

Effect of Telehealth Nursing program Regarding 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. Telehealth nursing program via SMS messages has become vital to ensure safe and effective health for maternal and fetal conditions. **Aim:** The study aimed to evaluate the effect of telehealth nursing program regarding Covid-19 among Pregnant Women. **Design:** A quasi-experimental study design was used. **Setting:** the study was conducted at Beni-Suef Governorate. **Data collected for 6 months from the first of April 2020 till the end of September 2020.** **Sample:** An online snowball sample approach of sixty pregnant women included in the study. **Tools:** Three tools were used for data collection; demographic and clinical data structured interviewing sheet, knowledge, attitude of pregnant women towards Covid-19 questionnaire, and Covid-19 Practice questionnaire. **Results:** nearly half of the studied women with a mean age of (28.80±5.24), three-quarters of them had a university education. A statistically significant improvement of COVID-19 knowledge, attitude, and practices of the studied women after implementation of COVID-19 educational program via telehealth nursing and SMS messages, and the improvement still apparent across all the studied sample regardless of their demographic characteristics and clinical data. The studied women's COVID-19 knowledge was positively associated with their attitude and practice. A positive relation was found between studied women's COVID-19 attitude and practices. **Conclusion:** Implementation of telehealth nursing program during Covid 19 pandemic showed a positive impact and effective improvement in pregnant knowledge, attitudes, and practices. **Recommendation:** Application of educational program via telehealth nursing for pregnant women in various antenatal clinics should be conducted, and designing a long-term plan by healthcare providers to improve Obstetric conditions and access to education via telehealth nursing after COVID-19.

Keywords: Telehealth nursing, pregnant women, knowledge, attitude, practices, and COVID-19.

Introduction

COVID-19 is caused by the new virus labeled SARS-CoV-2. The first case was reported in Wuhan, China, in December 2019, and the illness rapidly spread throughout China and other countries. The infection typically presents as fever and cough. Pneumonia is frequently observed in the diagnostic imaging tests of infected patients. The World Health Organization (WHO) estimates an overall mortality rate ranging from 3 to 4%, with a high rate of patients requiring admission to intensive care units (Wang *et al.*, 2020).

The World Health Organization (WHO) declared the Covid-19 virus disease as an infectious disease caused by a newly discovered coronavirus or novel coronavirus

disease (COVID-19) outbreak, it is a public health emergency of international concern on January 30, 2020, and on March 11, 2020, it was characterized as a pandemic. Most people infected with the COVID-19 virus will experience mild to moderate respiratory illness and some people requiring special treatment and also admission to intensive care units. The best way to prevent and slow down transmission is to be well informed about the COVID-19 virus, the disease it causes, and how it spreads (WHO, 2021).

Pregnancy presents characteristics that make pregnant women more susceptible to respiratory pathogens and severe pneumonia. These changes include increased oxygen consumption, elevated diaphragm, and edema of the respiratory tract mucosa, which cause

pregnant women to have an intolerance to hypoxia. This was noted during the H1N1 outbreak in 2009, in which pregnant women were four times more likely to be admitted to a hospital than the general population. During pregnancy, the morbidity and mortality of viral infections are more severe than those from bacterial pneumonia. The mortality rate reached 50%.²³, premature rupture of membranes, stillbirth, intrauterine growth restriction, and preterm birth are frequent complications of pulmonary infections. So, it is advisable to reduce access to hospitals or medical offices as much as possible (*Castro et al., 2020*).

Social isolation and disconnection can cause sadness, concerns, fear, anger, irritation, and frustration. Such behaviors are performed by individuals to maintain and promote health level and disease prevention. However, pregnant women have concerns about how to take care of their pregnancies and how to carry out their plans for childbirth during the outbreak of the novel coronavirus. Social distancing programs and fear of getting the sick lead to the reduction of prenatal care referrals, additionally pregnant women are also more willing to reduce the frequency of prenatal care visits which might be drastically harmful (*Chen et al., 2020*).

Maternal care institutes should understand the demands and needs of pregnant women, optimize the means of prenatal care service, and provide tailored and accessible health education and service for the safety of them. Pregnant women have the right to participate in decisions involving their well-being and what may or may not be done to their care. Understanding pregnant woman's experiences and perspectives of prenatal care and factors affecting it's during the outbreak of disease is particularly critical for enhancing the effectiveness of services delivery and addressing women's needs and expectations (*Masjouidi et al., 2020*).

