Effect of Educational Nursing Intervention based on Health Beliefs Model on Prevention of COVID-19 among Pregnant Women

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ABSTRACT

Background: A COVID-19 pandemic is emerging infections and a horrible disease has been shown to have a fatal impact on pregnant women and their fetuses.

Aim of this study: was to evaluate effect of educational nursing intervention based on health beliefs model on prevention of COVID-19 among pregnant women.

Study design: A quazi -experimental design was used.

Setting: the study was conducted in Obstetrics and Gynecology clinic (antenatal unit) in outpatient clinics at Zagazig University Hospital.

Subject: A purposive sample composed of 195 pregnant women.

Tools of data collection: four tools were used: **Tool I**: An interview questionnaire; **Tool II**: pregnant women's knowledge questionnaire regarding COVID-19; **Tool III**: pregnant women's practice for self-protective measures in relation to prevention COVID-19 and **tool IV**: health belief model regarding COVID-19.

Results: the current study revealed that mean age of pregnant women was 33.74±6.51 years old. Furthermore, there was highly statistically significant difference of studied pregnant women regarding total mean score of knowledge, practice and health belief at post intervention (P= 0.000**) as well there was statistically significance correlation between total knowledge, practice of self-protective measure and health belief model among studied pregnant women throughout intervention where (P <0.05).

Conclusion: it was concluded that implementation of heath educational program based on health belief model regarding the COVID 19 pandemic showed a positive impact and effective improvement of knowledge, self- protective measure practices and health belief regarding prevention of COVID 19 among pregnant women.

Recommendations: Heath educational intervention regarding prevention for COVID-19 should be provided for all pregnant women at all MCH centers until the total management of COVID-19 virus.

Keywords: Health Beliefs Model, COVID19, Knowledge, Pregnant women, Self-protective measure.

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INTRODUCTION

Outbreak of a novel coronavirus disease 2019 (COVID-19) is recognized as a global health crisis. It was caused by a member of the family of coronaviruses, finally named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) ***(Shigemura, et al., 2020).*** Since its first identification in Wuhan, China, in December 2019, COVID-19 has spread globally at an accelerated rate with rapid increases in cases and mortality ***(Huang et al.,2020 & Abuelgasim et al.,2020).*** On February 11th, 2020, the World Health Organization (WHO) announced the official designation for this current coronavirus associated disease to be "COVID-19", caused by the SARS-CoV-2 ***(Gralinski et al, 2020).***

Everybody is at risk of becoming infected. Predictions based on similar infections such as SARS-CoV-1 and MERS-CoV suggest that pregnant women are at an increased risk of severe infection; as well, an immunocompromised state, as seen in pregnancy with its physiological changes, could predispose a pregnant woman to increased risk of SARS-COV-2 infection compared to the general population. Pregnant women experience only mild or moderate cold/ flu-like symptoms. Coughs, fever, shortness of breath, headache and loss or change to sense of smell or taste are other relevant symptoms ***(Favre et al., 2020).***

Moreover, women may be developed further fatal complications, including sepsis, septic shock, pulmonary edema, severe pneumonia, and acute respiratory distress syndrome ***(Guan, et al., 2020).*** However, some infected patients report no symptoms, with the asymptomatic ratio currently estimated at around 30.8%. Asymptomatic expression makes the undetected transmission and massive spreading of this disease possible ***(Nishiura, et al., 2020).***

COVID-19 infection has resulted in death of thousands of people across several countries. As a result of the easy mobility across countries, its cases spread to other countries rapidly and intensely. Several preventive measures have been recommended to halt the spread of the disease and its associated mortality. So, the World Health Organization (WHO) has recommended a range of preventive steps, including daily hand washing with water and soap, social distance, hand and mouth covering when coughing and avoiding eyes, nose and mouth touching **(WHO., 2020).**

The government of Egypt has adopted similar strategies to control the virus transmission as well as has engaged in media campaigns to disseminate information on these preventive measures to the general public. Such population difficulty in adhesion to behavioral controls may likewise occur in our country. Therefore, understanding the determinants responsible for people's resistance to protective measures against the virus spread is of great importance for the effectiveness of social isolation-based public policies, avoiding or reducing non-adherence to the proposed social controls. So, the health believe model may be helped to find determinants for such behavior ***(Costam., 2020).***

Health Belief Model (HBM) is a psychosocial model for behavior change. It is commonly used to describe the relationship between health beliefs and healthy behaviors. HBM assumes that the participation of individuals in the prevention, early detection, and treatment measures of

a specific health problem depends on their perception that individuals are at risk of this a condition even if they do not suffer from symptoms (perceived susceptibility). In addition to, perceived severity which individuals consider this disease represents a significant health problem that can lead to serious complications.

Moreover, believing in benefits of suggested preventive measures (perceived benefits) and recognize that the benefits exceed the expected barriers related to these measures (perceived barriers). Moreover, individuals believe that have the motivation to engage in a healthy lifestyle and the capacity to perform these protective behaviors (self-efficacy). Furthermore, HBM assumes that cues for action can act as behavioral stimuli that can be classified into internal and external cues. The internal cues as the history of the disease while the external cues as the media, and health team intervention which increases the engagement in such protective and preventive behavior ***(Ghanbary, et al., 2015 & Chanay, 2016).***

Furthermore, in light of the recent developments regarding the coronavirus pandemic. So, health education is an important instrument of maternity health for motivating pregnant women to protect themselves from preventable diseases. However, effective health education programs have to be methodically designed and evidence based. So, to design a potentially successful intervention of health education for upgrading knowledge and preventive measures about COVID-19, it would be valuable to collect information on this subject and on the level of knowledge, beliefs, and behavior of pregnant women ***(Erfani, et al., 2020).***

Health Belief Model explain different preventive health behaviors. So, pregnant women should perceive the health threat posed by COVID-19 as a major health hazard to engage in preventive measures. This implies that women are considering themselves to be at risk and aware of the consequences and dangers. In addition, recognizing the efficacy of preventive behaviors. Identifying and striving to eliminate impediments to preventative behaviors ***(Carico et al., 2021).***

Health education programs play an important role in improving COVID-19 knowledge and also are helpful for encouraging an optimistic attitude and maintaining safe practices. Health education is an attempt to communicate a health message in such a way that people, groups, or individuals can obtain information about better health and change their behavior ***(Zhong et al., 2020).*** Additionally, nurses play an important role in this fight as is providing health education, screening services, support for the general public and for pregnant women as high-risk categories as well as providing care to pregnant women with COVID-19 who are in an acute or critical condition.

Significance of the study:

The emergence of a novel coronavirus has rapidly spread across the globe, creating a massive public health problem. As of 4 July 2020, 11,191,676 cases and 529,127 deaths have been reported globally. In Egypt there were 107.555 confirmed cases of COVID-19 and 6.266 deaths on 26 October, 2020 ***(WHO, 2020).*** Additionally, according to ***Knight, et al,. (2020)*** reported

that pregnant women have a high risk to acquire this infection and are more likely to be hospitalized and are at increased risk for intensive care unit (ICU) admission than non-pregnant women. Also, the incidence of SARS-CoV-2 in pregnancy about 4.9 per 1000 maternities, one in 10 women in the hospital required intensive care unit care as well as the women were 34 weeks pregnant on average when they were admitted to the hospital, indicating that the women are in the later stages.

Since, there is no specific treatment or vaccination available, pregnant women seem to have different beliefs regarding corona virus and its preventive measures based on their views and experiences and change them if do not feel useful. So, it is important that pregnant woman receive more accurate information regarding corona virus infection, preventive measures and accurate health beliefs related to the seriousness of COVID-19, for curtailing the control of the COVID-19 outbreak. so, there are a few studies that have applied educational program based on health belief model on prevention of COVID-19 among pregnant women and this study isn't done in Zagazig before, so it is useful to investigate this problem.

Aim of the study:

The study aimed to evaluate effect of educational nursing intervention based on health beliefs model on prevention of COVID-19 among pregnant women. **This aim was achieved through:**

1. Determining pregnant women's knowledge regarding COVID 19.
2. Assessing pregnant women's practices of self-protective measures against COVID 19.
3. Identify health beliefs model among pregnant women regarding COVID-19.
4. Design, implement &evaluate an educational program on prevention of COVID-19 among pregnant women.

Research hypothesis:

The following research hypotheses were formulated to fulfill the aim of the current study:

Hypothesis (1): Pregnant women who received an educational program based on health belief models had improved knowledge about COVID-19 in post intervention than pre intervention.

