyspnea, high fever, and fatigue **(Barakat & Kasemy, 2020)**. WHO set some simple precautions to protect the public against COVID-19, such as physical distancing, wearing a mask, having well-ventilated rooms,

avoiding crowded areas, frequent handwashing, coughing into a tissue or a bent elbow and regularly disinfecting surfaces **(WHO, 2020)**.

Pregnant women are at increased risk for serious complications associated with COVID-19 and adverse pregnancy outcomes, such as preterm birth. This risk may be increased when women have specific underlying medical problems, or other factors, such as diabetes, heart problems, old age, and high body mass index **(Centers for Disease Control and Prevention, 2021)**. Additionally, the pregnancy changes make such a group of women more susceptible to infection **(Collin et. al., 2020).** For this reason, all pregnant women need to understand the characteristics of COVID-19 and be aware of its prevention. Women engaging in preventive behaviors have great importance in reducing the likelihood of infection. This is influenced by women's beliefs and awareness because health belief alteration is needed for behavior change **(Kumbeni et. al., 2021).**

Health Belief Model (HBM) is a psychosocial model used to explain individuals' behavior in facing the risk of becoming ill. Person behavior could be changed through detection of the associated factors with beliefs which in turn can affect the decision for engaging in preventive health behaviors. The HBM includes six constructs considering positive factors increase health behaviors while negative factors decrease or inhibit them **(Wong et. al., 2020)**. To adopt a healthy behavior and/or avoid risks of disease, the woman must believe that she is exposed to the disease (perceived susceptibility), believe that the disease has complications and will negatively impact her life (perceived severity), believe that adopting specific behaviors or measures is important to reduce the susceptibility or severity (perceived benefits), overlap important barriers and realize the importance of preventive measures than the needed efforts to do them (perceived barriers), trust his/her abilities to overcome any barriers during applying the protective measures (self-efficacy), use the internal (e.g., previous history for the disease) or external behavior stimuli (e.g., mass media and health team) for further increase the engagement in the preventive behavior (cues for action) **(Costa, 2020)**.

Beliefs about COVID-19 have varied sources including governmental information, medical sources, social media, and previous personal experiences. Correction of these beliefs affects women's behaviors. There may be a potential risk if the women are unaware or if the medical-related beliefs are inaccurate or misunderstood **(Ferdous et. al., 2020)**. Thus, this study was carried out to evaluate the effect of nursing intervention based on HBM regarding COVID-19 pandemic on pregnant women's awareness, beliefs, and self-protective behaviors.

Significance of the study:

COVID-19 is a new respiratory infection that rapidly became widespread in the world. This pandemic has negative impacts on the quality of life; causing minor respiratory diseases that could lead to severe respiratory complications requiring immediate treatment. Up to now, there isn't a definite medication to cure this disease and the preventive measures are the only effective key to the successful prevention of its transmission **(Costa, 2020)**.

The HBM is a model which predicts behavioral outcomes depending on two main dimensions: the desire to avoid certain diseases or infections and the perception of the benefits of the adopted behavior **(Raamkumar et. al., 2020)**. Health Belief Model-based COVID-19 nursing intervention is effective in improving women's awareness and beliefs and encouraging the adoption and sustaining of healthy preventive behaviors **(Elgzar et. al., 2020).** There are limited nursing researches in Egypt on the application of HBM in intervention regarding the COVID-19 pandemic among pregnant women. This stimulates the present study to evaluate the effect of nursing intervention based on health belief model regarding COVID-19 pandemic on pregnant women's awareness, beliefs, and self-protective behaviors.

Aim of the study:

The present study aimed to evaluate the effect of nursing intervention based on the health belief model regarding COVID-19 pandemic on pregnant women's awareness, beliefs, and self-protective behaviors.

Research hypotheses:

H_1: Pregnant women who received Health Belief Model-based COVID-19 nursing intervention had a higher total awareness score than those who don't.

H_2: Pregnant women who received Health Belief Model-based COVID-19 nursing intervention exhibited more positive health beliefs than those who don't.

H_3: Pregnant women who received Health Belief Model-based COVID-19 nursing intervention had improved self-protective behaviors than those who don't.

Operational definitions:

Awareness: pregnant woman's knowledge and understanding of COVID-19.

Perceived susceptibility: woman's perception of being at risk for acquiring COVID-19.

Perceived severity: COVID-19-related negative impact on the pregnant woman.

Perceived benefit: woman's motives for adopting COVID-19 preventive behaviors.

Perceived barrier: difficulties facing the woman to adhere to COVID-19 preventive behaviors.

Self-protective behavior: ability of the pregnant woman to perform healthy protective behaviors against COVID -19.