Telehealth nursing virtual visits and health education via SMS messages do not fully replace in-person encounters during prenatal care, but they offer a means of reducing pregnant women and provider exposure to COVID-19 while providing

consolidated in-person testing and services. Prenatal care telehealth nursing regimens can be modified for high-risk patients to ensure they receive adequate access to fetal testing and ultrasound examinations, no obstetric consultants, and their obstetric providers (*Aziz et al., 2020*).

The use of telehealth during epidemic conditions of the COVID-19 pandemic has the potential to control disease and management of clinical cases. Telehealth services are rendered using real-time or store-and-forward techniques with the rapid evolution and downsizing of portable electronics, most families have at least one device of digital, such as smartphones and webcams that provide communication between patient and healthcare provider (Bradford et al., 2016). It Providing health care at the home natural environment as they feel comfortable and meet their family members, allows the person to feel more control over his life status and simultaneously as well as receive safe and supervised health care. to continue providing services while minimizing risks for both patients and providers (Hill, & Burroughs, 2020).

Significance of the Study:

Centers for Disease Control and Prevention (CDC) reported that pregnant women at a higher risk of Intensive Care Unit (ICU) admission and mechanical ventilation compared to non-pregnant women in an analysis of 8207 cases of COVID-19 in the obstetric population, and no higher risk of mortality was identified. According to the report from the CDC, out of 19,600 pregnant women studied, 33 died a 0.2 percent death rate. For women who are not pregnant, the death rate was 0.1 percent. Researchers believe the increased risk may be attributable to physiological changes that occur with pregnancy, such as increased heart rate and oxygen consumption, decreased lung capacity, and shifts in the body's immune system (*Nakamura-Pereira et al., 2020*).

COVID-19 is currently the most horrible issue around the world as there is no proven vaccine or medicine for this rapidly spreading disease (*Rasmussen, et al 2020*). The only way left to this situation is to slow down or eradicate the spreading by adopting prevention

measures, inspire the pregnant women's knowledge, and ultimately result in better preventive practices toward COVID-19. Telehealth nursing represents one approach to optimizing care and mitigating risk for exposure for prenatal women in the setting of the COVID-19 and has become crucial to confirm the safety and effective delivery of obstetric care (Fryer, et al 2020). Therefore, the present study aimed to evaluate the effect of the telehealth nursing program Regarding Covid-19 among Pregnant Women. Moreover, assessing pregnant women's knowledge, skills, and practice is important in clarifying gaps and strengthen awareness of pregnant women.

Operational definition.

Telehealth nursing: In the present study, it was defined as the use of telecommunication technology like (SMS messages, virtual meetings via smartphones, and different apps) to support health information and increase health services. Telehealth nursing in developed countries can improve the behavior of healthy living.

COVID-19: Coronavirus disease is an infectious disease caused by a newly discovered coronavirus or novel coronavirus disease outbreak, it is a public health emergency of international concern it was characterized as a pandemic.

Aim of the study:

The study aimed to evaluate the effect of the telehealth nursing program regarding Covid-19 among Pregnant Women. **This aim was achieved through:**

1. Assessing pregnant women's knowledge, Attitude, and Practices (KSA) regarding **COVID 19**.
2. Design and implementation of telehealth nursing program to improve knowledge, attitudes, and practice of pregnant women regarding COVID -19
3. Evaluating the effectiveness of telehealth nursing program on knowledge, attitude, and practice of pregnant women Regarding **COVID -19**

Research Hypotheses:

Pregnant women who will be exposed to telehealth nursing program regarding **COVID -**

19 will have improved in their knowledge, attitude, and practice post-education compared to pre-education

Subjects and Method

Research design:

A quasi-experimental study design was used to accomplish the aims of this study.

Setting:

The study was conducted at Beni-Suef Governorate.

Subject:

Sample Type: An online snowball sample

Sample Size: 60 pregnant women were included. Who are residents at previously mentioned settings; over 6 months beginning at first of April 2020 till the end of September 2020. The studied sample was selected according to the following **inclusion criteria:** pregnant women at any age, can read and write, have their mobile phone to receive text messages, and willingness to receive the text message.

Tools of Data Collection: Three tools were used for data collection: The survey questionnaire was designed in Arabic, and it covered the demographic characteristics, knowledge, attitude & practices toward COVID-19.

First tool: Demographic and clinical data structured interviewing sheet: To assess pregnant women's personal data and knowledge regarding Covid-19. It was designed by the researcher after reviewing related literature, and was consisted of **two** parts:

First part: Demographic data of pregnant women, it consisted of two main parts: **Part I:** women's socio-demographic characteristics (age, residence, and monthly income, level of education, work, and telephone number).