Hypothesis (2): Pregnant women who received an educational program based on health belief models had a good practice of self-protective measures regarding COVID-19 in post intervention than pre intervention.

Hypothesis (3): Pregnant women who received an educational program based on health belief models had positive changes of health beliefs regarding COVID-19 in post intervention than pre intervention.

Subjects and Methods:

A-Technical Design

The technical design included description of the research design, study setting, sample, and tools for data collection.

➢ **Research design:**

A quazi -experimental design was used for this study for pregnant women with pre/ post assessment to evaluate their knowledge and practice of self-protective measures regarding COVID-19.

➢ **Study Setting:**

This study was conducted in antenatal unit in outpatient clinics building at Zagazig University Hospital. It works from 9 A.M to 1 P.M. It provides low cost services and free with high quality of care for all levels of population. Also, it covers a wide range of population with different socio-demographic and obstetric characteristic as well as the rate of attendance was high. It's the reason given for choosing the above-mentioned setting.

➢ **Study Subjects:**

The sample eligible for this study included 195 pregnant women who attending antenatal care unit in outpatient clinic and fulfilling the following criteria:

Inclusion criteria: -

- Women who can read and write.
- Women's age ranged between 18- 45 years old.
- Both women who would be primigravida and multigravida.
- Pregnant women who attend to the above-mentioned setting for antenatal follow-up.
- All pregnant women who had agreed to participate in the study.

Exclusion criteria: -

- Women who have respiratory symptoms or diagnosis with COVID-19 infection.
- Women who have receive the same intervention before.

➢ ***Sampling technique:***

A purposive sampling consisted of 195 pregnant women was used in recruiting study subjects according to the eligibility criteria in the above-mentioned settings.

Sample Size: Sample size needed was 195 pregnant women who attended to the previously mentioned setting . It was calculated by using the Yamane statistical equation as the following (***Yamane., 1967):***

$$n = \frac{N}{1 + N(e2)}$$

n = Sample, N =The whole population, e = Margin error

Tool for data collection:

The data of this study were collected by using four tools as the following;

Tool I: *An interview questionnaire: -* it was developed by the researcher and composed of two parts:

- **Part (1): Demographic characteristics of pregnant women:** composed of 5 questions as women's age, place of residence, educational level, occupation, and marital status.
- **Part (2): Obstetric history of pregnant women**: consisted of gravidity, parity, gestational age as well as mode of last delivery. It composed of 4 questions.

Tool II: *Pregnant women's knowledge questionnaire regarding COVID-19: (Appendix* II*):* to evaluate knowledge of pregnant women about COVID-19. It was developed by the researcher in simple Arabic language It consisted of (16) items of closed-ended questions such as definition of COVID-19, pregnant women high risk factor, incubation period, main symptoms of COVID-19, ..ect. In addition to, the source of information about COVID-19 as TV, internet…. ect.

Knowledge scoring:

Knowledge items consisted of (16) items of closed-ended questions. Each question assigned a score of one mark (1) when the answer was "Correct" or zero (0) when the answer was "Incorrect", with a total score ranging from 0 to 16.

The total women's knowledge score was classified as the following:

- **Having inadequate knowledge**: less than 60% (score 0- less than 9.6).
- **Having adequate knowledge**: 60% to 100% (score 9.6- 16).

Tool III: *Pregnant women's practice questionnaire of self-protective measures regarding prevention of COVID-19 (self-reported): (Appendix* III*):* it was developed by the researcher to prevent human-to-human transmission of COVID-19 infection. This questionnaire had 11 items to reduce and prevent COVID - 19 infections among pregnant women such as washing hands with soap and water, rubbing hands with alcohol, mask wearing, …ect.

Self-protective measures practice scoring:

Self-protective measures practice items consisted of (11) items of closed-ended questions. Each question assigned a score of one mark (1) when the answer was "Performed" or zero (0) when the answer was " Not performed", with a total score ranging from 0 to 11.

The total self-protective measures practice score was calculated as the following:

- **Unsatisfactory practice:** scored ≤ 60% of total practice (score 0- 6.6).
- **Satisfactory practice:** scored > 60% of total practice score (more than 6.6 - 15).

Tool IV: Health Belief Model (HBM) regarding COVID-19: *(Appendix* IV*):*

Health Belief Model (HBM) was adapted from **Champion (2002**) and modified by the researcher after reviewing available related literature ***(Tong, et al., 2019 & Mehanna et al., 2021)***. It was used to assess pregnant women's health beliefs regarding COVID-19. It was translated into Arabic by the researcher. It was divided into four subscales as the following:

- Perceived susceptibility: five-items as, pregnant woman considers to be at risk of COVID-19……. ect.
- Perceived severity: ten-items such as, COVID-19 has a high mortality rate, the emerging COVID-19 is rapidly spreading, COVID-19 is a hopeless disease & lead to death……. ect.
- Perceived barriers: fourteen – items as, it is difficult to follow the instructions to prevent COVID-19, the absence of rules governing the distance between people in crowded places …...ect.
- Perceived benefits: six-items as, COVID-19 can be easily prevented by washing hands regularly with soap and water, the innovative COVID-19 vaccine is an effective primary prevention strategy for COVID-19 & save pregnant woman's life …...ect.

Scoring system Health Belief Model (HBM): composed of 34 items with a total score ranging from 0 to 136. Responses to scale items were scored on a five-point Likert scale as strongly disagree was scored as (0), disagree was scored as (1), No idea was scored as (2), Agree was scored as (3), and strongly agree was scored as (4).

Total Health Belief Model score was calculated for each subscale, converted to percentage and categorized into:

- **Low HBM** : if score ≤ 33.33% of total score (score 0- <46).
- **Moderate HBM** : if score 33.33% to 66.67% of total score (score 46 - < 91).
- **High HBM** : if score > 66.67% of total score (score 91-136).

B) Operational design:

The operational design of this study involved the description of the preparatory phase, validity, reliability, pilot study, field work, and ethical consideration.

Preparatory phase:

During this phase, the researcher reviewed literatures related to the current study, articles, and scientific magazines concerning the various aspects of the research problem. This phase helped the researchers to be familiar with the seriousness of the problem, this also helped in designing the study tools. The tools were prepared.

Validity of the tools:

Validity of the tools was tested for content validity by Jury of three experts from the Faculty of Nursing and Medicine. These experts assessed the tool for clarity, relevance, comprehensiveness, applicability, and understanding. All recommended modifications in the tools were done.

Reliability of the tools:

The reliability was done by Cronbach's Alpha coefficient test to ensure that three tools of data collection consisted of relatively homogenous items as indicated by the moderate to high reliability of each tool, it was (0.910) for knowledge tool, (0.703) for self-protective measures practice and (0.852) for health belief model.

Pilot Study:

The pilot sample was applied on 10% of the study sample and included (20) pregnant women who selected from the previously mentioned study setting according to inclusion criteria. This pilot study was conducted in month before collection of data. The subjects of pilot sample were excluded in the study sample.

Field work

The data collection was done first by using the interview questionnaire sheet, after identifying the pregnant women who fulfilled the criteria of the study, the researcher explained the aim of the study to the pregnant women, expected outcomes of the study then verbal consent to participate was obtained. The interviewed of pregnant women took place in the previously mentioned setting in the waiting area. Pregnant women filled out the questionnaire's sheets. The researcher started the data collection for 3 days per week from 9.30 Am to 12.30 Pm where the program was implemented. The average time spent with each participant to be interviewed 30-45 minutes. The pregnant women were grouped; each group included (3-7) women. The study was done during the period from beginning February 2021 to end of January 2022.

An educational session was developed based on actual educational need assessment of the studied subjects to improve their knowledge and practice of self-protective measures regarding COVID-19. It was developed by researcher in the light of available researches and literature. It was written in simple Arabic language with attractive and colorful pictures and covers the relevant theoretical aspects of COVID-19 overview and prevention. The total number of sessions ranged to (39-65) session. It was applied as following:

Assessment phase:

This was first phase in the educational sessions, where the needs in knowledge and practice of self-protective measures were identified in (pre-test) through collection and analysis of the baseline data from the filled tools. Thus, the development of the program was partially built on assessment of pregnant women knowledge about COVID-19.