Subjects and Method:

Study design:

A quasi-experimental design was used in this current study. The effect of the independent variable (i.e., nursing intervention based on the health belief model) on the dependent variables (i.e., pregnant women's awareness, beliefs, and self-protective behaviors regarding COVID-19 pandemic) was evaluated in this study.

Study setting:

This study was conducted at the antenatal outpatient clinics of Mansoura University Hospitals, Egypt which provide antenatal care services for pregnant women from Saturday to Wednesday, from 9 a.m. to 1 p.m.

Sampling:

A non-probability purposive sample of one hundred fifty-four pregnant women attending antenatal outpatient clinics for follow-up was recruited to share in this study. While, pregnant women who were admitted for gynecologic, medical, or surgical reasons were excluded from this study.

Sample size calculation:

The sample size was calculated using G 'power' version 3.1, according to the study of **Elgzar et. al., (2020)** which reported that the total health belief model mean score in the experimental group was 65.04 ±7.66 and the mean score in the control group was 56.10 ± 6.42. Which is significant at the $P < 0.05$ level. Where effect size =0.85 with a significance level ($\alpha = 0.05$) at two-sided independent samples t-test with statistical power = 90%. The calculated total sample was 154 women, 77 women for each group (control and intervention).

Groups' allocation:

Using a closed envelope containing nursing intervention based on the health belief model regarding COVID- 19 group or only routine care group cards, one hundred fifty- four pregnant women who attended the previously

mentioned setting were randomly assigned to two different groups of seventy-seven. The intervention group received both nursing intervention based on HBM and routine hospital care, while the control group received only the routine hospital care.

Tools of data collection:

Three tools were used for data collection; an interviewing questionnaire, COVID-19 health belief scale, and COVID-19 self-protective behaviors survey.

Tool I. An interviewing questionnaire

It was developed by the researchers and included three parts:

Part one: It included the basic demographic data such as age, level of education, occupation and residence.

Part two: It included obstetric history as the duration of the marriage, gravidity, parity, and gestational age.

Part three: COVID-19 awareness questionnaire. This part was developed based on the related literature **(Centers for Disease Control and Prevention, 2019; WHO, 2020 and López et al., 2020)** to assess pregnant women's awareness regarding COVID-19. It included 36 COVID-19-related questions: definition, risk factors, clinical features, modes of transmission, complications, prevention, and control during pregnancy, labor, and postpartum. The scoring system was calculated as: (2) for "correct" answer, (1) for "incorrect" answer, and (0) for "don't know". The total score was equal 72 categorized into "poor, fair, and good awareness" as the following: poor (27 to < 39 scores), fair (39 to < 51 scores), and good (51 to ≥ 64 scores).

Tool II. COVID-19 health belief scale: It was an 18-item scale adopted from **Elgzar et. al., (2020)** to assess pregnant women's beliefs regarding COVID-19. It consisted of six subscales addressing health beliefs: perceived susceptibility (3 items), perceived severity (3 items), perceived barriers (8 items), self-efficacy (1 item), perceived benefits (2 items), and cues for action (1 item). Each item was rated using a 5 point Likert scale with 1 = strongly disagree, 2 = partially disagree, 3 = neutral, 4 = partially agree, and 5 = strongly agree except for perceived barriers, the reverse score was calculated (5 = strongly disagree, 4 = partially disagree, 3 = neutral, 2 = partially agree, and 1 = strongly agree).

Tool III. COVID-19 self-protective behaviors survey: It was a 27-item self-report descriptive survey developed based on NIPH and WHO guidelines **(National Institute for Public Health, 2020; WHO, 2020)** to assess pregnant women's engagement in COVID-19 self-protective behaviors involving eight subscales as handwashing, wearing masking, personal hygiene, nutrition & vitamins during pregnancy, physical rest, exercises during pregnancy, cleaning surrounding environment and social distance using a 5-point scale (always= 5, often= 4, sometimes=3, rarely=2 and never=1).

Tools validity and reliability

The developed tools were tested for clarity, relevance, comprehensiveness, and applicability by 3 experts in woman's health and midwifery nursing. Tools reliability was done for internal consistency using Cronbach's Alpha coefficient test. It was 0.94 for the COVID-19 awareness questionnaire, 0.81 for the COVID-19 health belief scale, and 0.95 for the COVID-19 self-protective behaviors survey.

Ethical considerations

Official approval was taken from the research ethics committee of the Faculty of Nursing, Mansoura University, Egypt to carry out this study. Informed written consent was signed by women after clarification of the study purpose and approach. Women's privacy was maintained. The women were informed that their participation was voluntary and that they can withdraw from the study at any time.

Pilot study

It was performed from 15/4/2021 to 15/5/2021 on 15 pregnant women to assess the feasibility and applicability of the study tools, estimate the time required to be answered, and test the feasibility of fieldwork. Necessary modifications were done based on the findings. The women in the pilot study were excluded from the study sample.