Part II: Obstetric history (gravidity, parity, and follow-up during this pregnancy).

Second part: Assessment of pregnant women's knowledge about COVID -19: It

consisted of 25 questions, as following (3 questions covered pregnant women' knowledge regarding the concept of COVID -19, 6 questions covered methods of transmission, 4 questions covered the signs and symptoms, 4 questions covered high-risk groups, 7 questions covered the preventive methods, and only one question about treatment).

Scoring: The pregnant women who checked the correct answer were given (1), while the one who checked the incorrect answer was given (0). Thus, pregnant women' total knowledge score was classified as the following:

- Inadequate when the total score was <75%.
- Adequate when the total score was ≥ 75%.

Second tool: Pregnant women's Attitude towards Covid-19 Questionnaire: (**Zhong et al., 2020**) this tool was modified by the researcher to evaluate pregnant women's attitude part: It consisted of 15 questions as following (7 questions about COVID -19, 7 questions reflecting women attitude toward preventive measures, and 5 questions about treatment). Women's answers were scored on a three-point Likert scale as disagree = 0, I'm not sure =1, Agree =2. The attitude's total score ranged from zero to 15, as a higher score indicated a positive attitude toward COVID-19.

- Less than 80% indicated a negative attitude.
- More than or equal to 80% indicates a positive attitude.

Third tool: Covid-19 Practices Questionnaire; (**Alzoubi et al., 2020**) this tool was modified by the researcher to assess pregnant women' Practice which includes measures that the women follow to prevent acquiring the infection as hand washing, using alcohol rub, covering the nose and mouth with a tissue while sneezing or coughing, avoidance of handshaking and eating or drinking herbal. It consisted of 17 questions as following (2 questions about handwashing, 4 questions about using protective measures, and 11 questions about preventive measures of COVID-19)

- **Scoring:** the pregnant women who checked Always were scored "2" and who checked

sometimes was scored "1", while those who checked never were scored (0). The pregnant women practice was classified as the following:

- Satisfactory if the percent score was 80% or more.
- Unsatisfactory if less than 80%.

Method:

The study was executed according to the following steps:

1) Validity

The tools' validity was tested by seven experts in the obstetrics, and community Health Nursing field to check the clarity, applicability, and comprehensiveness of the questions. Recommended modifications were done accordingly, and the final form was modified.

2) Reliability

The reliability was done by Cronbach's Alpha coefficient test which revealed that each of the three tools consisted of relatively homogenous items as indicated by the moderate to high reliability of each tool, which are 0.86 for knowledge, 0.76 for practices, and 0.65 for attitude.

3) A Pilot study

The pilot study was carried out on 10% of the total sample (6 pregnant women) to test the clarity and applicability of the study tools as well as estimation of the time needed to fill the questionnaire. Pregnant women involved in the pilot study were excluded from the sample.

Educational program Construction

To fulfill the aim of the study, the following phases were adopted. Preparatory, assessment phase, planning phase, implementation phase, and evaluation phase. These phases were carried out from the beginning of April 2020 till the end of September 2020, covering six months.

A- Preparatory phase:

The researchers conducted this phase by reviewing local and international related literature concerning the various aspects of the research problem. This phase helped the researchers to be acquainted with the magnitude and seriousness of the problem and

guided the researchers to prepare the required data collection tools.

B-Interviewing and assessment phase:

We designed a semi-structured questionnaire using Google forms and we generate the link was shared on social media and Facebook groups and WhatsApp. Then, the link was shared personally to the contact list of researchers. The researchers introduced themselves and the purpose of the study was explained to women who agreed to participate in the study. The researcher took the pregnant women's telephone number to send SMS text messages. Data was collected throughout two phases of assessment by using three tools. The first phase of assessment was applied before applying the educational Program to obtain baseline data about the pregnant women's knowledge, attitude, and practices toward COVID-19, identify misconceptions, and deficient practices to be addressed in the construction of the implementation. They were intended to be used also after the intervention to measure the knowledge level of the trainers about coronavirus and evaluate the improvement after Telehealth education. Filling the questionnaire took from 15 to 20 minutes for each participant.

C- Planning phase:

This phase included the development of the educational material depending on the analysis of the data collected after reviewing the relevant literature. The researcher developed it in Arabic with large-sized fonts to improve the studied women's deficit knowledge and attitude regarding COVID-19. Also, researchers used teaching materials and media such as guiding videos for handwashing steps and face mask-wearing.