Planning phase:

Based on the outcomes from the assessment phase, the educational intervention based on the health beliefs model was designed, and the session number, its contents, different education methods, and educational media were assigned

Content: the first step in developing this program was to determine the main aim and objectives. These objectives were derived from the assessed needs of the participants. These were categorized into specific objectives and tasks were ordered in sequential order consistent with teaching and learning process. The program was set in seven sessions covering the following content:

❖ **Description of the program:**

- **General objective of the program**

It was aimed to improve pregnant women's knowledge and optimal self-protective measures regarding prevention of COVID-19 transmission.

- **Specific objectives:**

By the end of this program, each participants will able to:

- Increase their knowledge regarding COVID-19.
- Follow preventive measures guidelines toward COVID-19.
- Enhance health beliefs toward COVID-19.

The program consisted of two main parts:

- **The theoretical part:** this part covered the basic knowledge about COVID-19 and its prevention (those were 5 sessions for each women).
- **The practical part:** include techniques of hand washing in addition to wearing face mask, removing and how to get rid of the mask (those were 2 sessions for each women).

Implementation phase:

The program was conducted in a waiting area in the outpatient clinic building at Zagazig University Hospital. The researcher ensured a learning environment that is most convenient to the studied subjects. The time scheduling of educational activities gave considerations to time of sessions that best suit the studied subjects. The researcher started the data collection for 3 days per week from 9.30 Am to 12.30 Pm where the program was implemented. Collection of the required data was carried out through face-to-face interviews with participated women under following protective measures. The pregnant women were grouped; each group included (3-7) women. It was necessary for the researcher to introduce herself for the pregnant women, provide clear explanation about the aim and all the needed information were taken from all women who accepted to participate in this study.

Evaluation phase:

In order to evaluate the effect of the intervention of health education program, the same tools used in the pre-test were re-used. The program evaluated two times, immediately after implementation of the program (the post-test) and after one month of implementing the program (follow-up).

Ethical consideration:

Ethical approval was obtained from the scientific and ethics committee of the Faculty of Nursing at Zagazig University. The researcher met with the participants and provided them with all the information needed about the study purpose.They gave their verbal agreement to participate after being informed that participation is totally voluntary and that they have the right to withdraw at any time without giving any reason and with no consequences. The study maneuvers could not have any actual or potential harmful effects on participants. Furthermore, the study had been approved by Zagazig University, Faculty of Nursing Ethical Committee.

C) Administrative design:

Permission to collect data and implement of the educational program in the outpatient clinics building at Zagazig University hospitals was obtained. This was through submission of a formal letter from the dean of the Faculty of Nursing Zagazig University to the responsible authorities of the study setting. Meetings and discussions were held between the researcher and the participants to make them aware about the objective of educational program.

D) Statistical design:

Prior to data entry, data was checked, then categorized, coded, computerized, and tabulated using IBM SPSS-22. Numbers and percent were used to describe qualitative data, the mean, and standard 10 deviation for quantitative data. The t-test and X2 test were used to examine the differences between quantitative and qualitative data, respectively. The Pearson Correlation Coefficient (r) was also utilized to assess the correlation between different variables under investigation. The p-value is considered a significant level at less than 0.05.

RESULTS:

Table (1) shows that, 50.3% of the studied pregnant women their age ranged between 27- < 36 years old, the mean of age was 33.74±6.51 years old. As regards to residence, 52.3% of studied pregnant women were from the urban area and all of the studied pregnant women were married. As for the educational level, the same table reveals that 42.6 % of studied pregnant women had secondary education and 60.5% of studied pregnant women were housewives.

Table (2) obvious that, 67.7% & 56.9% respectively of the studied pregnant women were had more than three times gravidity and parity. Additionally, 47.8 % of the studied pregnant women were in 2nd trimester. As regards to the mode of previous delivery 48.7 % of the studied pregnant women had normal vaginal delivery (NVD).

Figure (1) demonstrates that, all studied pregnant women had knowledge and heard about COVID-19 100.0%. Furthermore, the commonest source of knowledge about COVID-19 was internet 57.0%, followed by TV 19.5%.

Table (3) demonstrates that, the highest mean of the studied pregnant women's total level of knowledge in post intervention whereas (10.7333± 4.35069). As well as, there was highly statistically significant difference of studied pregnant women regarding total mean of knowledge throughout pre/ post-intervention (P= 0.000**).

Figure (2) displays that, illustrates that, 36.3% of the studied pregnant women had adequate level of knowledge about COVID- 19 in pre intervention and this percentage was increased to (84.1 % & 81.5% respectively), at post and follow up intervention.

Table (4) detects that, the highest mean of the studied pregnant women's total level of practice in post intervention whereas (9.4513± 1.38156). Additionally, there was highly statistically significant difference of studied pregnant women regarding total mean of practices of self-protective measure throughout pre/ post-intervention (P= 0.000**).

Figure (3) illustrates that, 58.6% of the studied pregnant women had satisfactory performed of self-protective measure against COVID- 19 in pre intervention and this percentage was increased to 84.7 % at post intervention, while 83.6% at follow up intervention.

Table (5) clarifies that, there was statistically significant difference of studied pregnant women regarding the domains of health belief model (HBM) for COVID-19 throughout pre/ post-intervention phase (P= 0.000**). As well as, the highest mean of studied pregnant women regarding HBM domains was perceived barriers of HBF throughout intervention phase (20.82±5.481 **&** 36.36 ±8.454 **&** 35.54±7.316) respectively.

Figure (4) demonstrates that 47.6% of studied pregnant women had high level of total health belief at pre intervention phase, while this percentage increased to (84.1%& 80.5% respectively), at post and follow up intervention.

Table (6) obvious that, there was statistically significant relationship between studied pregnant women total level knowledge and educational level throughout the intervention phases (p_1= .000**& p_2=.004*& p_3= .009*) respectively.

Table (7) presents that, there was highly statistically significant relationship between total practice of self-protective measures and educational level in pre intervention phase (p_1= .000**& p_2=.004*& p_3= .009*) respectively.

Table (8) reveals that, there was statistically significant relationship between studied pregnant women total health belief model and their age throughout the intervention phases (p_1= .004*& p_2=.000**& p_3= .003*) respectively.

Table (9) shows that, there was statistically significance correlation between total knowledge, practice of self-protective measure and health belief model among studied pregnant women throughout intervention where (P<0.05).

Table (1): Frequency distribution of the studied pregnant women regarding their demographic characteristics (n = 195).

Demographic characteristics	No	%
Age (year)		
18- < 27	57	29.2
27- < 36	98	50.3
36- 45	40	20.5
Mean ±SD	**33.74±6.51**	
Residence		
Rural	93	47.7
Urban	102	52.3
Marital status		
Married	195	100.0
Educational Level		
Read & write	30	15.4
Primary school	55	28.2

Secondary school	83	42.6
University (above)	27	13.8
Occupation status		
Worker	77	39.5
Housewife	118	60.5

Table (2): Frequency distribution of the studied pregnant women regarding obstetric history (n = 195).

Obstetric data	No	%
Gravidity		
Primigravida	19	9.7
2-3	44	22.6
>3	132	67.7
Parity		
Nullipara	19	9.7
Para 1	20	10.3
2-3	45	23.1
>3	111	56.9
Gestational age (trimester)		
1st trimester	14	7.2
2nd trimester	94	48.2
3rd trimester	87	44.6
Mode of previous delivery		
Normal Vaginal Delivery (NVD)	95	48.7
Cesarean Section (CS)	81	41.5
None	19	9.7

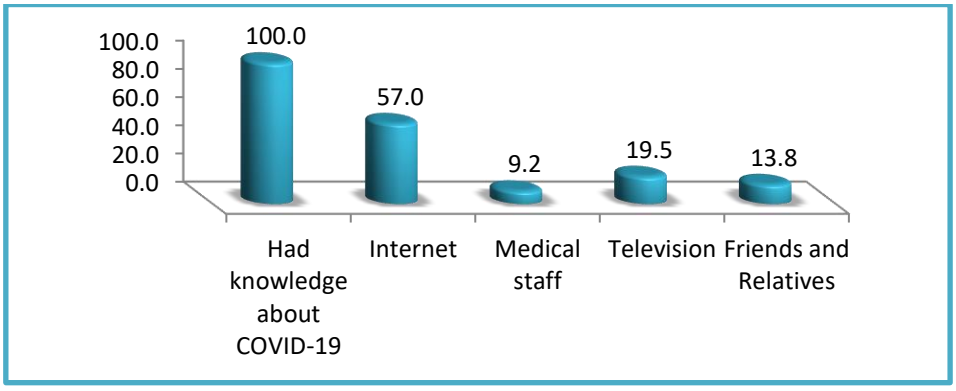

Figure (1): Frequency distribution of the studied pregnant women regarding previous knowledge about COVID-19 and their source of knowledge (n=195).