Research process

This study was carried out for 6 months from the beginning of June to the end of November 2021. The researcher visited the previously mentioned setting on Saturday, Monday & Wednesday weekly from 9 a.m. to 1 p.m. Implementation of the study was done through four phases: preparatory, assessment, implementation, and outcome evaluation.

Preparatory phase

This phase included a massive review of related literature concerning the research problem. After that, tools of the nursing intervention regarding the COVID-19 pandemic based on the HBM were developed teaching methods were decided and the educational material (an Arabic simple booklet) was designed to provide information on COVID-19.

- **Assessment phase**

1.In the beginning, the researcher followed protective measures such as handwashing and wearing protective gloves and masks before meeting the pregnant women at antenatal outpatient clinics of Mansoura University Hospitals to protect herself and other pregnant women from COVID-19 infection.

2.The researcher introduced herself to each pregnant woman included in the control group, clarified the study purpose, and obtain their consent to participate in the study.

3.The women's basic demographics and obstetric history were collected by using an interviewing questionnaire. Also, women's beliefs regarding COVID-19 and their engagement in COVID-19 self-protective behaviors were assessed by the COVID-19 health belief scale and the COVID-19 self-protective behaviors survey respectively as a pretest. No intervention was given to the women in the control group except for follow-up care they received from outpatient antenatal clinics.

4.A total of (3-4) pregnant women were interviewed on Saturday, Monday & Wednesday. Each woman was assessed separately for 30 mins with the previously mentioned three tools. The obtained data constituted the baseline for further comparison to evaluate the effect of the nursing intervention.

Objectives of nursing intervention

General objective: help the studied women to acquire all the essential knowledge and self-protective behaviors about COVID -19 infection.

Specific objectives: each pregnant woman recruited in this study would be able to:

- Define COVID-19 infection
- Identify risk factors, modes of transmission, and complications.
- Mention COVID-19 prevention and control during pregnancy, labor, and postpartum.
- Apply COVID -19 self-protective behaviors during pregnancy.

- **Implementation phase**

1.The researcher introduced herself to each pregnant woman in the intervention group, clarified the study purpose, and obtain their consent to share in the study. The women's basic demographics and obstetric history were collected by using an interviewing questionnaire. Also, women's beliefs regarding COVID-19 and their engagement in COVID-19 self-protective behaviors were assessed by the COVID-19 health belief scale and the COVID-19 self-protective behaviors survey respectively as a pretest.

2.After that, nursing intervention based on the health belief model was provided by the researcher in the waiting room of the antenatal clinic in the form of two educational sessions of 45 mins. The first session lasted 30 mins for

theoretical and the second session lasted 15 mins for practical education. During the theoretical session, the researcher gave information to pregnant women about COVID-19 infection as definition, clinical features, risk factors, modes of transmission, complications, treatment, prevention & control during pregnancy, labor, and postpartum. During the practical session, the researcher educated women on how to apply self-protective behaviors against COVID-19 infection as how to perform handwashing, wearing a protective face mask, removing and how to get rid of it, measures of social distance, measures of increasing oral hydration, rest, sleep, and follow up. Lectures, group discussion, demonstration, posters, short videos, and slides were used as teaching methods.

3.Total educational intervention time reached 72 hours / 8 weeks, with 9 hours /week-3 hours /each day the researcher attended the antenatal clinic. COVID-19 booklets were used as educational materials and distributed to the women at the end of the last session for the intervention group and after evaluation for the control group.

4.Each woman in the intervention group was stimulated and instructed through the telephone to start and continue COVID- 19 self-protective behaviors after the education.

- **Outcome evaluation phase**

Pregnant women's awareness, beliefs, and self-protective behaviors of both groups were evaluated one month after completion of the sessions using the same previous tools.

Statistical Analysis:

Statistical Package for Social Sciences (SPSS) version 18.0 was used for data analysis. Quality control was done at the stages of coding and data entry. Data were presented using descriptive statistics in the form of frequencies, percentages for qualitative variables, and means and standard deviations for quantitative variables. Qualitative variables were compared using the (χ^2) test while paired (t) test comparison of quantitative data. Mann Whitney for rank values (from Non-Gaussian Population) to compare two unpaired groups & Cronbach's Alpha to test the reliability of the tools. Pearson Correlation Coefficient (r) was done to find the correlation between two quantitative variables. Statistical significance was considered at a P-value < 0.05.

Results:

Table (1) shows no statistically significant differences were found between the two groups in terms of their demographic characteristics (p= > 0.05), indicating that the two groups under study are homogeneous.