Objectives of the educational program were constructed and included the following:

General Objectives: By the end of the health education program via telehealth nursing each woman will be able to acquire essential knowledge and adaptive healthy attitude and practice regarding COVID-19 and satisfied with the educational program via SMS messages.

Specific Objectives By the end of the health education program, each woman will be able to define COVID-19, discuss signs and symptoms of COVID-19, Identify the mode of transmission of COVID-19, discuss methods of prevention of COVID-19, and identify healthy practices and attitude to prevent the spread of COVID-19.

D-Implementation phase:

The questionnaire was initially structured in English, thereafter content was validated by Obstetric and Community experts. The questionnaire was then translated into Arabic. After being validated, the questionnaire was formatted into Google forms, internet-based software, commonly used for data collection via personalized survey. It was preferred for its convenience, efficiency, and high popularity especially in the current scenario where all antenatal units were closed to combat COVID-19 following detecting several cases After adding the questionnaire into the Google forms, a link for the same was generated and distributed to the studied sample.

The pregnant women received messages three times per week as two ways of communication via a mobile phone it was voice messages, text messages, and videos related to antenatal care, coronavirus, and methods of prevention of COVID-19. The researcher conducted online **3 consecutive** sessions.

First session: This session included knowledge about the definition of COVID-19, symptoms, methods of transmission, and Preventive methods. The Session was in small groups (N=9-11 women) with a duration of approximately 20 -30 minutes. The researchers send text messages in simple Arabic language with simple videos and discussed with the pregnant women. This session was repeated six times to cover all studied women

Second session: Included 15 questions concerning pregnant women's attitude regarding coronavirus, methods of prevention of infection, and treatment. The session was in small groups (N=9-11 women) with a duration of approximately 20 -30 minutes.

Third session: this session concerning with practices of pregnant women. This tool was used before and after implementation to evaluate the extent to which the training implementation affected the pregnant women practices. The session was in small groups (N=9-11 women) with a duration of approximately 30-35 minutes for each session. The questionnaire measures the pregnant women's knowledge, attitudes, and practices (pre-posttest). At the end of the session, the pregnant women were allowed to ask questions related to pregnancy and coronavirus. The researcher provided explanations, necessary consultations, and information according to their needs.

E-Evaluation phase: To assess the impact of the telehealth nursing program on improving knowledge, attitudes, and practice of pregnant women regarding COVID-19, a post-test (after one month from the application of the program) was done using the same three tools through telephone.

Ethical consideration

Official permission was obtained from the ethical committee of the Faculty of Nursing Beni-Suef University. Oral consent was obtained from each woman. The participants

were informed by the researchers that participating in the study is voluntary and they have the right to withdraw from the study at any time. The pregnant women were ensured that the questionnaire sheet will be used only for the study and will be discarded at the end of the study. Anonymity was assured as the filled questionnaire sheets were given a code number (not by names).

Statistical analysis:

Data were verified before computerized entry. The Statistical Package for Social Sciences (SPSS) version 21.0 was used for that purpose, followed by data tabulation and analysis. Descriptive statistics were applied (e.g., mean, standard deviation, frequency, and percentages). Test of significance (t-test, chi-square). A significant level value was considered when $p \leq 0.05$. Also, A highly significant level value was considered when $p < 0.001$.

Limitation of the study:

The termination of the internet and weak signal is the main obstacles for giving sessions for the pregnant women at the time as it was planned.

Results:

Table (1): Frequency distribution of studied pregnant women regarding their demographic characteristics (N=60)

Variables	No	%
Age		
<25	20	33.3
25-<35	28	46.7
35+	12	20.0
Min –max	21-40	
Mean ±SD	28.80±5.24	
Women education		
Intermediate education	14	23.3
University education	46	76.7
Women' occupation		
Housewife	22	36.7
Working	38	63.3
Residence		
Rural	32	53.3
Urban	28	46.7
Family income		
Insufficient	8	13.3
Sufficient	52	86.7

Table 1 reveals that nearly half (46.7%) of the studied women were in the age group of (25-<35) years old with a mean age of (28.80±5.24). three quarters (76.7%) of them had a university education. Also, more than half (63.3%) of the studied pregnant women were working and (53.3%) of them reside in rural, while (86.7%) have got sufficient monthly income

Table (2): Frequency distribution of studied pregnant women regarding their obstetric history (N=60)

Variables	No	%
Gravidity		
Primigravida	10	16.6
1-2 times	29	48.4
≥3 times	21	35
Parity		
Nulliparous	10	16.6
1-2 times	35	58.4
≥3 times	15	25
Follow up during this pregnancy		
Regular	28	46.6
Irregular	32	53.4

Table 2, denotes that nearly half (48.4%) of the studied women's number of gravidities was 1-2 times, also more than half (58.4%) of them had the number of parity 1-2 times. While more than half had irregular follow up during this pregnancy.