Table (3): Mean and Standard deviation of total level of knowledge among studied pregnant women throughout the intervention phases (n =195).

Total level of knowledge	Pre intervention	Post intervention	Follow up
Mean	4.2718	10.7333	10.5282
±SD	3.68096	4.35069	4.43544
Paired t test	t1= 15.833	t2= .461	
p-value	P1=.000**	p2= .645	

* Statistically significance p<0.05, ** highly statistically significance p<0.00 t= paired t test was used

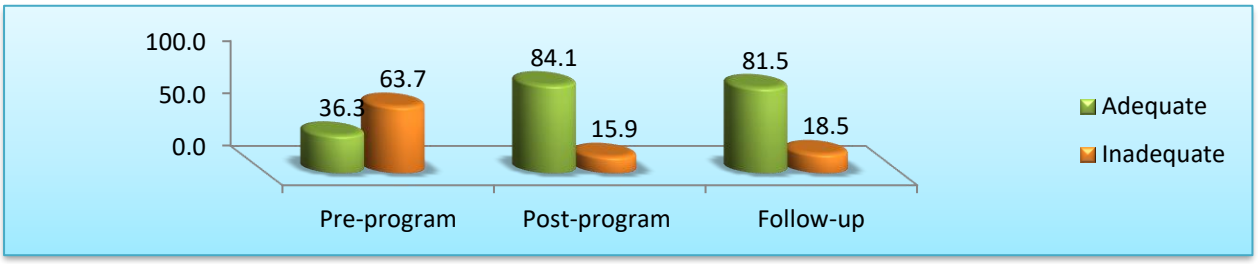

Figure (2): Distribution of studied pregnant women regarding their total knowledge about COVID- 19 during the intervention phases (n =195).

Table (4): Mean and Standard deviation of total practices of self-protective measure among studied pregnant women throughout the intervention phases (n =195).

Total level of practice	Pre intervention	Post intervention	Follow up
Mean	8.0154	9.6000	9.4513
±SD	1.90895	1.34087	1.38156
Paired t test	t1= 9.486	t2= 1.079	
p-value	P1=.000**	p2=.281	

* Statistically significance p<0.05, ** highly statistically significance p<0.00 t= paired t test was used

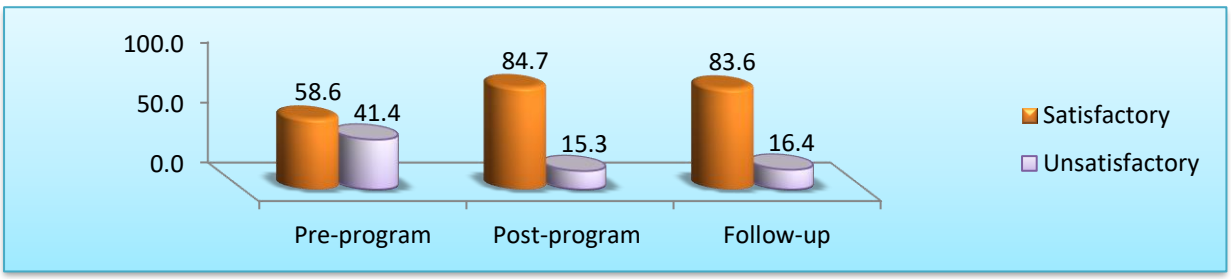

Figure (3): Distribution of studied women regarding their total practices of self-protective measure through the intervention phases (n =195).

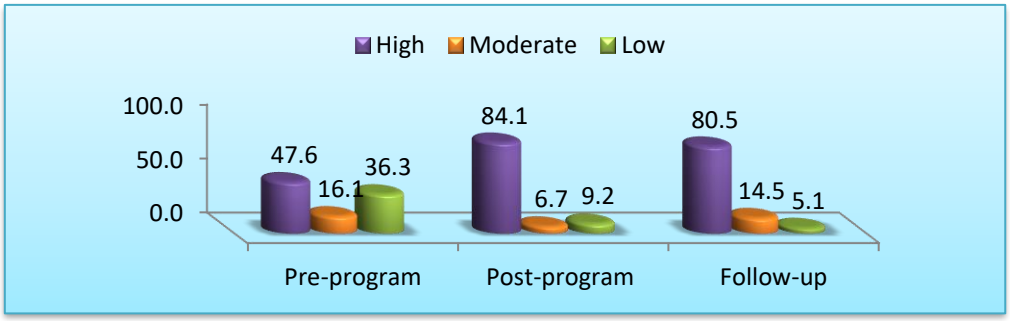

Figure (4): Distribution of studied women regarding their total health belief throughout the intervention phases (n =195).

Table (5): Mean and Standard deviation of health belief model (HBF) domains among studied pregnant women throughout the intervention phases (n =195).

Health Belief Model	Pre intervention		Post intervention		Follow-up		T 1	p-value1	T2	p-value2
	Mean	±SD	Mean	±SD	Mean	±SD				
Total perceived susceptibility	8.23	1.629	13.57	1.342	13.48	1.400	8.852	.000**	0.664	.507
Total Perceived severity	19.52	2.593	27.50	3.293	26.89	3.894	23.249	.000**	1.671	.096
Total Perceived barriers	20.82	5.481	36.36	8.454	35.54	7.316	14.605	.000**	1.025	.306
Total Perceived benefits	12.86	2.814	17.49	.875	17.25	1.237	12.440	.000**	2.173	.030
Total health belief	55.45	7.124	94.93	9.278	93.17	10.486	25.643	.000**	1.754	.080

• Paired t test was used * Statistically significance p<0.05 ** highly statistically significance p<0.00

Table (6): Statistically relation between studied pregnant women total level of knowledge and their demographic characteristics through the intervention phases (n =195).

Demographic characteristics	Total level of knowledge															
	Pre intervention				Test of significance	P_1-value	Post intervention				Test of significance	P_2-value	Follow up				Test of significance	P_3-value
	Inadequate (N=118)		adequate (N=77)				Inadequate (N=49)		Adequate (N=146)				Inadequate (N=70)		Adequate (N=125)			
	No	%	No	%			No	%	No	%				%		%		

Age / years																	
(18- < 27)	32	27.1	25	32.5	F= 0.255	.415	17	34.7	40	27.4	F= 0.385	.698	25	35.7	32	25.6	F= 0.030	.9711
(27- < 36)	63	53.4	35	45.5			22	44.9	76	52.1			31	44.2	67	53.6		
(36-45)	23	19.5	17	22.0			10	20.4	30	20.5			14	20.1	26	20.8		
Residence																		
Rural	60	50.8	33	42.9	t= 1.349	.032*	23	46.9	70	47.9	t= 1.650	.4229	37	52.9	56	44.8	t= 1.519	.1310
Urban	58	49.2	44	57.1			26	53.1	76	52.1			33	47.1	69	55.2		
Educational level																		
Read & write	25	21.2	5	6.5	F= 0.048	.000**	8	16.3	22	15.1	F= 0.753	.004*	10	14.3	20	16.0	F= 1.609	.009*
Primary school	32	27.1	23	29.9			17	34.7	58	26.0			23	32.9	32	25.6		
Secondary school	38	32.2	45	58.4			17	34.7	43	45.2			25	35.7	58	46.4		
University(above)	23	19.5	4	5.2			7	14.3	20	13.7			12	17.1	15	12.0		
Occupation																		
Worker	42	35.6	35	45.5	t= 0.360	0.305	17	34.7	60	41.1	t= 0.085	.8422	31	44.2	46	36.8	t= 0.472	.6377
House wife	76	64.4	42	54.5			32	65.3	86	58.9			39	55.7	79	63.2		

F test one way ANOVA t: independent t test was uses * Statistically significance p<0.05 ** highly statistically significance p<0.001

Table (7): Statistically relation between studied pregnant women practice of self-protective measures against COVID-19 and their demographic characteristics through the intervention phases (n =195).