Table (2) shows that more than half (55.8%) of the women in the intervention group were married from 1 to 5 years compared to 39 % in the control group. Regarding gravidity, more than two-thirds (64.9 %) of women in the control group were pregnant 2-5 times. As regards the gestational age, it is shown that the mean and standard deviation was 19.22 ± 6.23 in the intervention group, while in the control group it was 20.84 ± 8.19 with no statistically significant differences (P= > 0.05).

Table (3) represents no statistically significant differences were found between the intervention and control groups in all areas of the COVID-19 pre-awareness test as definition, clinical features, modes of transmission, risk factors, complications, practices in pregnancy, practices in labor, and practices in postpartum & treatment at p level 0.05 which indicates the homogeneity of the two groups under study.Table (4) shows no statistically significant differences between the intervention and control groups in the pre-test of health belief model constructs as susceptibility, severity, barriers, self-efficacy, benefits, and cues to action at p level 0.05. This means that the two groups under study are homogenous.

Table (5) demonstrates no statistically significant differences between the intervention and control groups in a pre-test in all areas of COVID-19 self-protective behaviors such as handwashing, wearing the mask, personal hygiene, nutrition & vitamins, physical rest, exercises during pregnancy, cleaning the

environment, and social distance with at p level 0.05. This means that the two groups under study are homogenous.

Table (6) represents highly statistically differences between both groups related to all areas of COVID-19 awareness as definition, clinical features, modes of transmission, risk factors, complications, practices in pregnancy, practices in labor, and practices in postpartum & treatment at p level 0.01.

Figure (1) clarifies that 1.3% of pregnant women in the intervention group had poor awareness scores regarding COVID-19 post-intervention compared to 59.7 % in the control group. Furthermore, the majority of the intervention group (89.6%) had good awareness scores compared to no one in the control group.Table (7) illustrates the mean differences regarding COVID-19 health belief model constructs scores as susceptibility, severity, barriers, self-efficacy, benefits, and cues to action, highly statistically significant differences were found among both groups under the study at p level (0.01).

Table (8) shows highly statistically differences between the intervention and control groups in all items of COVID-19 self-protective behaviors as wearing the mask, personal hygiene, nutrition & vitamins, physical rest, exercises during pregnancy, cleaning the environment, and social distance except handwashing at p level (0.01).

Table (9) shows highly significant positive correlations between women's total scores of awareness, health beliefs, and self-protective behaviors regarding COVID-19 in the intervention compared to the control group at P level 0.01.

Table (1): Distribution of the studied groups according to their demographic characteristics.

Demographic characteristics	Intervention group (n=77)		Control group (n= 77)		Test of significance	P-value
	No.	%	No.	%		
Age (years)						
< 20	18	23.3	13	16.9		
20- < 25	20	26	17	22.1	X^2= 1.79	0.62
25- < 30	19	24.7	23	29.9		
30 and more	20	26	24	31.1		
Mean ± SD	25.73 ± 5.27		26.42 ± 5.12		t= 0.82	0.41
Educational level						
Primary	16	20.8	13	16.9	X^2= 4.58	0.10
Secondary	26	33.8	39	50.6		
University	35	45.4	25	32.5		
Occupation						
Working	37	48.1	34	44.2	X^2= 0.24	0.63
Housewife	40	51.9	43	55.8		
Residence						
Rural	29	37.7	26	33.8	X^2= 0.26	0.61
Urban	48	62.3	51	66.2		

X^2: Chi square test, t: Student t-test. Statistically significant at P < 0.05.

Table (2): Distribution of the studied groups according to their obstetric history.

Obstetric history	Intervention group (n= 77)		Control group (n= 77)		Test of significance	P-value
	No.	%	No.	%		
Duration of marriage						
1-5 yrs	43	55.8	30	39		
6-10 yrs	21	27.3	29	37.6	X^2= 4.40	0.11
> 10 yrs	13	16.9	18	23.4		
Gravidity						
1	32	41.6	27	35.1		
2-5	45	58.4	50	64.9	X^2= 0.68	0.41
Parity						
None	35	45.4	30	39		
One	13	16.9	15	19.5	X^2= 0.67	0.71
Two and more	29	37.7	32	41.5		
Gestational age						
Mean ± SD	19.22 ± 6.23		20.84 ± 8.19		t= 1.38	0.17

X^2: Chi square test, t: Student t-test. Statistically significant at P < 0.05.

Table (3): Mean differences regarding COVID-19 awareness between the studied groups pre-intervention.