Table (3): Frequency distribution of studied pregnant women regarding their using of internet and SMS data (N=60)

	No	%
Use the internet (telehealth)	60	100.0
Receive SMS towards guidelines toward pregnancy and COVID-19	60	100.0
The time preferred to receive the SMS		
Morning	14	23.3
At afternoon	44	73.3
At evening	2	3.3
Sources of information regarding pregnancy guidelines?		
Health care providers	52	86.7
YouTube /Face book	14	23.3
Television	4	6.7
Relatives/friends	2	3.3
Receive SMS text message towards guidelines toward pregnancy and COVID-19?	60	100
Favorite information regarding pregnancy guidelines?		
Nutrition	34	60.7
Exercise	14	25.0
expectation during pregnancy	12	21.4
Avoiding Things	34	60.7
personal hygiene	10	17.9
when I go to the hospital	28	50.0
Favorite information about COVID-19?		
Prevention methods	46	76.7
Symptoms	10	16.7
Nature of disease	14	23.3
Treatment	4	6.7

* The results not mutually exclusive

Table 3 indicates that all the studied women (100%) were using the internet and want to receive SMS of guidelines about pregnancy and COVID-19. The majority of the studied women (86.7%) had the source of information regarding pregnancy guidelines from health care providers while (23.3%) had the source of information from YouTube and Facebook. more than half of the studied women (60.7%) their favorite information regarding pregnancy guidelines were about nutrition and avoiding things, and half of them (50.0%) their favorite information was about precautions when going to the hospital. Three-quarters of the studied women their favorite information about the coronavirus were preventive methods.

Figure (1): percentage distribution of studied pregnant women regarding their source of information (N=60).

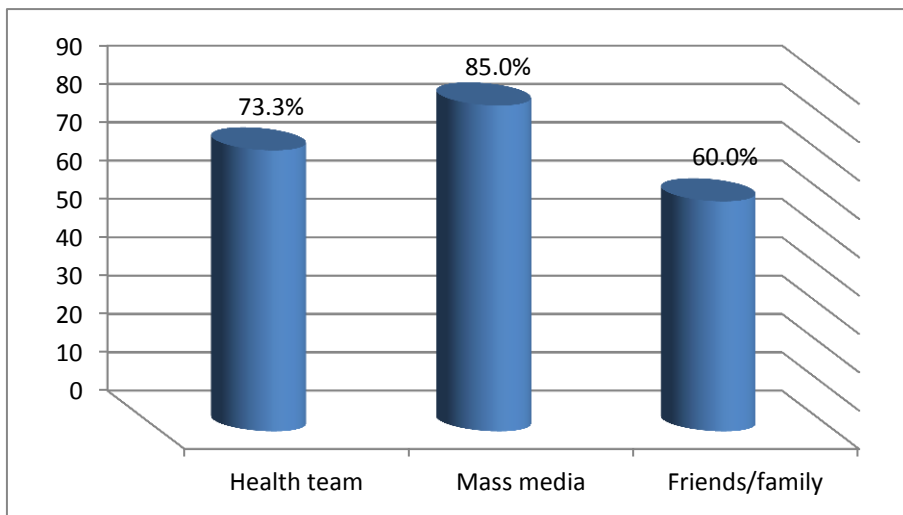


Figure 1 shows that the majority of the studied women source of coronavirus information were from mass media, and about three-quarters of them their source of information was from the health team.

Table (4): Frequency distribution of studied pregnant women regarding their total knowledge about COVID-19 items pre and post-program (N=60).

	Pre				Post				X ²	p-value
	Correct		Incorrect		Correct		Incorrect			
	No	%	No	%	No	%	No	%		
Methods of transmission	36	60.0	24	40.0	47	78.3	13	21.7	4.72	0.030*
Signs and symptoms	34	56.7	26	43.3	56	93.3	4	6.7	21.51	0.000**
High-Risk group	33	55.0	27	45.0	44	73.3	16	26.7	4.38	0.036*
Methods of Prevention	22	36.7	38	63.3	51	85.0	9	15.0	29.41	0.000**
Concepts	14	23.3	46	76.7	43	71.7	17	29.3	28.10	0.000**
Treatment	24	40.0	36	60.0	42	70.0	18	30.0	10.90	0.001*

Table 4, indicates that there was a highly statistically significant difference between mean scores of knowledge about COVID-19 at the pre and post-implementation phases (p<0.001).