Demographic characteristics	Total practice of self-protective measures																	
	Pre intervention				Test of significance	P_1-value	Post intervention				Test of significance	P_2-value	Follow up				Test of significance	P_3-value
	Unsatisfactory (N=80)		Satisfactory (N=115)				Unsatisfactory (N=30)		Satisfactory (N=165)				Unsatisfactory (N=49)		Satisfactory (N=146)			
	No	%	No	%			No	%	No	%				%		%		
Age / years																		
(18- < 27)	33	41.3	24	20.9	F= 1.621	.200	10	33.3	47	28.5	F= 1.195	.305	18	36.7	39	26.7	F= 0.550	.578
(27- < 36)	37	46.2	61	53.0			16	53.3	82	49.7			21	42.9	77	52.7		
(36-45)	10	12.5	30	26.1			4	13.4	36	21.8			10	20.4	30	20.6		
Residence																		
Rural	40	50.0	53	46.1	t= 0.783	.032*	15	50.0	78	47.3	t= 0.726	.469	22	44.9	71	48.6	t= 0.826	.410
Urban	40	50.0	62	53.9			15	50.0	87	52.7			27	55.1	75	51.4		
Educational level																		
Read & write	18	22.5	12	10.4	F= 7.613	.000**	9	30.0	21	12.7	F= 1.194	.004*	11	22.4	19	13.0	F= 3.518	.016*
Primary school	19	23.8	36	31.3			9	30.0	46	27.9			15	30.6	40	27.4		
Secondary school	36	45.0	47	40.9			10	33.3	73	44.2			18	36.7	65	44.5		
University(ab	7	8.7	20	17.			2	6,7	25	15.			5	10.3	22	15.		

ove)				4						2						1		
Occupation																		
Worker	45	56.3	32	27.8	t= 1.947	0.305	17	56.7	60	36.4	t= 0.349	.742	25	51.1	52	35.6	t= 1.248	.214
Housewife	35	43.7	83	72.2			13	43.3	15	63.6			24	48.9	94	64.4		

F test one way ANOVA t: independent t test was uses * Statistically significance p<0.05 ** highly statistically significance p<0.00

Table (8): Statistically relation between studied pregnant women health belief model and their demographic characteristics through the intervention phases (n =195).

Demographic characteristics	Total Health Belief Model																							
	Pre						Test of significance	P-value	Post						Test of significance	P-value	Follow up						Test of significance	P-value
	Low (N=67)		Moderate (N=39)		High (N=89)				Low (N=30)		Moderate (N=34)		High (N=131)				Low (N=43)		Moderate (N=29)		High (N=123)			
	No	%	No	%	No	%			No	%	No	%	No	%			No	%	No	%	No	%		
Age / years																								
(18-< 27)	19	28.4	11	28.2	27	30.3	F= 2.165	.002*	9	30.0	9	26.5	39	29.8	F= 1.604	.004*	15	34.8	8	27.6	34	27.6	F= 0.412	.006*
(27-< 36)	40	59.7	20	51.3	38	42.7			18	60.0	22	64.7	58	44.2			22	51.2	16	55.2	60	48.8		
(36-45)	8	11.9	8	20.5	24	27.0			3	10.0	3	8.8	34	26.0			6	14.0	5	17.2	29	23.6		
Residence																								
Rural	36	53.7	22	56.4	35	39.3	t= 2.720	.004	14	46.7	25	73.5	54	41.2	t= 1.426	.000*	19	44.2	21	72.4	53	43.1	t= 0.563	.003

Urban	31	46.3	17	43.6	54	60.7		*	16	53.3	9	26.5	77	58.8		*	24	55.8	8	27.6	70	56.9		*
Educational Level																								
Read & write	9	13.4	10	25.6	11	12.4	F=0.889	.031*	4	13.3	3	8.8	23	17.6	F=1.040	.448	6	14.0	3	10.3	21	17.1	F=0.414	.1443
Primary school	20	29.9	10	25.6	25	28.1			10	33.3	9	26.5	36	27.5			13	30.2	7	24.2	35	28.5		
Secondary school	32	47.8	14	36.0	37	41.6			13	43.4	20	58.8	50	38.2			19	44.2	16	24.2	48	39.0		
University (above)	6	8.9	5	12.8	16	17.9			3	10.0	2	5.9	22	16.7			5	11.6	3	10.3	19	15.4		
Occupation																								
Worker	25	37.3	19	48.7	33	37.1	t=0.374	.006*	11	36.7	8	23.5	58	44.3	t=0.597	.708	16	37.2	7	24.1	55	43.9	t=0.161	.168
House wife	42	62.7	20	51.3	56	62.9			19	63.3	26	76.5	73	55.7			27	62.8	22	75.9	69	56.1		

F: test one way ANOVA t: independent t test was uses * Statistically significance p<0.05 ** highly statistically significance p<0.00

Table (9): Correlation matrix between total knowledge, practice of self-protective measure and health belief among studied pregnant women through the intervention phases (n =195).

Items	Knowledge		Practice of self-protective measure		Health belief model	
	r	P-value	r	P-value	r	P-value
Pre intervention						
Knowledge	1	–	.738	.017*	.169	.001**
Practice of self-protective measure	.738	.017*	1	–	.489	.047*
Health belief model	.169	.001**	.489	.047*	1	–
Post intervention						
Knowledge	1	–	.560	.024*	.123	.018*
Practice of self-protective measure	.560	.024*	1	–	.854	.000**
Health belief model	.123	.018*	.854	.000**	1	–
Follow up						
Knowledge	1	–	. 713	.026*	.365	.000**
Practice of self-protective measure	.713	.026*	1	–	.788	.001**
Health belief model	.365	.000**	.788	.001**	1	–

* Statistically significance p<0.05 ** highly statistically significance p<0.00 r. Spearman correlation coefficient

DISCUSSION:

The fight against COVID-19 is still going strong. People's willingness to accept lifestyle changes given to them by health care practitioners across the country is determined by their knowledge, and practices about COVID-19 ***(Allagoa, et al., 2021)***. The beliefs and behavioral responses of the general population, particularly pregnant women, are crucial in preventing and controlling COVID-19 outbreak. The HBM is one of the effective health education models, focusing primarily on preventing illnesses and adopting behaviors to avoid diseases. In addition, HBM is used to study the relationship between beliefs and health behaviors ***(Carico et al., 2021)***. Therefore, the aim of this study was to evaluate the effect of educational program based on health belief model on prevention of COVID-19 among pregnant women.

Regarding to demographic characteristics; the current study revealed that half of the studied pregnant women their age was ranged between 27 - < 36 years and their mean of age was 33.74±6.51 years old. This result agreed with ***(Elhameed, et al., 2022)***, in their study which done in Menoufia city; as they revealed that half of their respondents belonged to age group between 26- 35 years. Also, this finding is similar to a study in Banha by ***(Rabea et al., 2021)***, who stated that the age of women ranged from 25- < 30 years old with Mean ± SD 33.21±5.32.

Dissimilarly with that of the study in Tanta done by (***Hashem et al., 2020)*** who revealed that more than one third of pregnant women their age ranged between 25- <30 with mean age was 27.03±5.19.

In relation to residence, marital status and occupation of studied pregnant women; the present study found that more half of studied pregnant women were from urban area and were housewives as well as all of them were married. This corresponds well with the results of cross-sectional study in Nigeria done by ***(Nwafor et al., 2020)***, who mentioned that the majority of the participants were married and reside in urban area. Similarly, with a study in Assiut City conducted by ***(Mahmoud et al., 2022)***, who clarified that more than two third of studied pregnant women lived in rural area and were housewife. While, this result disagreed with ***(Mohamed et al., 2020)***, in their study in which they reported that more than two thirds of them were lived in rural area. Also, contrary with ***(Kunno et al., 2022),*** in their study in Bangkok, Thailand; as they said that more than half of their subjects were employee.

As regard to educational level; the present study showed that more than one third of the studied pregnant women had secondary school education. This result agreed with a study carried out by, ***(Mahmoud et al., 2022),*** reported that more than one-third of pregnant women had secondary education. These findings contradicted with ***(Nasir et al., 2021***), in a cross-sectional online survey, who reported that majority of their subjects were high education. The difference may be due to variations in demographic characteristics, study setting and sample.