Variables	Intervention group (n= 77)		Control Group (n= 77)		U	Z	P-value
	Mean rank	Sum of rank	Mean rank	Sum of rank			
Awareness							
1. Definition	75.12	5784.5	79.88	6150.5	2781.5	0.76	0.45
2. Clinical features	75.14	5786	79.86	6149	2783	0.69	0.49
3. Modes of transmission	75.14	5785.5	79.86	6149.5	2782.5	0.69	0.49
4. Risk factors	74.14	5708.5	80.86	6226.5	2705.5	0.96	0.34
5. Complications	74.26	5718	80.74	6217	2715	0.92	0.36
6. Practices in pregnancy	81.03	6239.5	73.97	5695.5	2692.5	1.004	0.32
7. Practices in labor	74.48	5735	80.52	6200	2732	0.89	0.38
8. Practices in postpartum	76.02	5853.5	78.98	6081.5	2850.5	0.43	0.67
9. Treatment	75.81	5837	79.19	6098	2834	0.50	0.61
Total awareness score	73.14	5631.5	81.86	6303.5	2628.5	1.22	0.22

U: Mann Whitney test.
Statistically significant, If the calculated Z value is > the tabulated Z value at significant level 0.05

Table (4): Mean differences regarding COVID-19 Health Belief Model constructs between the studied groups pre-intervention.

Variables	Intervention group (n= 77)		Control group (n= 77)		U	Z	P-value
	Mean rank	Sum of rank	Mean rank	Sum of rank			
Health Belief Model constructs							
Susceptibility	81.18	6251	73.82	5684	2681	1.04	0.30
Severity	78.95	6079	76.05	5856	2853	0.41	0.68
Barriers	80.34	6186	74.66	5749	2746	0.80	0.43
Self- efficacy	72.10	5551.5	82.90	6383.5	2548.5	1.60	0.11
Benefits	74.30	5721	80.70	6214	2718	0.93	0.35
Cues to action	77.27	5949.5	77.73	5985.5	2946.5	0.09	0.93
Total health belief score	80.65	6210	74.35	5725	2722	0.88	0.38

U: Mann Whitney test. Statistically significant, If the calculated Z value is > the tabulated Z value at significant level 0.05

Table (5): Mean differences regarding COVID-19 self-protective behaviors between the studied groups pre-intervention.

Variables	Intervention group (n= 77)		Control group (n= 77)		U	Z	P-value
	Mean rank	Sum of rank	Mean rank	Sum of rank			
Self-protective behaviors							
Handwashing	78.34	6032	76.66	5903	2900	0.24	0.81
Wearing mask	75.57	5819	79.43	6116	2816	0.55	0.58
Personal hygiene	74.37	5726.5	80.63	6208.5	2723.5	0.88	0.38
Nutrition & vitamins	82.59	6359.5	72.41	5575.5	2572.5	1.50	0.14
Physical rest	77.97	6004	77.03	5931	2928	0.17	0.86
Exercises during pregnancy	78	6006	77	5929	2926	0.17	0.86
Cleaning the environment	74.12	5707	80.88	6228	2704	0.97	0.33
Social distance	73.97	5695.5	81.03	6239.5	2692.5	0.99	0.32
Total behavior score	74.26	5718	80.74	6217	2715	0.90	0.37

U: Mann Whitney test.
Statistically significant, If the calculated Zvalue is > the tabulated Z value at significant level 0.05

Table (6): Mean differences regarding COVID-19 awareness between the studied groups post-intervention.

Variables	Intervention group (n= 77)		Control group (n= 77)		U	Z	P-value
	Mean rank	Sum of rank	Mean rank	Sum of rank			
Awareness							
1. Definition	92.06	7089	62.94	4846	1843	4.48	0.001**
2. Clinical features	86.33	6647.5	68.67	5287.5	2284	3.04	0.002**
3.Modes of transmission	102.8	7915.5	52.2	4019.5	1016.5	7.22	0.001**
4. Risk factors	96.85	7457.5	58.15	4477.5	1474.5	5.6	0.001**
5. Complications	90.26	6950	64.74	4985	1982	3.75	0.001**
6. Practices in pregnancy	109.65	8443	45.35	3492	489	9.42	0.001**
7. Practices in labor	101.38	7806	53.62	4129	1126	7.17	0.001**
8.Practices in postpartum	115.77	8914	39.23	3021	18	10.91	0.001**
9. Treatment	113.06	8705.5	41.94	3229.5	226.5	10.27	0.001**
Total awareness score	114.86	8844.5	40.14	3090.5	87.5	10.41	0.001**

U: Mann Whitney test. ** Highly statistically significant, If the calculated Z value is > the tabulated Z value at p level 0.01.

Figure (1): Percentage distribution of total awareness score of the studied groups regarding COVID -19 post-intervention.