Figure (2): Percentage distribution of studied pregnant women regarding total knowledge pre and post-program

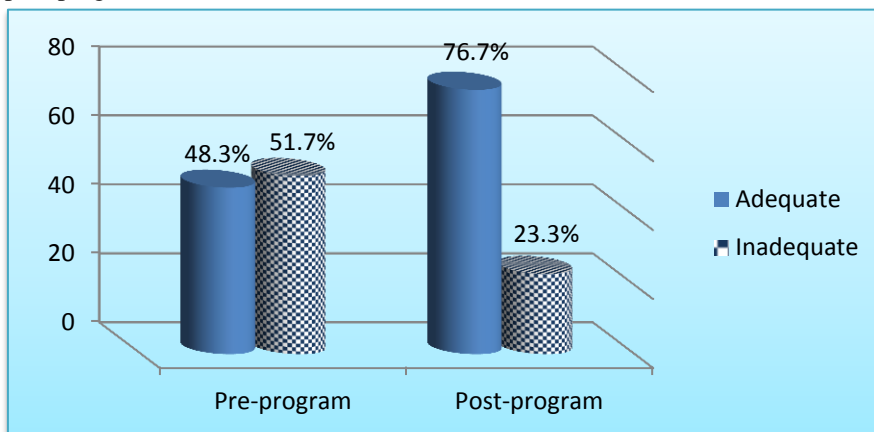


Figure 2, represents that more than three quarters (76.7%) of the studied women’ have adequate knowledge regarding COVID-19 versus half of the studied women (51.7%), also the total knowledge score regarding COVID-19 was improved after implementation than pre-implementation.

Figure (3): percentage distribution of studied pregnant women regarding total attitude pre and post-program

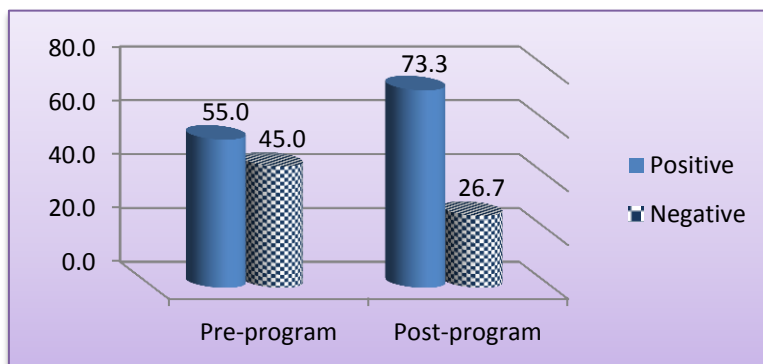


Figure 3, clarifies that nearly three quarters (73.3%) of the studied women’ have positive attitude regarding COVID-19 versus half of the studied women (55 %), also total attitude score regarding COVID-19 were improved after implementation than pre-implementation of the program

Table (5): Frequency distribution of studied women regarding their total attitude items pre and post-program (N=60).

	Pre				Post				X ²	P-value
	Positive		Negative		Positive		Negative			
	No	%	No	%	No	%	No	%		
Virus	34	56.7	26	43.3	52	86.7	8	13.3	4.91	0.027*
Prevention	32	53.3	28	46.7	45	75.0	15	25.0	6.125	0.013*
Treatment	30	50.0	30	50.0	42	70.0	18	30.0	5.00	0.025*

Table 5, Shows that there was a statistically significant difference between mean scores of attitude about COVID-19 at the pre and post-implementation phases

Table (6): Frequency distribution of studied women regarding their total practice items pre and post-program (N=60).

	Pre				Post				X ²	p-value
	Satisfactory		Unsatisfactory		Satisfactory		Unsatisfactory			
	No	%	No	%	No	%	No	%		
Hand washing	26	43.3	34	56.7	56	93.3	4	6.7	34.66	0.000
Prevention	32	53.3	28	46.7	50	83.3	10	16.7	12.47	0.000
Using protective measures	21	35.0	39	65.0	44	73.3	16	26.7	17.75	0.000

Table 6, reveals that there was a highly statistically significant difference between mean scores of practices regarding COVID-19 at the pre and post-implementation phases.