As concerning to obstetric history of the studied subjects; the current study revealed that, the highest percentage of the studied women were had more than three times of gravidity and parity. Also, it clarified that nearly half of studied pregnant women were in second trimester of gestation. This agrees with a cross-sectional study in Zagazig City carried by ***(Metwally& Desoky., 2020),*** who reported that most of studied pregnant women were multiparous. In the same context, a cross-sectional study Northwest Ethiopia done by ***(Degu et al., 2021),*** who reported that most of women were multigravida and multipara. Also, in the agreement with ***(Kumbeni et al., 2021)***, clarified that the majority of women in the second trimester.

On contrast with these finding, a study in done by ***(Kunno et al., 2022),*** in their descriptive study which done in Bangkok, Thailand, who reported that the more than two third of participants were in their third trimester and more than one third of them were in their first pregnancy. Dissimilarly ***(Abd Elmordy et al., 2021),*** who found that more than one third of studied pregnant women were in the third trimester of pregnancy. The disparity in the result might be due to differences in the study population characteristics and change of study setting.

In relation to the previous knowledge for COVID-19 and the source of these knowledge of the studied pregnant women, the current study showed that all studied pregnant women reported that they had heard about COVID-19 as well as more than half of the studied women had sources of knowledge about COVID-19 from internet followed by TV. In this respect a study done by ***(Abdelhafiz et al., 2020),*** mentioned that, all participants claimed that

they had heard about COVID-19 and more than half of studied pregnant women had knowledge from internet followed by TV / satellites channel.

In addition to, the result is in line with study conducted in Bangladesh carried by ***(Abdul & Mursheda., 2020),*** who reported that mass media was the commonest source of information. These findings contradicted those of ***(Helmy et al., 2021)***, who stated that three-quarters of pregnant women got their pregnancy information from health care professionals. It highlighted the importance of mass media in the fight against COVID- 19, especially when people are in lockdown and the media is a health education resource that is utilized to facilitate the reception of health messages for the community. Moreover, the World Health Organization had provided information about COVID-19 through their websites to increase the awareness of the population regarding COVID-19.

One of the objectives of the current study was to assess the pregnant women' knowledge regarding COVID-19, the study result demonstrates that, the total score of women's knowledge regarding COVID-19 throughout pre/ post-intervention was highly statistically significant difference (P= 0.000**), while no statistically significant difference between post/ follow up intervention (p >0.05). In agreement with the present study finding, a quasi-experimental study in Egypt by ***(Elmordy et al., 2022),*** who found that there was highly statistically significant difference in the mean scores of the total knowledge pre and post program application (P<0.001), but no statistically significant difference was found post and follow up program application (P >0.05).

It is similar to **(Elgzar et al., 2020)**, who showed that after intervention there were significant differences observed between intervention and control groups in all areas of knowledge assessed. The explanation of such result might due to a difference in sources of information, worry related to the outbreak of study participants and good understanding of high infectiousness of COVID-19. Furthermore, higher level educated pregnant women might be more active in seeking for information about COVID-19.

Concerning the effect of educational program on pregnant women' total level of knowledge regarding COVID-19; the present results displayed that more than half of the studied sample had inadequate level of total knowledge about COVID-19. While, more than three quadrants of studied pregnant women had adequate level of knowledge about the COVID-19 pandemic in post and follow up intervention. This reflects the importance of the educational program which increased the pregnant women's' knowledge in promoting health, especially during pandemics crisis.

Similarly, ***(Sabry et al., 2021)***, reported that three quadrants of the women had a poor level of knowledge about covid-19 pre educational program compared with majority of women had a good level of knowledge post educational program with highly statistical significance difference between women's knowledge pre and post educational program (p<0.001). In the same line, a study in Beni-Suef, Egypt carried by ***(Helmy et al., 2021)***, who revealed that there was a high

improvement of knowledge in more than three quadrants of the pregnant women about COVID-19 post-implementation.

This result contradicted ***(Akalu, et al., 2020)***, who reported that there was a high prevalence of poor knowledge among the study subjects after implementation. Contrary**,** ***(Elayeh, et al., 2020)*** in the Jordanian population, who illustrated that majority of the studied women had adequate information about COVID-19 pre-implementation the program. The dissimilarity between the present study and a fore mentioned result is mainly due to study populations' socioeconomic, level of education, available of health care provider, change of study setting, the period of the study as well as health care system of the countries to increase awareness regarding to the pandemic.

In relation to second objectives of the present study to assess self-reported of studied pregnant women self-protective measure practice against COVID-19, the current study finding demonstrates that, the mean score of women' practice toward COVID-19 throughout pre/ post-intervention was highly statistically significant difference (P= 0.000**), while no statistically significant difference between post/ follow up intervention (p >0.05). In congruence with this, according to, ***(Mohamed et al., 2020),*** who found that there was a highly statistically significant difference found in practices of self-protective measures between the two groups post educational program at p-values < 0.001.

This result comes in line with ***(Elmordy et al., 2022),*** who demonstrated that there was highly statistically significant difference in pregnant women in the mean scores of the total preventive measures practice pre and post-program application (P <0.001) while, no statistical significant difference in the mean scores of post and follow up program application (P>0.05). This might be due to that educational program help to improve pregnant women practice including wearing mask, and recognizing the importance of self-protection, and recognizing that COVID 19 may be avoided by demonstrating protective measures as educated during educational intervention. Also, the level of education of pregnant women had a positive impact on their preventive practices regarding the coronavirus.

Regarding the effect of educational program on self-reported of pregnant women's self-protective measures practices toward COVID-19 throughout intervention, the current study reveals that more than one third of studied pregnant women were within unsatisfactory category regarding self-protective measures practices in pre intervention compared to more than three quadrants of studied pregnant women in post and follow up intervention. This has the same consequence as educational program helping to improve or modify their practices and recognizing the importance of self-protection. In agreement with, ***(Helmy et al., 2021)***, who stated that more than three quadrants of the pregnant women's practices regarding COVID-19 were improved after the implementation of the program.

Also, the current study findings supported by ***(Fikadu et al., 2020)*** who indicated that more than three quadrants of the participant had a good practice on prevention of COVID-19. While, a study carried by ***(Nwafor, et al., 2021),*** who reported that the level of practice of

preventive measures among studied pregnant women remained poor. The possible justification of this disparity might be a difference in sources of information, information seeking behavior, knowledge, phase of the outbreak in the study area, and worry related to the outbreak of study participants which lead to the variation in the application of recommended actions and behaviors to prevent COVID-19. As well as, the action taken by the government to avert transmission of COVID-19 might also be the other possible difference.

Third objectives of the current study to determine health belief models dimension throughout intervention, the current study finding showed that, the mean score of women' health belief models throughout pre/ post-intervention was highly statistically significant difference (P= 0.000**), while no statistically significant difference between post/ follow up intervention (p >0.05). similarly with, ***(Elmordy et al., 2022),*** who reported that there are a highly statistically significant in all items of health belief model except for perceived susceptibility at pre/ post program application, as well as, a highly statistically significant in all items of health belief model except for perceived benefits at post/ follow up program application (p<0.001).

This results in line with, a study in Kingdom of Saudi Arabia done by ***(Elgzar et al., 2020)***, whose results showed that there is a statistically significant difference between intervention and control groups in all elements of the health belief model after the program. Additionally, the current study found differences in some dimensions of HBM, where the highest mean of studied pregnant women regarding HBM dimensions was perceived barriers then perceived severity of HBF throughout intervention phase. This finding in agreement with, a study done by ***(Costa., 2020),*** who reported that, the highest mean score of health belief model are perceived barriers, perceived severity. Also, partially in agreement with, ***(Mirzaei et al., 2021),*** showed that the participants obtained highest mean scores from perceived susceptibility and perceived severity.

According to, quazi experimental study in Tanta, Egypt done by ***(ELsayed & Sarhan, 2022)*** who reported that the mean scores of the overall health belief model and subscales were similar before the educational intervention in both groups, with no statistically significant differences observed. After intervention, there was statistically significant differences observed as well as the mean scores of the overall health belief model were significantly increased except perceived barriers was markedly lower in the study group (P< 0.001).

As for the total level of health beliefs model, the present study result clarified that more than one third of the studied pregnant women had high health beliefs pre intervention compared to more than three quadrants post intervention. It is agreed with ***(Elmordy et al., 2022),*** who reported that about one fifth of the studied pregnant women had high health beliefs pre-program and improved to more than one third of pregnant women at post and at follow up phase. Another a quazi experimental study in Egypt which are consistent with those finding ***(El Sayed & Salama., 2021***) study, who demonstrated that majority of studied pregnant women had high level of health beliefs pre intervention compared to more than half of pregnant women post intervention. As researcher view, this finding confirming the value and importance of applying

the health Beliefs model could be right away to assist reinforce COVID-19 prohibitive practices and encourage the significance of contamination control measures in open places.