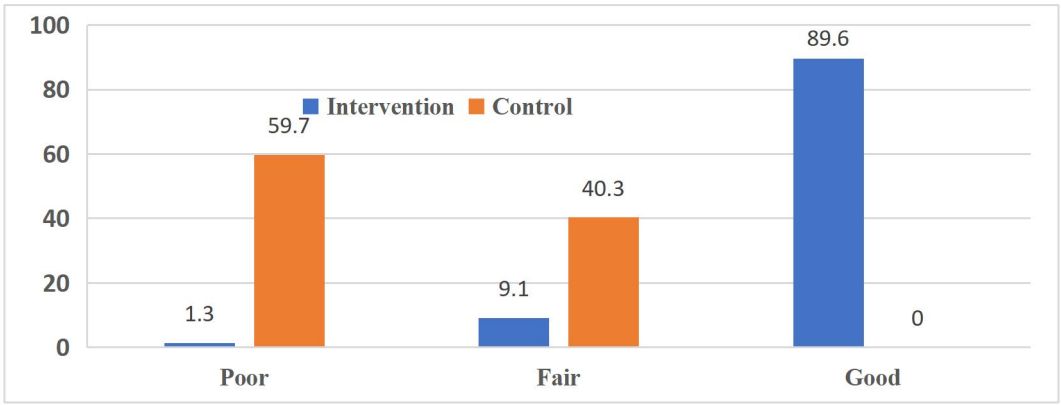

Table (7): Mean differences regarding COVID-19 Health Belief Model constructs scores between the studied groups post-intervention.

Variables	Intervention group (n= 77)		Control group (n= 77)		U	Z	P-value
	Mean rank	Sum of rank	Mean rank	Sum of rank			
Health Belief Model constructs							
Susceptibility	87.98	6774.5	67.02	5160.5	2157.5	3.02	0.003**
Severity	93.47	71975	61.53	4737.5	1734.5	4.50	0.001**
Barriers	93.51	7200	61.49	4735	1732	4.47	0.001**
Self- efficacy	90.21	6946	64.79	4989	1986	3.69	0.001**
Benefits	88.72	6831.5	66.28	5103.5	2100.5	3.17	0.002**
Cues to action	91.60	7053	63.40	4882	1879	4.06	0.001**
Total health belief score	100.11	7708.5	54.89	4226.5	1223.5	6.30	0.001**

U: Mann Whitney test. ** Highly statistically significant, If the calculated Z value is > the tabulated Z value at p level 0.01

Table (8): Mean differences regarding COVID-19 self-protective behaviors between the studied groups post-intervention.

Variables	Intervention group (n= 77)		Control group (n= 77)		Mann Whitney	Z	P-value
	Mean rank	Sum of rank	Mean rank	Sum of rank			
Self-protective behaviors							
Handwashing	81.30	6260	73.70	5675	2672	1.06	0.29
Wearing mask	90.08	6936.50	64.92	4998.50	1995.5	3.52	0.001**
Personal hygiene	98.51	7585.50	56.49	4349.50	1346.5	5.91	0.001**
Nutrition & vitamins	116	8932	39	3003	0.000	10.82	0.001**
Physical rest	115.58	8899.50	39.42	3035.50	32	11.25	0.001**
Exercises during pregnancy	106.5	8200.5	48.5	3734.5	731.5	8.38	0.001**
Cleaning the environment	101.37	7805.50	53.63	4129.50	1126.5	6.81	0.001**
Social distance	110.48	8507	44.52	3428	425	9.21	0.001**
Total self-protective behaviors score	113.15	8712.5	41.85	3222.5	219.5	9.92	0.001**

U: Mann Whitney test. ** Highly statistically significant, If the calculated Z value is > the tabulated Z value at p level 0.01

Table (9): Pearson correlation coefficient between scores of awareness, health beliefs, and self-protective behaviors regarding COVID-19 between the studied groups.

Variables	Intervention group (n= 77)			Control group (n= 77)		
	Awareness	Health beliefs	Self-protective behaviors	Awareness	Health belief	Self-protective behaviors
Awareness						
Health beliefs	r=0.34 P= 0.002**			r=0.21 P= 0.06		
Self-protective behaviours	r=0.42 P= 0.000**	r=0.45 P= 0.000**		r=0.12 P= 0.31	r=0.13 P= 0.28	

r: Pearson correlation coefficient. (**) Highly significant at p level 0.01.

Discussion

The aim of the current study was to evaluate the effect of nursing intervention based on health belief model regarding COVID-19 pandemic on pregnant women's awareness, beliefs, and self-protective behaviors. The findings of the current study revealed statistically significant differences between the studied groups regarding women's awareness, beliefs, and self-protective behaviors about COVID- 19 post-intervention in favor of the intervention group. Furthermore, highly significant positive correlations were reported between scores of awareness, health beliefs, and self-protective behaviors regarding COVID-19 in the intervention group. These findings support the research hypotheses that women who received Health Belief Model-based COVID-19 nursing intervention exhibited higher total awareness, positive beliefs, and improved self-protective behaviors than those who don't.