Figure (4): Percentage distribution of studied pregnant women regarding total practices pre and post-program

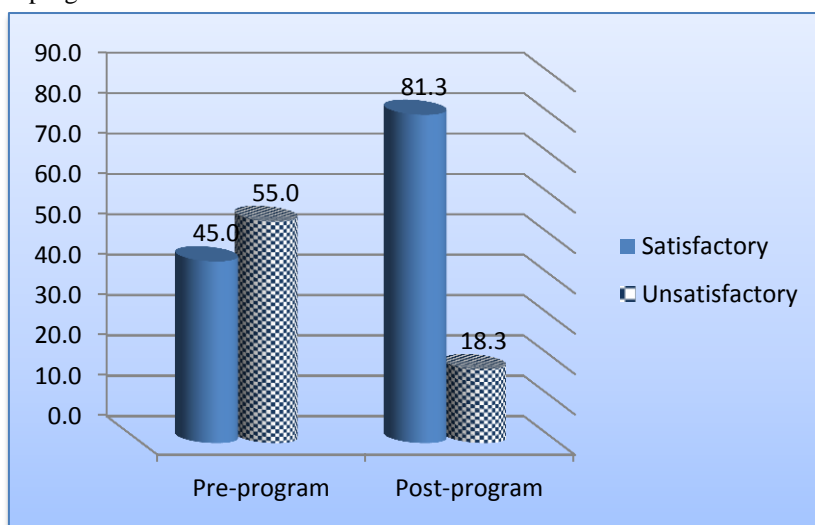


Figure 4, clarifies that the total practice score regarding COVID-19 was improved after implementation than pre-implementation.

Table (7): Correlation between total knowledge, attitude, and practices among studied pregnant women pre and post-program

	Pre		Post	p-value
	R	p-value	R	
Virus	0.28	0.067	0.68	0.025*
Prevention	0.197	0.131	0.790	0.024*

Table 7, reveals that there was a statistically significant difference between total knowledge, total attitude, and total practices regarding COVID-19 at the pre and post-implementation phases.

Table (8): Correlation between total attitude and practices among studied pregnant women pre and post-program

	Pre		Post	
	R	p-value	R	p-value
Total attitude	0.422	0.143	0.751	0.005*

Table 8, shows that there was a statistically significant difference between the total score of practices and the total score of attitudes regarding COVID-19 at the pre and post-implementation phases.

Discussion:

COVID-19 is an emerging infection that has been shown to have a fatal impact on pregnant women and their fetuses, with an increased risk of complications in pregnant women. The COVID-19 outbreak is rapidly increasing in the number of cases, deaths, and countries affected. At present, limited data are available on pregnant women with COVID-19 on which to base recommendations for pregnancy-specific care. In many low- and middle-income countries, access to health information regarding COVID-19 during pregnancy is poor. The rapid adoption of mobile phones in these countries has created new opportunities for disseminating such information (Sonja, et al., 2019).

Telehealth nursing has the potential to address many challenges in providing health services during the COVID-19 pandemic. Also, it can help us avoid direct physical contact and minimize the risk of COVID transmission and finally provide continuous care to the community. Telehealth can become a basic need for the general population, and health care providers, especially when people are in quarantine, enabling patients in real-time through contact with health care providers for advice on their health problems (Monaghesh & Hajizadeh, 2020).

The present study indicated that 46.7% of the studied women were in the age group (25-<35) with a mean age of (28.80±5.24). All pregnant women were using the internet and want to receive short message services (SMS) regarding COVID-19. This result supported by (Cormick et al., 2012) who illustrated that SMS technology was a feasible method for the

administration of health educational messages, 90% opened and read the SMS. According to (Lamont et al,2016) SMS messages were used to increase the efficacy of delivering health information to facilitate increased maternal knowledge and increased health facility utilization for overall improved maternal and neonatal health outcomes, SMS messaging as a vehicle to increase health knowledge and potentially change behavior during pregnancy. This result may be due to the rapid adoption of mobile phones and SMS messages in the low- and middle-income countries had created new opportunities for disseminating such information for pregnant women who were locked down during the pandemic.

The present study indicated that the majority of the studied women's sources of information regarding COVID-19 were from mass media. This result was similar to (Anikwe et al, 2020) who revealed that the more than half (N=339, 61%) of the respondent was informed by mass media. This result was also supported by (Sambhav, 2020) who revealed that social media is spreading its day by day, and becoming one of the most popular online activities for entertainment but in COVID-19 it had become most popular for getting information about the world. It highlighted the importance of mass media in the fight against COVID- 19, especially when people are in lockdown. Moreover, the World Health Organization (WHO) had provided information about COVID-19 through their websites to increase the awareness of the population regarding COVID-19 (World Health Organization, 2020).