Concerning to the relation between pregnant women's knowledge and their demographic characteristics about COVID-19 throughout intervention, it was clear from the current study that, studied pregnant women who living in urban areas were positively associated with adequate knowledge on COVID-19 in pre/post intervention. Our finding is supported by ***(Kumbeni et al. 2021)***, who reported that pregnant women who living in urban areas had high prevalence of adequate knowledge on COVID-19 compared to compared to women live in the rural areas. The high prevalence of adequate knowledge on COVID-19 among women living in urban areas may due to the urban areas have good infrastructure such as internet connectivity and other media facilities compared to the rural area.

Another aspect worth mentioning is that, the present findings revealed that there was statistically significant relationship between studied pregnant women total level of knowledge and educational level throughout intervention phase p value <0.005. these results compatible with ***(Mahmoud et al., 2022)*** who found that there was statistically significant difference between women's total knowledge and educational level P-values 0.001. These results are comparable to those of ***(Apanga & Kumbeni., 2021)*** who concluded that educated women are more likely to access information on COVID-19 and comprehend the various messages being communicated on COVID19 and more likely to understand their importance.

As regard to the relation between pregnant women practice of self-protective measures and their demographic characteristics about COVID-19 throughout intervention, the current study mentioned that, there were a highly statistically significant difference between women's total practice of self-protective measure and educational level throughout intervention phase p value <0.005. This is in congruence with, a study carried by (***Ayele et al., 2021)***, pointed out that educational status has remained statistically significant with participants' level of practice to prevent COVID-19 infection. As a result of these findings, this may be due to the fact that as one gets more educated, there will be multiple ways of acquiring information to know about the prevention of COVID-19 and will practice accordingly. As well, when someone gets more educated, he/she will have a better understanding of control measures and preventive strategies related to COVID-19, and the ability to practice recommendations to protect COVID-19 will increase.

Regarding to the relation between pregnant women' health belief model and their demographic characteristics about COVID-19 throughout intervention, the current study results indicated that, there was highly statistically significant relationship between studied pregnant women total health belief model and their demographic characteristics at pre intervention phase (P < 0.005). Meanwhile, there was statistically significant relationship between studied pregnant women total health belief model and their age and residence at post/ follow-up phase (P < 0.005). This finding partially agreement with, ***(Abd Elmordy et al., 2021),*** who revealed that there was a positive statistical correlation between total health belief and age,

occupation and residence preprogram and between total health belief and age, education, occupation and residence post program application. While, there was a positive statistical correlation between total health belief and age, occupation and residence at follow up phase.

While, a study in India by ***(Kamal et al., 2020)*** who clarified that the practice score had a highly statistically significant association with age and place of residence p=.000 whereas, there was no significant association was found between practices and education P- value > 0.005). On the other hand, ***(Elgzar et al., 2020),*** pointed out that there were no statistically significant differences between studied groups concerning their demographic characteristic and health beliefs constructs before intervention regarding COVID19 (P > 0.005).

As related to the correlation between Correlation between total health belief model dimension among studied pregnant women through the intervention phases, the present study illustrated that there are positive, statistically significant correlations between studied pregnant women' total HBM dimensions at intervention phase. According to a study in Saudi Arabia done by ***Elgzar et al., (2020),*** clarified that there are no positive, statistically significant correlations between participants' total HBM dimensions at preprogram while there are no positive, statistically significant correlations between participants' total HBM.

As related to the correlation between pregnant women' knowledge, practices of self-protective measures and health belief model about COVID-19 throughout intervention, the current study showed that, there was highly statistically significance correlation between studied pregnant women total knowledge, practices of self-protective measures and health belief model throughout educational sessions (P < 0.005). These findings Confirming the value and importance of educational programs provided by various resources including educational booklet and program session to increasing level of knowledge, practices, this view validated by all studies in Egypt and other countries investigated the effect of educational program in changing people's knowledge and practices concerning covid-19 as a global crisis,

These finding supported with ***(ELsayed & Sarhan., 2020),*** who revealed a significant positive correlation between overall knowledge, health belief model, and self-reported compliance with COVID-19 preventive behaviors scores in both groups before and one month after the HBM-based educational intervention. This could be due to pregnant women with adequate knowledge had more positive perceptions and health beliefs about the prevention of COVID-19 and practiced more preventive behaviors.

CONCLUSION:

The findings of the current study supported the stated hypothesis and was concluded that implementation of the heath educational program based on health belief model regarding the COVID 19 pandemic showed the positive impact and effective improvement of knowledge, self-protective measure practices and health belief regarding prevention of COVID 19 among pregnant women. Additionally, there was a positive correlation between total knowledge, self-

protective measure practice and health belief model among studied pregnant women throughout intervention phases.

RECOMMENDATION:

In the light of the findings of the present study, the following recommendations are suggested:

- Incorporates the educational program regarding prevention for COVID-19 within outpatient clinics as well all MCH centers, and providing a printed copy of the educational brochure for other pregnant women and their relatives until the total management of COVID-19 virus.
- Emphasize the necessity of following COVID-19 preventative precautions during standard antenatal care instruction.
- Further research studies:
- Replication of the present study on a larger representative probability sample size in various Egypt governorates is recommended to achieve more generalization of the results.

REFRENCE*:*

[1] **Abdelhafiz, A. S., Mohammed, Z., Ibrahim, M. E., et al. (2020).** Knowledge, perceptions, and attitude of Egyptians towards the novel coronavirus disease (COVID-19). Journal of community health, 45(5), 881-890.

[2] **Abdul K, & Mursheda K (2020).** Knowledge and perception towards Novel Coronavirus (COVID 19) in Bangladesh. International Research Journal of Business and Social Science, 6(2).

[3] **Abuelgasim E, Saw L, Shirke M, et al. (2020).** COVID-19: Unique public health issues facing Black, Asian and minority ethnic communities. Curr Probl Cardiol.;45(8): 100621. 10.1016/j.cpcardiol.2020.100621.

[4] **Akalu, Y., Ayelign, B., & Molla, M. D. (2020):** Knowledge, attitude and practice towards COVID-19 among chronic disease patients at Addis Zemen Hospital, Northwest Ethiopia. Infection and resistance, 13, 1949: https://doi.org/10.2147/IDR.S2 58736

[5] **Allagoa D. O, Oriji P.C, Obagah L, et al. (2021):** Knowledge, Attitudes and Practices towards Covid- 19 among Pregnant Women in a Tertiary Hospital in SouthSouth, Nigeria,: International Seminar of Gender Equity Maternal and Child Health.1(1).

[6] **Apanga, P. & Kumbeni, M. T. M. (2021).** Adherence to COVID-19 preventive measures and associated, factors among pregnant women in Ghana, Tropical Medicine and International Health.

[7] **Ayele, A. D., Mihretie, G. N., Belay, H. G., et al. (2021).** Knowledge and practice to prevent COVID-19 and its associated factors among pregnant women in Debre Tabor Town Northwest Ethiopia, a community-based cross-sectional study. BMC pregnancy and childbirth, 21(1), 1-12.

[8] **Carico RR, Sheppard J, & Thomas CB. (2020).** Community pharmacists and communication in the time of COVID-19: Applying the health belief model. Res Social Adm Pharm. 2021; 17(1):1984-1987.

[9] **Champion VL, Strecher VJ. anz N K . (2002).** The Health Belief Model. In: Glanz K, Rimer BK, Lewis FM, editors. Health behavior and health education: theory, research, and practice. San Francisco: Jossey-Bass,: 45-66.

[10] **Chanay, M. D., & Anderson, B. A. (2016).** Caring for the Vulnerable, perspectives in nursing theory, practice and research. 4th ed., Jones & Bartlett Publishers, USA:153.

[11] **Costa, M. F. (2020).** Health belief model for coronavirus infection risk determinants. Revista de saude publica, 54.

[12] **Degu, A., Nibret, G., Gebrehana, H., et al. (2021).** Knowledge and attitude towards the current pandemic Corona virus disease and associated factors among pregnant women attending antenatal care in Debre Tabor general hospital northwest Ethiopia: an institutional-based cross-sectional study. International Journal of Women's Health, 13, 61.