Regarding pre-intervention pregnant women's total COVID-19 awareness scores between the intervention and control group, no statistically significant differences were found in all items of COVID-19 awareness. This result may be related to inadequate knowledge of pregnant women about COVID 19. In addition to the weak transmission of information from caregivers to pregnant women and less efficacy of non-systematic education

than model-based education in health care centers.

Concerning COVID-19 awareness between the intervention and control group post-intervention, the current study reported a statistically significant improvement in total awareness scores also, the researchers interpreted that improvement in pregnant women's awareness regarding COVID-19 due to the positive effect of the nursing intervention based on the HBM, that emphasized the importance and efficiency of the health belief model in increasing awareness of the pregnant women about COVID-19 pandemic. These findings were similar to **Elgzar et al., (2020)** who studied the impact of an educational intervention based on a health belief model on nursing students' awareness and health beliefs during the COVID-19 outbreak in Saudi Arabia. They clarified that participants in the intervention group had increased their awareness of COVID-19 after implementing the program.

Also, **Mohamed et. al., (2020)** assessed the effect of a health education intervention on pregnant women's knowledge, attitude, and self-protective practice regarding coronavirus prevention in Kalioubia Governorate, Egypt. They reported the majority of the subjects in the study group had a good level of knowledge versus more than two-thirds of the control group had a poor level of knowledge. In addition, a Chinese study conducted in psychiatric hospitals by **Shi et. al., (2020)** evaluated the awareness and attitudes of the medical staff toward COVID-19. It demonstrated good awareness scores among the majority of subjects.

Concerning pregnant women's awareness regarding the definition and clinical features of COVID-19, the present study revealed that highly statistically significant differences were found between the intervention and control groups in the area of COVID-19 definition & clinical features. This may be related to the intervention group's deep understanding of the information provided in nursing intervention regarding COVID-19 and also, reflected the fact that each person must be aware of every item related to this pandemic.

The same results were found in the study of **Mohamed et. al., (2020)** who revealed that the majority of the study group had correct answers regarding the definition of COVID-19 as a viral infection that affects the respiratory system, fever & dyspnea are signs and symptoms of COVID-19 compared to more than two-fifth of the control group. Also, the study by **Alzoubi et. al., (2020)** assessed COVID-19 knowledge, attitude, and practice among medical and non-medical university students in Jordan and reported that the majority of students knew the common clinical manifestations of COVID-19 were fever, cough, and dyspnea.

Moreover, such similarity was observed in the study of **Mohamed et. al., (2020)** which revealed that more than two-thirds of the control group had incorrect answers concerning risk groups for COVID 19: patients with heart disease, chronic kidney & lung diseases, and obesity. This might be due to inadequate knowledge they had and a lack of educational programs before. While on the other hand, the majority of the study group had correct answers regarding liver disease and severe obesity are major risk groups for COVID- 19. These findings matched with **Miller, (2020)**, who studied transmission and risk factors of COVID-19. He stated that more risk factors for a more severe course of COVID-19 currently include people who are or have liver disease, as well as those with a body mass index of 40 or higher.

In addition, the study was done by **Nwafor et. al., (2020)** titled knowledge and practice of preventive measures against COVID-19 infection among pregnant women in a low-resource African setting, found that the study participants had the following level of knowledge concerning COVID-19 preventive measures; (93.7%) of participant frequently handwashing with soap and water or rubbing hands with alcohol-based sanitizers, (87.7%) of them maintaining at least 1-meter distance between themselves and others, (75%) of them

avoiding touching eyes, nose and mouth with hands, (97.5%) of women covering mouth and nose when coughing or sneezing, also, (98.6%) wearing a facemask in public and (74.3%) staying indoor. As regards the treatment of COVID-19, the current study was consistent with **Huang et. al., (2020)** who conducted a study in Wuhan, China, on clinical features of patients infected with the 2019 novel coronavirus. They revealed that patients know the unavailability of specific treatments and vaccines.

Regarding total scores of COVID-19 HBM constructs before conducting the intervention, no statistically significant differences between the intervention and control group were reported. This may be due to inadequate awareness of the studied groups about COVID-19 before the intervention which negatively affects their health belief. While post-intervention results revealed statistically significant differences between both groups regarding pregnant women's health beliefs model constructs. This can be interpreted as the positive effect of the educational intervention regarding this pandemic enhanced pregnant women's awareness and drastically affected their health beliefs helping them acquire a more negative attitude towards the disease and adopt protective measures against the disease. Furthermore, to prevent health problems, the individual should first feel personally susceptible, be able to predict the possible disease seriousness, believe in the benefits of practicing prescribed health habits, and be able to resolve the costs of practicing that particular behavior.