The present study illustrated that three-quarters of pregnant women their sources of pregnancy information were from health care

providers. This study was contradicted with (Anikwe et al, 2020) showed that less than 20% of the respondents got their information from healthcare workers. This result may be due to the lockdown of all populations and the decreased numbers of prenatal visits, therefore; communication via telehealth nursing and SMS messages to gain information about antenatal care and pregnancy guidelines for the safety of maternal and fetal.

The result of the current study showed that the studied pregnant women already had knowledge regarding (methods of transmission, signs, risk group, prevention, concepts, and treatment) of COVID-19 pre-implementation. This study in the same line with (Elayeh et al., 2020) who illustrated that the studied sample had adequate information about COVID-19 pre-implementation. This is maybe due to the higher level of education of the most studied sample, and fear from COVID-19 as a pandemic disease which made them search about the virus and read more about it, moreover; the willingness of a healthy future baby and healthy family.

The current study revealed that there was a high improvement of knowledge about COVID-19 post-implementation. This result was supported by (Goudah, 2021) who revealed that there was a high level of awareness between Pregnant women regarding COVID-19 due to counseling to them about important points to follow to prevent exposure to infection. This reflects the importance of the Internet in promoting health, especially during infectious diseases and pandemics. Telehealth nursing presence in these lock-down months played an important role in providing knowledge and helped pregnant women to continue their antenatal care. Also, educational status was positively associated with the level of awareness of pregnant women regarding COVID-19. This result contradicted (Akalu, 2020) who reported that there was a high prevalence of poor knowledge among the study subjects after implementation.

The result of the current study revealed that most of the pregnant women's attitudes regarding COVID-19 were improved after the implementation of the program. This in agreement with (Erfani, 2020) who revealed

that 90% of the respondent had a positive attitude toward COVID-19. This is maybe due to the high level of education of pregnant women which is better subjected to various sources of information regarding the disease like the internet, Facebook, and telegram. Additionally, educated individuals have also the ability to understand the information easily that they receive. The higher educational attainment had a positive effect on their attitude.

The current study revealed that most of the pregnant women's practices regarding COVID-19 were improved after the implementation of the program. This is in the same line with (Fikadu, 2020) who indicated that 76.2% of the participant had a good practice on prevention of COVID-19, and most of them were obeying government restrictions due to the pandemic. This may be due to This also may be due to Pregnant women should be educated on preventative measures to reduce the severity and complications of COVID19 associated illness, and reduce the risk of transmission of the disease for the fetus and her family. Also, the higher level of education of pregnant women had a positive impact on their preventive practices them regarding the coronavirus

The result of the current study revealed that there was a statistically significant difference between the total score of practices and the total score of attitudes regarding COVID-19 at the pre and post-implementation phases. This result in agreement with (Anikwe et al, 2020) Who showed that the majority of pregnant women in Nigeria demonstrated a positive attitude and preventive practices. This result may be due to the educational program via telehealth nursing was effective in changing the women attitude positively and improving the women practice.

The present study indicated that there was a strong relationship between the level of knowledge, attitude, and practice regarding the coronavirus. Those participants were knowledgeable and had a positive attitude concerning the coronavirus. This result was supported by (Kamal et al., 2020) who indicated that the majority of pregnant women were knowledgeable about the coronavirus and

had a positive attitude and good practices. (Alzoubi et al, 2020) who revealed that there was good knowledge, practice, and a high attitude among the study population towards COVID-19. The possible explanation may be that a good telehealth nursing program may scale up women' insight and awareness which lead to a positive attitude and improve the overall practices of preventive measured to reduce transmission of COVID-19. Satisfactory knowledge promotes the day-to-day practice of COVID-19 prevention.

Conclusion:

Based on the findings of the current study; the study concluded that implementation of telehealth nursing program regarding the COVID 19 pandemic showed the positive impact and effective improvement of knowledge, attitudes, and practices among pregnant women.

Recommendations:

Based on the findings of the current study, the following recommendations are suggested:

- Application of educational program via telehealth nursing for pregnant women in different antenatal clinics and various Egypt governorates should be conducted to improve the awareness of pregnant women and other vulnerable groups regarding COVID-19.
- Designing a long-term plan by healthcare providers to improve Obstetric conditions and access to education via Telehealth nursing and after COVID-19.

Further research:

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.

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