[13] **EL Sayed, H. A., & Sarhan, A. E. (2022).** Effect of Health Belief Model-based Educational Intervention on COVID-19 Preventive Behaviors among Pregnant Women. Tanta Scientific Nursing Journal, 24(1), 308-338.

[14] **El Sayed,M S. L., & Salama, A. M. (2021).** Effect of an educational intervention based on health beliefs model adoption on pregnant women's knowledge and preventive health behaviours in relation to COVID-19. Egyptian Journal of Nursing and Health Sciences, 2(2), 159-175.

[15] **Elayeh, E., Aleidi, S. M., Ya'acoub, R., et al. (2020).** Before and after case reporting: a comparison of the knowledge, attitude and practices of the Jordanian population towards COVID-19. Plos one, 15(10), e0240780.

[16] **Elgzar, W. T., Al-Qahtani, A. M., Elfeki, N. K., et al. (2020).** COVID-19 outbreak: Effect of an educational intervention based on health belief model on nursing students' awareness and health beliefs at Najran University, Kingdom of Saudi Arabia. African journal of reproductive health, 24(2), 78-86.

[17] **Elhameed, E. M., El-Rahman, A., El-Razek, A. A., et al. (2022).** Knowledge Assessment of Pregnant Women and Maternity Nurses Regarding Coronavirus (COVID-19). Menoufia Nursing Journal, 7(1), 267-282.

[18] **Elmordy, Z., Mahmoud Hassan, M., Atta Mohammed, W., et al. (2021).** An educational intervention utilizing Health Belief Model for Pregnant Women's compliance with preventive measures regarding COVID-19. Egyptian Journal of Health Care, 12(4), 883-898.

[19] **Erfani, A., Shahriarirad, R., Ranjbar, K.,et al. (2020):** Knowledge, attitude and practice toward the novel coronavirus (COVID-19) outbreak: A population-based survey in Iran. Bull World Health Organ, E-pub, 30.

[20] **Favre, G., Pomar, L., Musso, D., & Baud, D. (2020).** 2019-nCoV epidemic: what about pregnancies? Lancet (London, England), 395(10224), e40.

[21] **Fikadu, Y, Yeshaneh, A, Melis, T, et al. (2021).** COVID-19 preventive measure practices and knowledge of pregnant women in Guraghe zone hospital, Int jour women's health, 13(39), 50.

[22] **Ghanbary, M.K., Shamsi, M., Khorsandi, M., et al. (2015).** Effect of training with teaching methods designed based on health belief model on awareness and self-efficacy in nurses on the discipline's standard precautions in hospitals, Journal of human health;1(2): 51-5.

[23] **Gralinski LE, Menachery VD. 2020.** Return of the Coronavirus: 2019-nCoV. Viruses 12(2):E135. doi: 10.3390/v12020135

[24] **Guan, W. J., Ni, Z. Y., Hu, Y., et al. (2020)** Clinical characteristics of coronavirus disease 2019 in China. New England journal of medicine, 382(18), 1708-1720.

[25] **Hashem, S. M. H., El-Kurdy, R., & Abdelmenem, E. E. (2022).** Pregnant women's concerns about Coronavirus disease 2019 (COVID-19) and its relationship to their preventive behaviors. *Tanta Scientific Nursing Journal*, *24*(1), 274-304.

[26] **Helmy H.H, Abdelhady F.S, & Ibrahim R.E, (2021).** Effect of Tele-health Nursing program Regarding Covid-19 among Pregnant Women, Original Article Egyptian Journal of Health Care, 2021 EJHC Vol.12 No.1

[27] **Huang C, Wang Y, Li X, et al. (2020).** Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet.;395:497–506.

[28] **Kamal D, Thakur VD, Swain SK, et al. (2020).** Knowledge, attitude, and practice toward COVID-19 among pregnant women in a tertiary care hospital during the COVID-19 outbreak. Journal of Marine Medical Society;22(3):66

[29] **Khalil, A., Kalafat, E., Benlioglu, C., et al. (2020).** SARS-CoV-2 infection in pregnancy: a systematic review and meta-analysis of clinical features and pregnancy outcomes. EClinicalMedicine 25: 100446.

[30] **Knight, M., Bunch, K., Vousden, et al. (2020).** Characteristics and outcomes of pregnant women hospitalised with confirmed SARS-CoV-2 infection in the UK: a national cohort study using the UK Obstetric Surveillance System (UKOSS). medRxiv. Accessed at May 12, 2020. Available at: https://www.medrxiv.org/content/10.1101/2020.05.08.20089268v1.

[31] **Kumbeni, M. T., Apanga, P. A., Yeboah, E. O., et al. (2021).** Knowledge and preventive practices towards COVID-19 among pregnant women seeking antenatal services in Northern Ghana. Plos one, 16(6), e0253446.

[32] **Kunno, J., Yubonpunt, P., Supawattanabodee, B., et al. (2022).** Knowledge, attitudes, and practices related to the COVID-19 pandemic among pregnant women in Bangkok, Thailand. BMC pregnancy and childbirth, 22(1), 1-11.

[33] **Mahmoud, G. A., Mohamed, H. M., Abbas, A. M., et al. (2022).** Educational program for pregnant women about Coronavirus (COVID-19) at Assiut University Hospitals. Assiut Scientific Nursing Journal, 10(30), 173-187.

[34] **Mehanna, A., Elhadi, Y. A. M., & Lucero-Prisno, D. E. (2021).** Public adherence to precautionary measures and preventive guidelines against COVID-19 in Sudan: An application of the Health Belief Model. medRxiv, 2020-12.

[35] **Metwally, H. M. S., & Desoky , M. (2020).** Knowledge, practice and attitudes of preventive measures against coronavirus infection among pregnant women in Egypt. Saudi Journal of Nursing and Health Care. doi, 10.

[36] **Mirzaei, A., Kazembeigi, F., Kakaei, H., et al. (2021).** Application of health belief model to predict COVID-19-preventive behaviors among a sample of Iranian adult population. Journal of education and health promotion, 10.

[37] **Mohamed, A. I., Elsayed, D. M. S., Abosree, T. H., et al. (2020).** Pregnant Women's Knowledge, Attitude and Self-Protective Measures Practice regarding Corona virus prevention: Health Educational Intervention. Egyptian Journal of Health Care, 11(4), 260-278.

[38] **Nasir, E. F., Elhag, A. K., & Almahdi, H. M. (2021).** COVID-19 Perceptions: Applying the Health Belief Model. SciMedicine Journal, 3(4), 325-333.

[39] **Nishiura, H., Kobayashi, T., Miyama, T., et al. (2020).** Estimation of the asymptomatic ratio of novel coronavirus infections (COVID-19). International journal of infectious diseases, 94, 154.

[40] **Nwafor, J. I., Aniukwu, J. K., Anozie, B. O., et al. (2020).** Knowledge and practice of preventive measures against COVID-19 infection among pregnant women in a low-resource African setting. MedRxiv.

[41] **Rabea A. Z., Mahmoud H., M. Atta M. W., et al. (2021).** An educational intervention utilizing Health Belief Model for Pregnant Women's compliance with preventive measures regarding COVID-19. Egyptian Journal of Health Care, 12(4), 883-898

[42] **Sabry A, M, F., Ahmed Abdelhafez Mohamed, A., Mohammed Amein Ghanem, N., et al. (2021).** Effect of What Sapp Educational Program Reminder on Pregnant Women's Knowledge, Attitude and Practice Regarding COVID-19 pandemic. Egyptian Journal of Health Care, 12(3), 116-130.

[43] **Shigemura, J., Ursano, R. J., Morganstein, J. C., et al. (2020).** Public responses to the novel 2019 coronavirus (2019-nCoV) in Japan: Mental health consequences and target populations. Psychiatry and Clinical Neurosciences. 74(4), 281.

[44] **Tong, K.-K. , Chen, J.H. , & Wu, A.M.S. (2019).** Application of health belief model to practice of responsible gambling. *Journal of Gambling Studies*, 35(3), 1047–1062.

[45] **World Health Organization. (2020):** Coronavirus disease (COVID-19) advice for the public

[46] **Yamane, T. (1967).** Statistics: An Introductory Analysis, 2nd Ed., New York: Harper and Row.

[47] **Zhang M, Zhou M, Tang F, et al. (2020).** Knowledge, attitude, and practice regarding COVID-19 among healthcare workers in Henan, China. J Hosp Infect;105(2):183-187.