These results were consistent with **Elgzar et. al., (2020)** who found that the total mean score of HBM in the intervention group has been increased following the program. Furthermore, **Mehanna et. al., (2021)** in a Sudanese study used a health belief model to determine the adherence of the public to COVID-19 precautionary measures. They reported that most of the study's participants believed in being susceptible to the disease, whether via contact with infected people or through contact with virus-in-contaminated surfaces or tools. Additionally, participants scored high marks on their health beliefs regarding their adherence to protective measures.

As regards COVID-19 self-protective behaviors pre-intervention, no significant differences were found between the intervention and control groups. While highly statistically significant differences were found in the mean ranks regarding all terms of COVID-19 self-protective behaviors post-intervention as wearing a mask, personal hygiene, nutrition & vitamins during pregnancy, physical rest, exercises during pregnancy, cleaning the environment, social distance, as well as the total health belief score except in the area of handwashing in favor of the intervention group than the control group. The researchers interpreted that the positive increase in pregnant women's awareness after the intervention encouraged women in the intervention group to perform self-protective behaviors to protect themselves.

The same was found in the studies of **Alzoubi et al., (2020)** and **Mohamed et al., (2020)** who clarified the positive attitudes of participants toward protective practices which reflected the proper way to prevent infection through handwashing, using alcohol rub, avoiding handshaking, and following preventive etiquettes during coughing and sneezing and maintaining at least 1-meter distance between themselves and others. These precautions are well known for preventing many infectious diseases, particularly respiratory infections like COVID-19. However, roughly two-thirds of the participants agreed that wearing the mask and using it as a preventive measure against infection was a good idea.

Furthermore, **Barakat and Kasemy, (2020)** investigated the preventive health behaviours during the coronavirus disease 2019 pandemic using a health belief model among Egyptians in the Middle East and reported that the third interview observing preventive behaviors regarding COVID-19 ten weeks later revealed a significant difference where it was significantly higher. In contrast to the study of

WHO, (2020) which doesn't recommend the use of face masks in public for people who don't have respiratory symptoms.

Regarding the correlation between scores of awareness, health beliefs, and self-protective behaviors about COVID-19 between the studied groups post-intervention. The current study revealed a positive statistically significant correlation among women's total scores of awareness, health beliefs, and self-protective behaviors about COVID-19 between the intervention group versus the control group. This could be related to the fact that increasing pregnant women's awareness about COVID-19 leads to positive health beliefs, which encouraged them to engage in self-protective behaviors to protect themselves from infection. Furthermore, this result appears logical because as the awareness increases, the constructs of the health belief model would also be increased to resist barriers to disease prevention.

These findings were supported by the study of **Guidry et. al., (2019)** conducted during Zika virus infection to investigate the use of HBM in public communication. They reported that without enough information to increase the sense of susceptibility and severity, no one would adhere to any preventive action. Furthermore, raising awareness will aid in the removal of barriers and increase the perceived benefits of adopting these actions.

In addition to another similar study done by **Alsulaiman & Rentner, (2021)** where they utilized the health belief model to assess King Saud University students' perceptions of COVID-19 and adherence to preventive measures. They reported a positive association between the HBM and adopting most of the COVID-19 preventive measures. Those who wear a mask in public settings, wear a mask when visiting sick people, and follow a healthy and balanced diet to strengthen the immune system showed higher HBM scores than others. The findings also suggest a positive correlation between the HBM and the frequency of washing hands, meaning as the HBM scores increase, the frequency of washing hands increases, too.

Also, **Carico et. al., (2020)** studied community pharmacists and communication during a pandemic using the HBM. They reported that HBM constructs could be quickly assembled to aid in the reinforcement of COVID-19 protective behaviours. They also stressed the importance of applying the infection control measures in public areas. Contrary to the study done by **Lu et. al., (2020)** titled outbreak of pneumonia of unknown etiology in Wuhan, China: The Mystery and Miracel. They demonstrated that good knowledge about COVID-19 may not always imply good long-term behaviour to prevent COVID-19. On the other hand, a lack of knowledge may also not necessarily imply poor environmental practice. Therefore, other factors that influence behaviour must be considered.

Conclusion

From the current study findings, it can be concluded that nursing intervention based on the health belief model could be used as an effective way to improve pregnant women's awareness, promote positive health beliefs and enhance self-protective behaviors regarding the COVID-19 pandemic.

Recommendations

- Nursing interventions for COVID-19 prevention should be provided to all pregnant women at all maternal and child health centers until the virus is completely eradicated.

- The Health Belief Model should be an important component of COVID-19 prevention. It's a good framework for looking into health behaviours and identifying key health beliefs.
- Further research: replication of the research on a large probability sample is recommended to achieve more generalization.

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Conflict of interest

The researchers declare that there is no conflict of interest.

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